

Direct Testimony and Schedules
Matthew Langan

**STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION**

IN THE MATTER OF THE APPLICATION
FOR A ROUTE PERMIT FOR THE
ALEXANDRIA TO BIG OAKS 345 kV
TRANSMISSION PROJECT IN CENTRAL
MINNESOTA

MPUC DOCKET No. E002, E017, ET2,
E015, ET10/TL-23-159
OAH DOCKET No. 25-2500-39723

DIRECT TESTIMONY OF
MATTHEW LANGAN

On Behalf of

APPLICANTS

May 30, 2024

Exhibit ____ (MAL-1)

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Schedules

- Schedule 1 Resume of Matthew Langan
- Schedule 2 Mississippi River Crossing Analysis

1 **I. INTRODUCTION**

2
3 Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

4 A. My name is Matthew Langan, and my business address is 401 Nicollet Mall,
5 Minneapolis, Minnesota 55401.

6
7 Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

8 A. I am employed as a Principal Agent, Siting and Land Rights by Northern States
9 Power Company, doing business as Xcel Energy (Xcel Energy).

10
11 Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

12 A. My educational background comes from the University of Minnesota where I
13 majored in Natural Resources and Environmental Studies with a Forestry
14 minor. From 1999 to 2009, I was employed by the Minnesota Department of
15 Natural Resources (MnDNR) in various capacities. From 2004 to 2009, I was
16 the principal planner and was responsible for preparing environmental review
17 documents in compliance with the Minnesota Environmental Policy Act and
18 coordinating the MnDNR's review of transmission line, pipeline, power plant,
19 and wind energy projects for the entire state. In 2009, I took a position as a
20 planning director at the Minnesota Department of Commerce where I led
21 utility companies, local government units, state and federal agencies,
22 landowners and other stakeholders through the environmental review and
23 permitting process for the Minnesota Power Plant Siting Act. In 2012, I
24 started with Xcel Energy in its Siting and Land Rights Department. I am
25 currently a Principal Agent, and I am responsible for leading the planning,
26 route alternatives analysis, site selection, and management of sites and

1 corridors for major energy facilities, including high voltage transmission lines.
2 My resume is attached to this testimony as Schedule 1.

3
4 Q. FOR WHOM ARE YOU TESTIFYING?

5 A. I am testifying on behalf of Xcel Energy, Great River Energy, Minnesota
6 Power, Otter Tail Power Company (Otter Tail), and Missouri River Energy
7 Services, on behalf of Western Minnesota Municipal Power Agency (Western
8 Minnesota), the applicants for a Route Permit in this proceeding (collectively,
9 the Applicants).

10
11 Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

12 A. On September 29, 2023, the Applicants filed a Route Permit application
13 (Application) with the Minnesota Public Utilities Commission (Commission)
14 for approval of a route permit to construct the Alexandria – Big Oaks 345 kV
15 Transmission Project (Project). The purpose of my testimony is to discuss a
16 portion of the Project route that will cross the Mississippi River. There are a
17 number of route alternatives currently under consideration for this river
18 crossing, and I discuss each of these alternatives as part of my testimony. I
19 also identify the Applicants' preferred route for the river crossing, which is
20 based on extensive analysis of each route option's potential impacts.

21
22 Q. WHAT SCHEDULES ARE ATTACHED TO YOUR TESTIMONY?

23 A. The following schedules are attached to my testimony:

- 24 • Schedule 1: Resume of Matthew Langan; and
- 25 • Schedule 2: Applicants' Mississippi River Crossing Analysis.

1 **II. EVALUATION OF RIVER CROSSING ROUTE OPTIONS**

2
3 Q. BRIEFLY DESCRIBE THE APPLICANTS’ PROPOSED ROUTE FOR THE PROJECT.

4 A. The Project involves construction of an approximately 105 to 108-mile long,
5 345 kV transmission circuit from the existing Alexandria Substation located
6 in Alexandria, Douglas County to the new Big Oaks Substation that will be
7 constructed on the north side of the Mississippi River in Becker, Sherburne
8 County. The majority of the Applicants’ proposed route for the new 345 kV
9 transmission circuit from the existing Alexandria Substation to the new Big
10 Oaks Substation follows existing transmission line right-of-way as the Project
11 involves placing a new 345 kV transmission circuit on existing CapX2020
12 transmission line structures that were previously permitted and constructed as
13 double-circuit capable.¹ One portion of the proposed route that will deviate
14 from existing transmission right-of-way is at the Mississippi River. At this
15 junction, new right-of-way will be required to connect the new 345 kV
16 transmission circuit from where it deviates from the existing transmission line
17 structures to the new Big Oaks Substation located northwest of the Monticello
18 Nuclear Generating Plant (Monticello Plant) in Becker.

19
20 Q. HOW MANY ROUTE ALTERNATIVES ARE CURRENTLY BEING EVALUATED FOR
21 THE MISSISSIPPI RIVER CROSSING PORTION OF THE PROPOSED ROUTE?

22 A. Five route alternatives for the Mississippi River crossing are currently being
23 evaluated—two of these route alternatives were included in the Application

¹ These structures were permitted as double-circuit capable as part of the Monticello to St. Cloud 345 kV Transmission Project (E002, ET2/TL-09-246) and the Fargo to St. Cloud 345 kV Transmission Project (E002, ET2/TL-09-1056).

1 and three were proposed by the MnDNR in its January 8, 2024 scoping
2 comment and were thereafter modified by the Applicants.

3
4 Q. CAN YOU BRIEFLY DESCRIBE THE FIVE PROPOSED ROUTE ALTERNATIVES FOR
5 THE MISSISSIPPI RIVER CROSSING?

6 A. Yes. The five route alternatives for the Mississippi River crossing are as
7 follows:

- 8 1. Western Crossing Option: This option would involve construction
9 of a new crossing of the Mississippi River directly south of the
10 proposed Big Oaks Substation and would include 1.4 miles of new
11 right-of-way located entirely on Xcel Energy-owned land. There are
12 two different design options for the Western Crossing Option. The
13 first option, as proposed in the Application, would construct the
14 new 345 kV transmission line as a single-circuit line across the
15 Mississippi River (Western Crossing Single-Circuit Option), while
16 the second option would be to double-circuit the new 345 kV line
17 with an existing 115 kV transmission line (Western Crossing Option
18 B (Double-Circuit));
- 19 2. Eastern Crossing Option: This option would involve construction
20 of a new crossing of the Mississippi River just west of the Monticello
21 Plant. This option would parallel an existing 115 kV transmission
22 line, would include 2.9 miles of new transmission line right-of-way,
23 and would be located entirely on Xcel Energy-owned land. This
24 option would also require two separate structures to be placed on
25 an island in the Mississippi River;

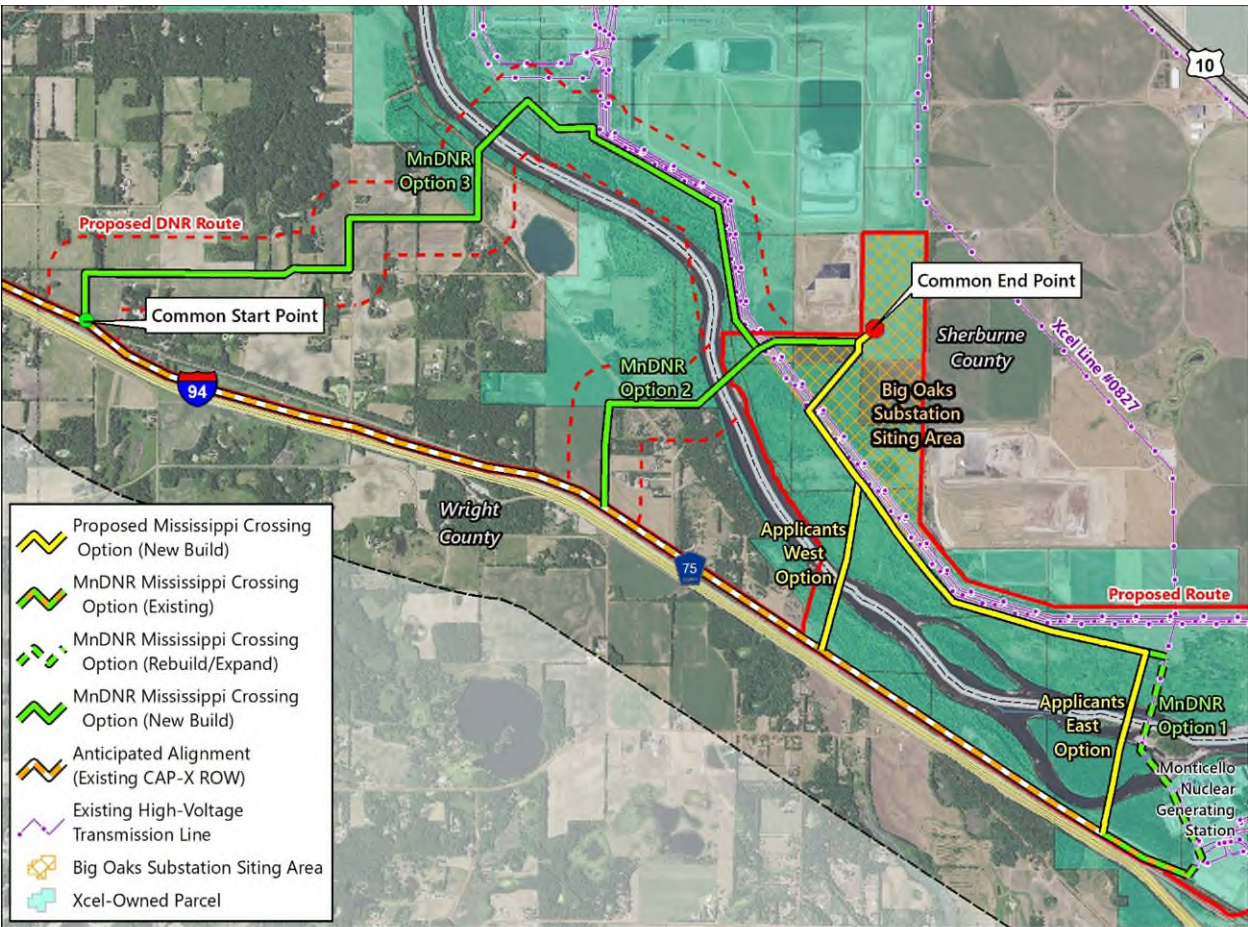
- 1 3. MnDNR Option 1: This option would rebuild the existing 115 kV
2 transmission line directly west of the Monticello Plant so that these
3 structures can accommodate the new double-circuit 345/115 kV
4 line across the Mississippi River. This option would include 2.2
5 miles of new transmission line right-of-way, plus one mile of
6 existing right-of-way that would require expansion from 75 feet in
7 width to 150 feet in width;
- 8 4. MnDNR Option 2: This option would cross the Mississippi River
9 northwest of the existing Monticello Plant. There are two different
10 design options for the MnDNR Option 2. The first option, as
11 proposed by the MnDNR, would construct the new 345 kV
12 transmission line as a single-circuit line across the Mississippi River
13 (MnDNR Option 2 (Single-Circuit)). The second option would be
14 to double-circuit the new 345 kV line with an existing 115 kV
15 transmission line (MnDNR Option 2B (Double-Circuit)). Both
16 options would include 1.6 miles of new right-of-way and cross
17 private land; and
- 18 5. MnDNR Option 3: MnDNR Option 3 is the northernmost option
19 and would depart from the existing 345 kV transmission line
20 structures and travel east across private land before crossing the
21 Mississippi River north of the proposed Big Oaks Substation. This
22 option would include 4.4 miles of new right-of-way.

23 A map showing each of these options is provided below in Figure 1.
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Figure 1
Overview of Mississippi River Crossing Options



Q. HAVE THE APPLICANTS CONDUCTED ANY ANALYSIS OF THESE VARIOUS ROUTE ALTERNATIVES?

A. Yes. The Applicants prepared a Mississippi River Crossing Analysis for the Project, wherein the Applicants reviewed and evaluated each of the proposed river crossing options outlined above. This analysis is attached to my Direct Testimony as Schedule 2.

1 Q. BASED ON THIS MISSISSIPPI RIVER CROSSING ANALYSIS, HAVE THE
2 APPLICANTS IDENTIFIED A PREFERRED MISSISSIPPI RIVER CROSSING
3 ALTERNATIVE?

4 A. Yes. Based on this analysis and guidance provided by the routing factors
5 outlined in Minn. R. 7850.4100, the Applicants have identified Western
6 Crossing Option B (Double-Circuit), described in more detail above and
7 below, as its preferred river crossing route alternative. The Applicants have
8 also identified MnDNR Option 2B (Double-Circuit) as a viable routing
9 alternative, although for the reasons outlined below, Western Crossing Option
10 B (Double-Circuit) is the Applicants' preferred alternative.

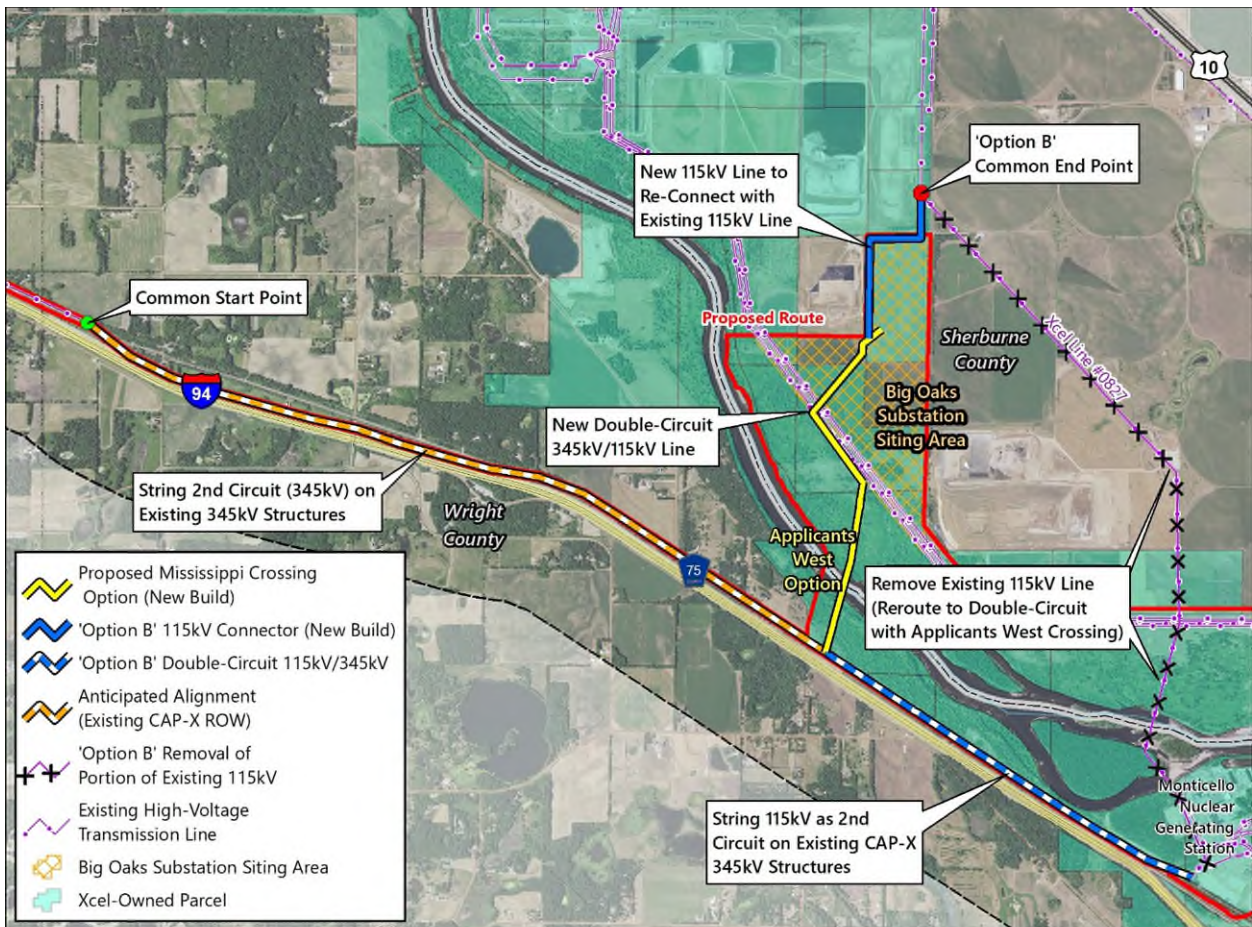
11

12 Q. PLEASE DESCRIBE WESTERN CROSSING OPTION B (DOUBLE-CIRCUIT) IN
13 MORE DETAIL.

14 A. Western Crossing Option B is a modification to the Western Option included
15 in the Application. This option involves stringing a new 115 kV circuit on
16 existing 345 kV structures from the Monticello Substation north to where the
17 new 345 kV transmission line deviates from the existing 345/345 kV
18 structures to cross the Mississippi River. At this point, the new 345 kV
19 transmission line would be double-circuited with an existing 115 kV
20 transmission line across the Mississippi River to the Big Oaks Substation. At
21 the Big Oaks Substation, the 115 kV circuit would then route north around
22 the new Big Oaks Substation to reconnect with the existing 115 kV
23 transmission alignment. The existing 115 kV transmission line crossing the
24 Mississippi River would be removed. This option is shown in Figure 2 below.

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Figure 2
Western Crossing Option B (Double-Circuit)



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5 Q. PLEASE EXPLAIN WHY WESTERN CROSSING OPTION B (DOUBLE-CIRCUIT) IS
6 THE APPLICANTS' PREFERRED RIVER CROSSING ALTERNATIVE.

7 A. The Western Crossing Option B (Double-Circuit) is the Applicants' preferred
8 river crossing alternative because it best aligns with the routing factors in
9 Minn. R. 7850.4100 by minimizing impacts to existing land use and the natural
10 environment and has fewer potential construction and maintenance issues.
11 First, this option mitigates a number of key construction and maintenance
12 issues that may arise for the river crossing. Unlike other alternatives identified

1 and discussed in this testimony, this option would not require any new
2 transmission structures to be placed either on an island in the middle of the
3 Mississippi River or on the river bluffs. Additionally, while this option would
4 require the removal of the existing 115 kV structure on the island north of the
5 Monticello Substation location, it is anticipated that access with heavy
6 equipment would not be required for this work, as the existing lattice structure
7 could be disassembled and removed in pieces. Removing the existing 115 kV
8 circuit from the island will also eliminate the need for future work- and cost-
9 intensive access to the island for maintenance work.

10
11 Second, and in contrast to other river crossing options, this option minimizes
12 long-term impacts to ecologically significant areas and a nearby Wild & Scenic
13 River District by consolidating transmission line crossings of the Mississippi
14 River, as this option would remove an existing 115 kV transmission line river
15 crossings. It also has only 0.7 miles in that Wild & Scenic River District, which
16 will have significantly fewer ecological impacts in that area compared to the
17 other crossing alternatives. Additionally, with fewer nearby occupied
18 residences compared to other route alternatives, this option mitigates any
19 potential visual, aesthetic, and other impacts to nearby residents.

20
21 Finally, this option is located entirely on Xcel Energy-owned land, eliminating
22 the need for additional easements from local landowners and reducing the
23 costs associated with obtaining these easements. This will also allow the
24 Applicants the ability to more easily restore the area adjacent to the Mississippi
25 River crossing.

26

1 Q. ARE THERE ADDITIONAL REASONS WHY THE APPLICANTS SUPPORT WESTERN
2 CROSSING OPTION B (DOUBLE-CIRCUIT) AS THEIR PREFERRED
3 ALTERNATIVE?

4 A. Yes. In addition to those reasons I outline above, the Applicants have
5 determined that this option is more cost-effective than many of the other
6 route alternatives. As shown in Table 1 below, the projected cost of
7 constructing Western Crossing Option B (Double-Circuit) is \$14.38 million,
8 which is less than the estimated cost to construct either the Eastern Crossing
9 Option or MnDNR Option 2B (Double-Circuit), and significantly less than
10 the estimated cost to construct MnDNR Options 1 or 3.

11 **Table 1**

12 **Estimated Construction Costs of Mississippi River Crossing Alternatives**

Route Option	Western Crossing Single-Circuit Option	Eastern Crossing Option	MnDNR Option 1	MnDNR Option 2 (Single-Circuit)	MnDNR Option 3	Western Crossing Option B (Double-Circuit)	MnDNR Option 2B (Double-Circuit)
Estimated Cost	\$10,130,000	\$15,310,000	\$26,960,000	\$10,140,000	\$21,170,000	\$14,380,000	\$14,660,000

13
14 While costs alone do not determine the preferred route alternative, an analysis
15 of estimated costs that may eventually be passed on to utility customers should
16 not be overlooked. The cost-effectiveness of the Western Crossing Option B
17 (Double-Circuit), in conjunction with the other factors I discuss throughout
18 this testimony, favors this option as the preferred route alternative. Additional
19 information on these costs, as well as the Applicants' holistic Mississippi River
20 Crossing Analysis, is provided in Schedule 2.

21

1 Q. DO THE APPLICANTS HAVE A SECOND PREFERRED ROUTE ALTERNATIVE THAT
2 IT HAS IDENTIFIED?

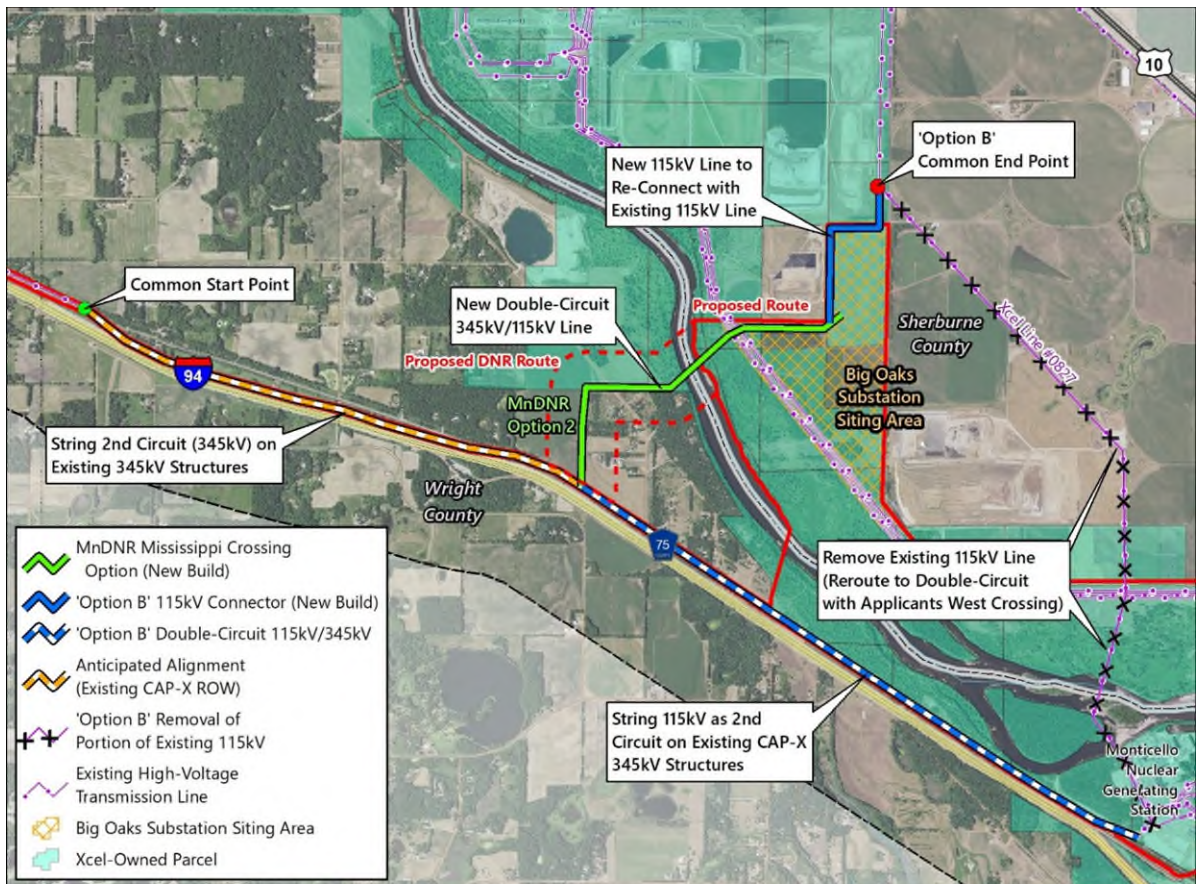
3 A. Yes. Based on the analysis provided in Schedule 2, the Applicants' second
4 preferred route alternative is MnDNR Option 2B (Double-Circuit).
5

6 Q. PLEASE DESCRIBE MNDNR OPTION 2B (DOUBLE-CIRCUIT) IN MORE DETAIL.

7 A. MnDNR Option 2B (Double-Circuit) is a modification to MnDNR Option 2
8 that was included in the MnDNR's January 8, 2024 scoping comment. This
9 option involves stringing a new 115 kV circuit on existing 345 kV structures
10 from the Monticello Substation north to where the new 345 kV transmission
11 line deviates from the existing 345/345 kV structures to cross the Mississippi
12 River. At this point, the new 345 kV transmission line would be double-
13 circuited with the 115 kV transmission line across the Mississippi River to the
14 Big Oaks Substation. At the Big Oaks Substation, the 115 kV circuit would
15 then route north around the new Big Oaks Substation to reconnect with the
16 existing 115 kV alignment. The existing 115 kV transmission line crossing the
17 Mississippi River would be removed. This option is shown in Figure 3 below.

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Figure 3
MnDNR Option 2B (Double-Circuit)



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5 Q. CAN YOU DISCUSS THE APPLICANTS' ANALYSIS AS IT RELATES TO MNDNR
6 OPTION 2B (DOUBLE-CIRCUIT)?

7 A. Yes. This option has the same primary construction and maintenance benefits
8 as Western Crossing Option B (Double-Circuit) that I outline above—namely,
9 that it would not require new structures to be placed on an island or river
10 bluffs, and that it would require removal of the existing 115 kV structure on
11 the island north of the Monticello Substation that will eliminate the need for
12 future access for maintenance work. It similarly mitigates potential
13 environmental impacts to ecologically significant areas and the Wild & Scenic

1 River District and would also remove an existing 115 kV transmission line
2 crossing the Mississippi River.

3
4 Q. GIVEN THE ABOVE, WHY HAS THE APPLICANTS DETERMINED THAT WESTERN
5 CROSSING OPTION B (DOUBLE-CIRCUIT) IS PREFERABLE TO MNDNR
6 OPTION 2B (DOUBLE-CIRCUIT)?

7 A. While many of the impacts will be the same between both options, there are
8 additional considerations that counsel in favor of Western Crossing Option B
9 (Double-Circuit) over MnDNR Option 2B (Double-Circuit). As noted above,
10 Western Crossing Option B (Double-Circuit) is projected to be slightly less
11 costly overall. While the cost differences may generally be minor, there are
12 also two residences located within 500 feet of the proposed transmission line
13 centerline for the MnDNR Option 2B (Double-Circuit), making that
14 alternative more likely to impact landowners residing nearby. MnDNR Option
15 2B (Double-Circuit) would also require approximately 6.9 acres of new
16 easements across private property, requiring tree clearing on private property
17 and potential impacts to agricultural practices near a center-pivot irrigator,
18 while Western Crossing Option B (Double-Circuit) could be constructed
19 entirely on land owned by Xcel Energy, removing any need to obtain private
20 land easements.

21
22 Thus, while the benefits for both options overlap considerably, there are
23 additional benefits to Western Crossing Option B (Double-Circuit)—and, in
24 turn, drawbacks to MnDNR Option 2B (Double-Circuit). The Applicants
25 have therefore identified Western Crossing Option B (Double-Circuit) as its
26 preferred option given the analysis attached as Schedule 2. However, the

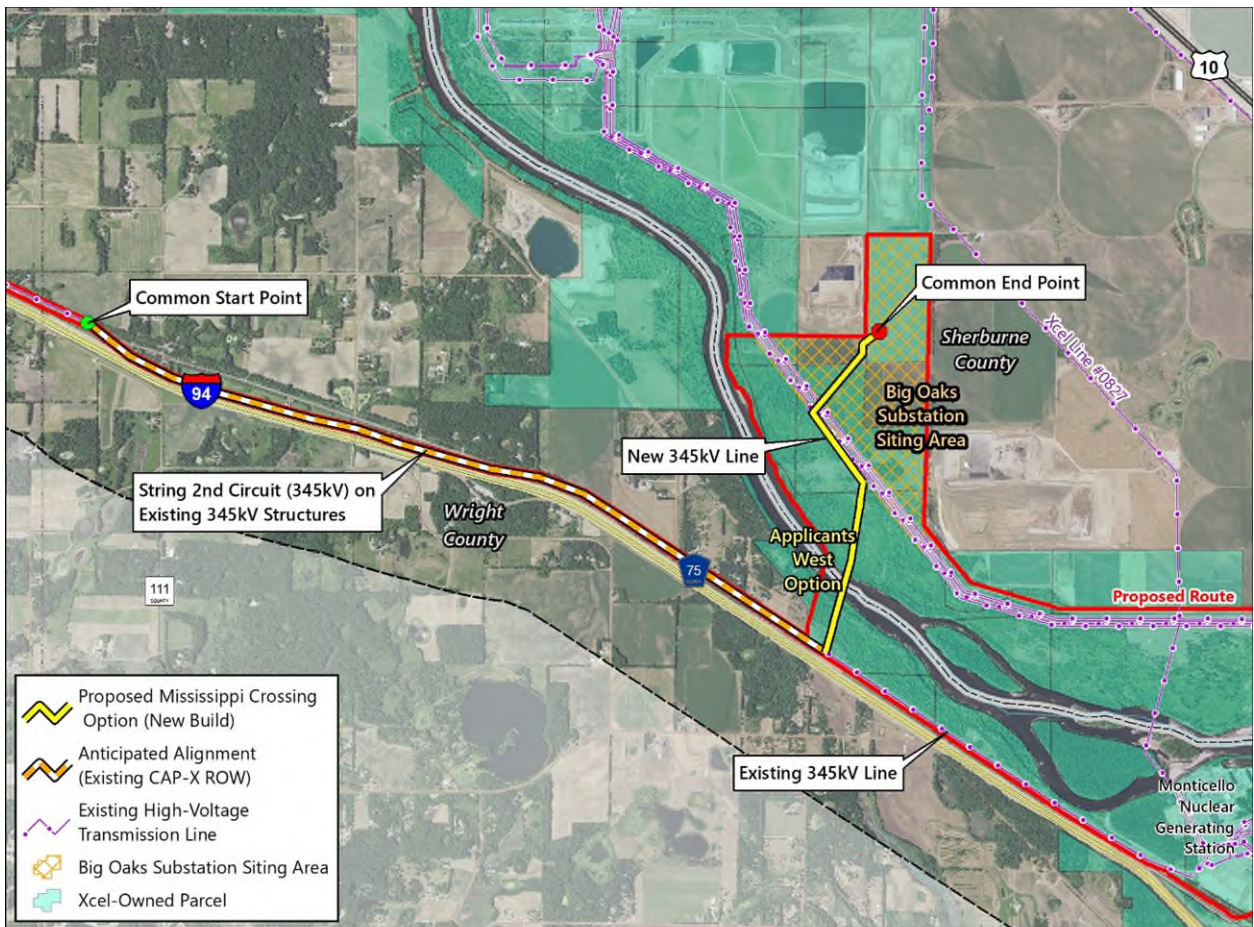
1 Applicants prefer MnDNR Option 2B (Double-Circuit) over the remaining
2 river crossing route alternatives.

3
4 Q. CAN YOU EXPLAIN HOW THE SINGLE-CIRCUIT OPTIONS FOR THE WESTERN
5 CROSSING AND MNDNR OPTION 2 DIFFER FROM THEIR DOUBLE-CIRCUIT
6 COUNTERPARTS?

7 A. Yes. First, I'll discuss the Western Crossing Single-Circuit Option, which
8 generally follows the same route as Western Crossing Option B (Double-
9 Circuit) but is constructed as a single-circuit (and would therefore not double-
10 circuit an existing 115 kV transmission line). This option was included and
11 discussed in the Application and would involve construction of a new crossing
12 of the Mississippi River directly south of the proposed Big Oaks Substation.
13 Like its double-circuit counterpart, this route option would be located entirely
14 on Xcel Energy-owned land. This route is shown in Figure 4 below.

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Figure 4
Western Crossing Single-Circuit Option

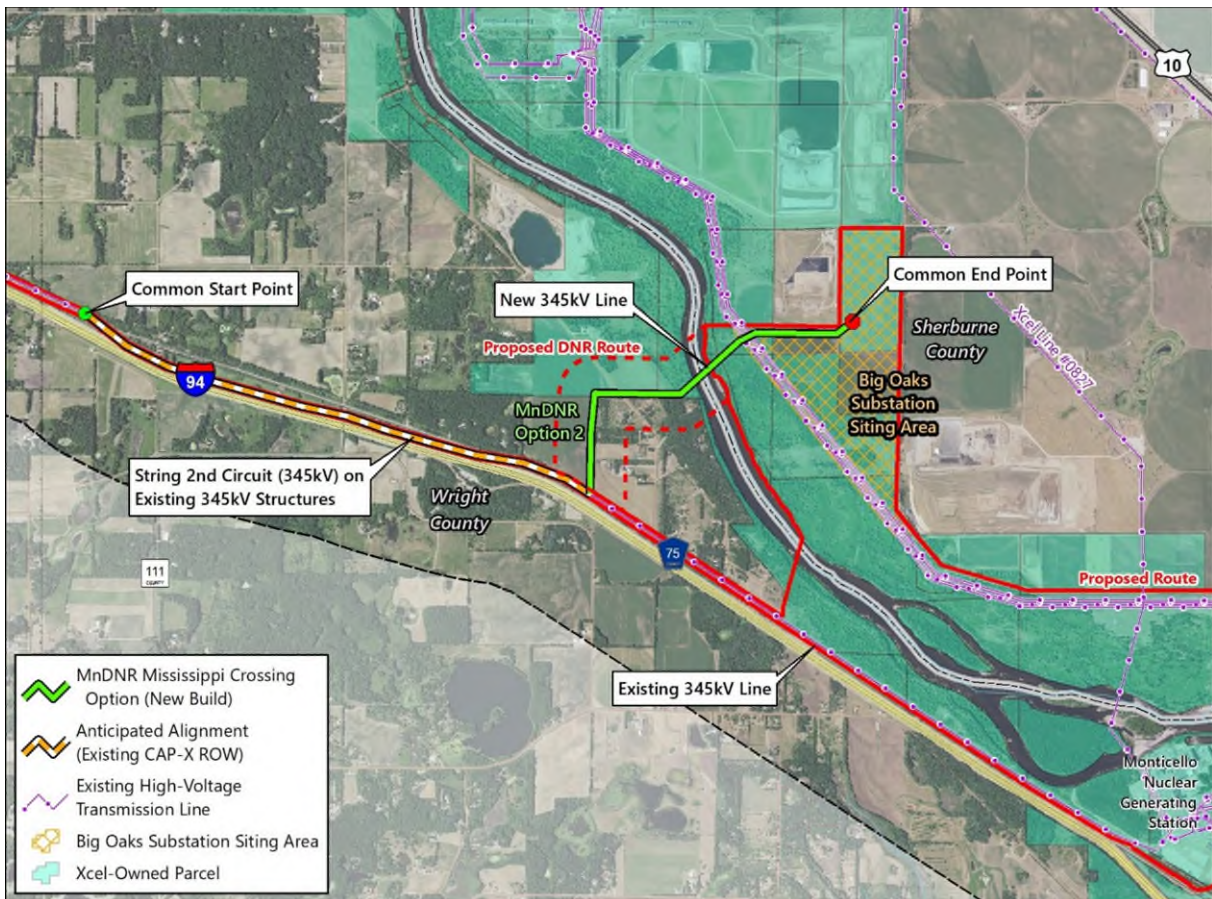


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5 Similarly, MnDNR Option 2 (Single-Circuit) generally follows the same route
6 as its double-circuit counterpart and would cross the river northwest of the
7 existing Monticello plant but would be constructed as a single-circuit 345 kV
8 transmission line. Like its double-circuit counterpart, there are two residences
9 located within 500 feet of the proposed transmission line centerline. This
10 route is shown in Figure 5 below.

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Figure 5
MnDNR Option 2 (Single-Circuit)



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- Q. WHY HAVE THE APPLICANTS DETERMINED THAT THE DOUBLE-CIRCUIT OPTIONS FOR THE WESTERN CROSSING AND MNDNR OPTION 2 ARE PREFERABLE TO THE SINGLE-CIRCUIT OPTIONS FOR THOSE SAME ROUTES?
- A. The double-circuit options allow for the existing 115 kV transmission line to be consolidated with the Project's new 345 kV transmission line thus minimizing impacts and maintaining only one transmission line crossing of the Mississippi River in this location.

1 Q. ARE THE APPLICANTS CONSIDERING DIFFERENT DESIGNS FOR THE DOUBLE-
2 CIRCUIT ROUTE OPTIONS?

3 A. Yes. There are currently two double-circuit design options under
4 consideration for the double-circuit route options: a side-by-side H-frame
5 design and a double-circuit monopole design. For both design options, the
6 Applicants propose to install bird flight diverters on the shield wire plane to
7 reduce the potential for avian interactions with the transmission line.

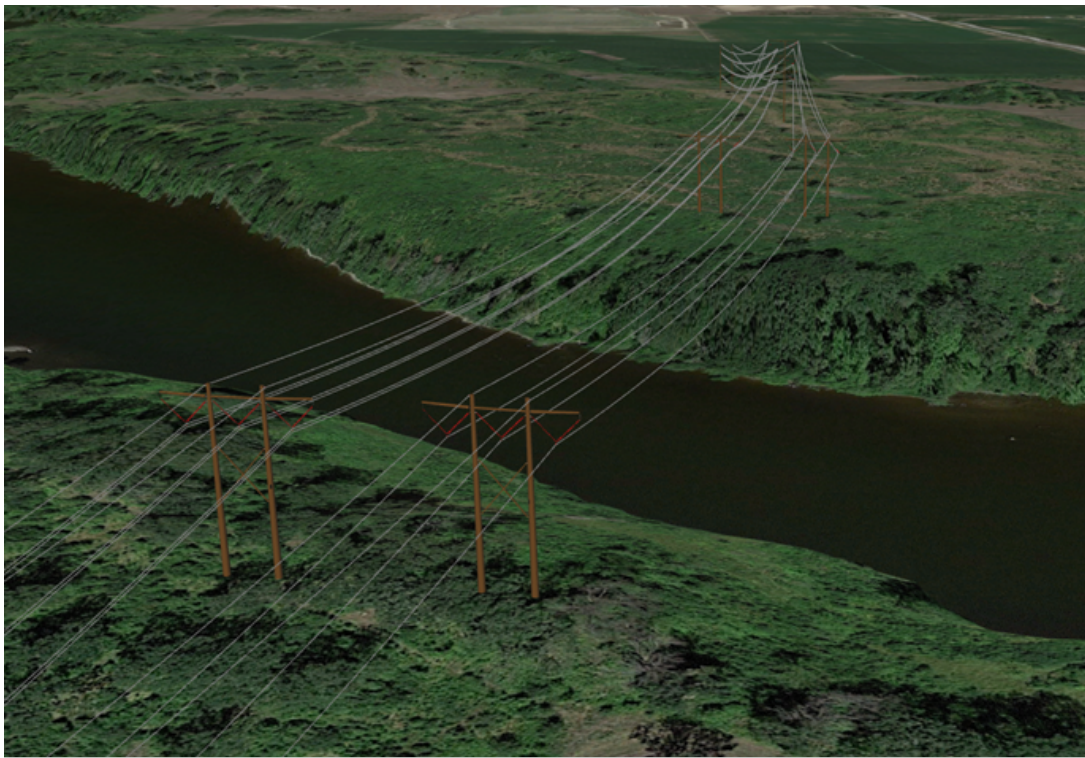
8

9 Q. WHAT IS THE SIDE-BY-SIDE H-FRAME DESIGN THAT YOU REFERENCE?

10 A. This option would use side-by-side H-frames for the structures on either side
11 of the Mississippi River. This would require splitting the 345 kV and 115 kV
12 transmission circuits onto separate side-by-side H-frame structures as they
13 cross the river. These H-frame structures will be approximately 120 feet tall
14 and have two sets of vertical planes created by the one conductor phase plane
15 and one shield wire plane, which reduces the potential for avian interaction
16 with the transmission circuits. The two structures would be spaced to provide
17 adequate clearance between wires to meet code requirements during operation
18 of the lines and safety requirements during maintenance of one line while the
19 other line remains energized. This design is shown in Figure 6 below.

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Figure 6
Side-by-Side H-Frame Design



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5 Q. WHAT RIGHT-OF-WAY WIDTH WOULD BE REQUIRED FOR THIS
6 CONFIGURATION?

7 A. The total required right-of-way width for this configuration would be
8 approximately 230 feet. That width would be required for the crossing span,
9 and one additional span out on either side of the river crossing. Trees and
10 vegetation would be cleared for the entire 230-foot-wide right-of-way.

11

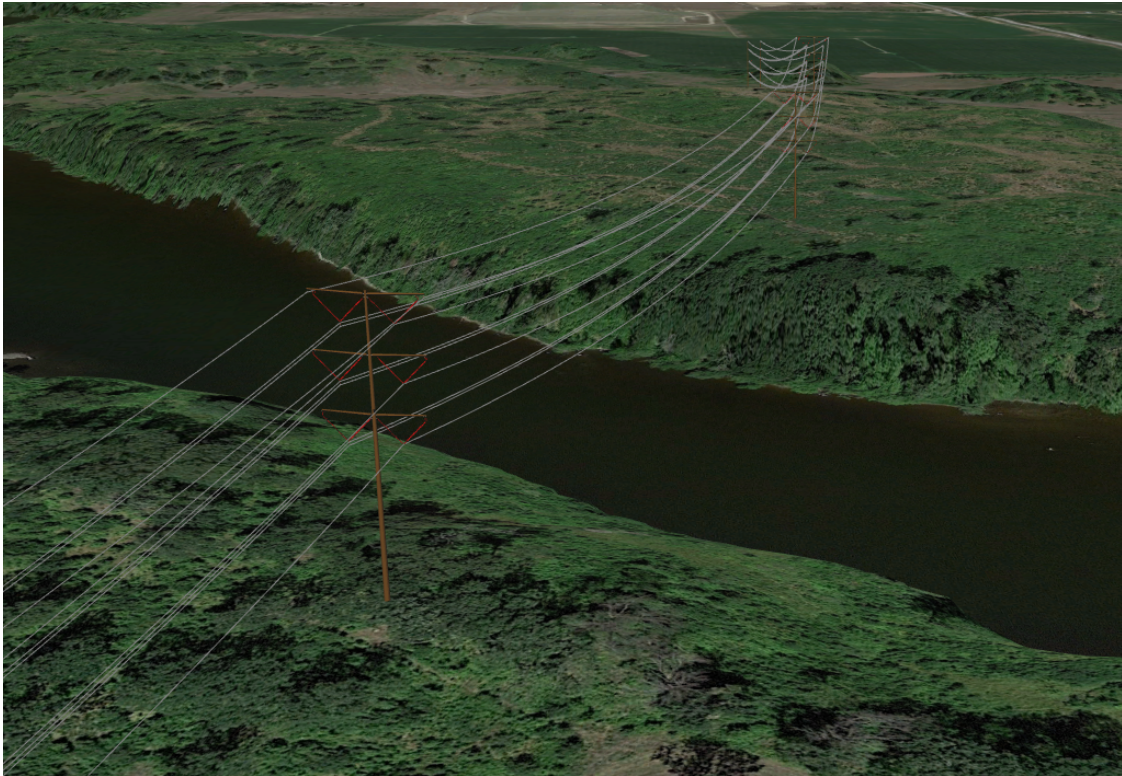
12 Q. WHAT IS THE DOUBLE-CIRCUIT MONOPOLE DESIGN THAT YOU REFERENCE?

13 A. This configuration would co-locate both the 345 kV and 115 kV circuits on
14 the same double-circuit structure. This would consist of a monopole structure
15 with davit arms carrying the phase wires vertically stacked with one circuit on

1 either side of the structure. Transmission structures near the river crossing
2 with this vertical configuration will be approximately 150 feet tall and have
3 four sets of vertical planes created by the three conductor phases and shield
4 wire. This design is shown in Figure 7 below.

5 **Figure 7**

6 **Double-Circuit Monopole Design**



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9 Q. WHAT RIGHT-OF-WAY WIDTH WOULD BE REQUIRED FOR THIS
10 CONFIGURATION?

11 A. The typical right-of-way width required for this configuration is 150 feet.
12

1 Q. HOW DO THESE DOUBLE-CIRCUIT CONFIGURATION ALTERNATIVES COMPARE
2 TO ONE ANOTHER?

3 A. As indicated above, the H-frame design would generally require wider right-
4 of-way than the monopole design, while the monopole design is taller and has
5 more vertical planes, which are more likely to interfere with the flight paths of
6 various avian species. The monopole design would also likely be slightly less
7 expensive than separating out the circuits into two H-frame structures at the
8 river crossing, as using double-circuit capable structures will reduce of the
9 number of poles and foundations and require the clearing of a smaller right-
10 of-way width.

11

12 Q. HAVE THE APPLICANTS IDENTIFIED A PREFERRED CONFIGURATION FOR THE
13 DOUBLE-CIRCUIT ROUTES AT THIS TIME?

14 A. Not at this time, but the Applicants will continue to analyze the design
15 configurations to determine which will be most appropriate for the chosen
16 route alternative.

17

18 Q. ARE THERE ANY OTHER RIVER CROSSING ROUTE ALTERNATIVES THAT YOU
19 WISH TO DISCUSS?

20 A. Yes, I would like to discuss the Applicants' analysis of MnDNR Option 1,
21 Applicants Eastern Crossing Option, and MnDNR Option 3.

22

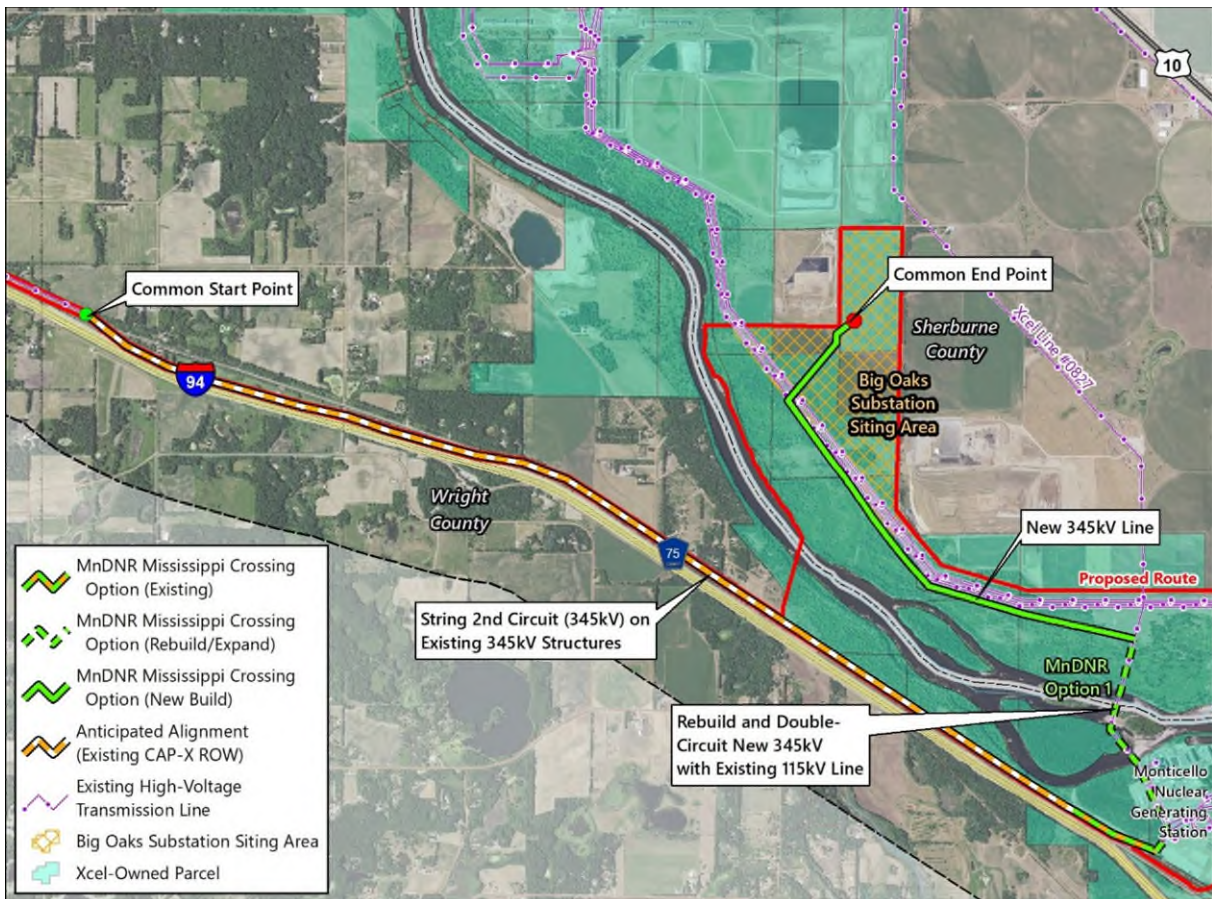
23 Q. PLEASE DESCRIBE MNDNR OPTION 1 IN MORE DETAIL.

24 A. MnDNR Option 1 would remove the existing 115 kV transmission line
25 directly west of the Monticello Plant and re-build new structures that can
26 accommodate a new double-circuit 345/115 kV line across the Mississippi

1 River. This alternative requires installing one unique multi-pole angle
2 structure, similar to an H-frame structure, on the island in the middle of the
3 Mississippi River. This structure is needed to reduce the lateral loading on the
4 foundation, given the anticipated poor soil conditions at this location. Phase
5 wires would be located at two levels horizontally, with both levels containing
6 phases from each circuit to maintain proper separation between the circuits.
7 This phasing configuration will require both the 345 kV and the 115 kV line
8 to be deenergized simultaneously if maintenance is required on either line. It
9 is anticipated that the foundations for these structures would use multiple
10 driven piles with a large concrete pile cap, requiring the use of heavy
11 equipment and concrete trucks. This route is shown in Figure 8 below.

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Figure 8
MnDNR Option 1



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5 Q. WHAT WERE THE RESULTS OF THE APPLICANTS' ANALYSIS OF THE MNDNR
6 OPTION 1?

7 A. The Applicants determined that this option has a number of unique
8 construction and maintenance constraints. The primary constraint for this
9 option is that it requires construction (and long-term maintenance activities)
10 to occur on an island in the Mississippi River. This will require the use of
11 barges that can only be operated during certain times of the year and under
12 certain river conditions, thereby limiting construction and maintenance to the
13 spring, summer, and fall months and to times when the Mississippi River is

1 both deep enough and has proper flow to accommodate barge traffic.
2 Structure installation during construction would also require heavy equipment
3 to access the island, and while the use of helicopters could be considered, this
4 would likely increase the cost of the structure to provide small enough sections
5 for the helicopter to lift into place. Helicopter use near the Monticello Plant
6 would require additional coordination and approval.

7
8 Additionally, this option requires approximately 0.3 miles of triple-circuit
9 345/345/115 kV through the Monticello Plant between the main plant
10 facilities and the nuclear waste storage area in order to reduce the required
11 right-of-way width in this narrow corridor. All three lines would need to be
12 deenergized if maintenance is required on any one of the three lines.
13 Significant coordination with the Monticello Plant during construction and
14 future maintenance of any of these lines would be required.

15
16 Q. ARE THERE ANY OTHER CONSTRAINTS FOR THIS OPTION THAT THE
17 APPLICANTS HAVE IDENTIFIED?

18 A. Yes. In addition to those constraints I discuss above, this option is likely to
19 have greater environmental impacts when compared to other alternatives. In
20 particular, this option has the second highest acreage of identified Sites of
21 High or Moderate Biodiversity within the proposed right-of-way of all of the
22 alternatives. This option would also cross multiple channels of the Mississippi
23 River, which creates the potential for additional disturbances within the local
24 watershed and impacts 1.8 miles of the local Wild & Scenic River District.

25

1 Additional land use impacts are also expected. While this option would be
2 located entirely on land owned by Xcel Energy, there is a University of
3 Minnesota research building located adjacent to this alternative after it crosses
4 the Mississippi River. This will require coordination with the University of
5 Minnesota during the detailed design and construction phase to mitigate any
6 potential impacts to their crop research at this site.

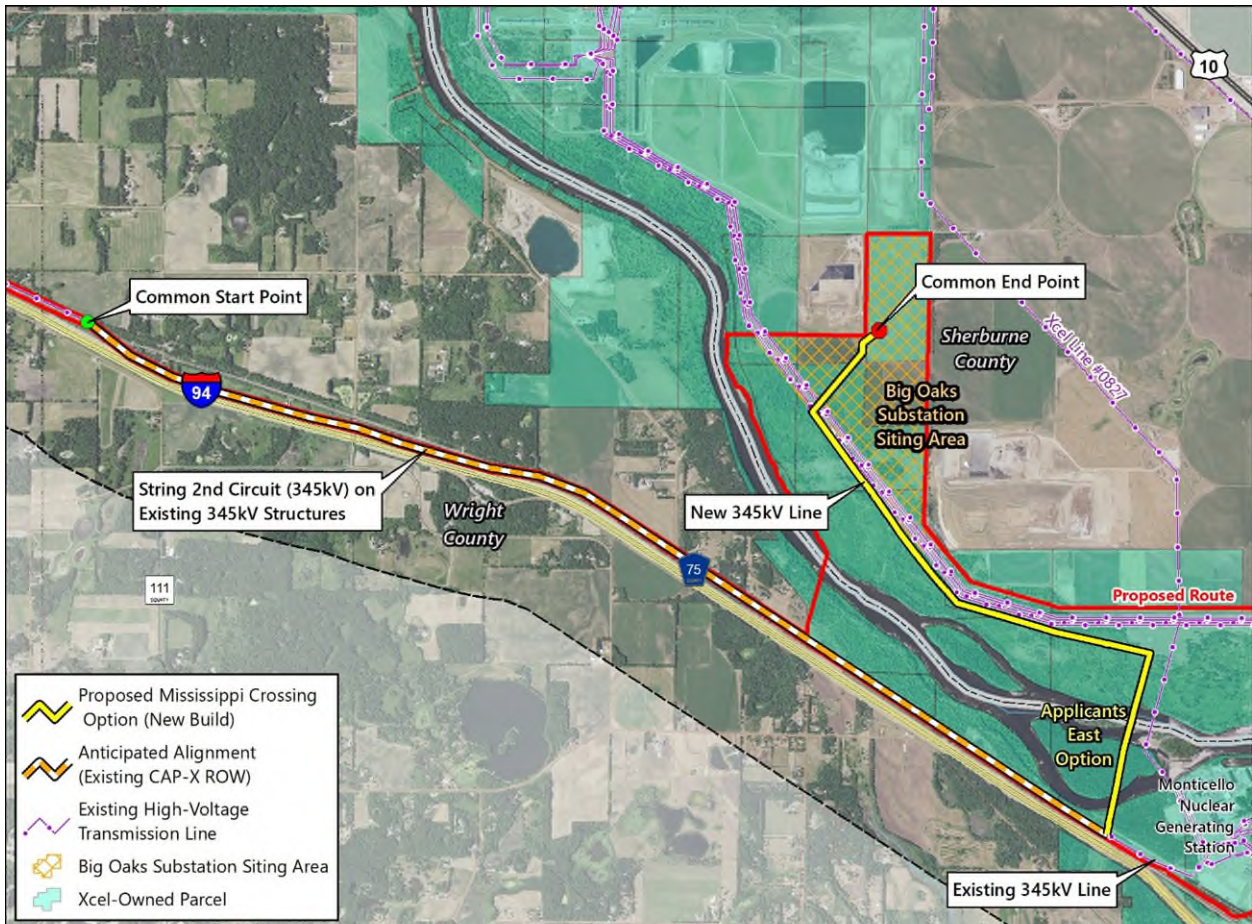
7
8 Finally, and as shown in Table 1 above, the cost for this alternative (\$26.96
9 million) is projected to be significantly higher than any other option currently
10 under consideration, primarily due to the high costs associated with the
11 constraints described above. Thus, in analyzing this alternative, the Applicants
12 have determined that it has a number of drawbacks and constraints that make
13 it less desirable than the options previously discussed. The Applicants
14 therefore does not recommend selection of this river crossing alternative.

15
16 Q. PLEASE DESCRIBE THE EASTERN CROSSING OPTION IN MORE DETAIL.

17 A. The Eastern Crossing Option was included in the Application and would
18 involve construction of a new crossing of the Mississippi River just west of
19 the Monticello Plant and would parallel an existing 115 kV transmission line.
20 This option would require installation of two tangent single-circuit structures
21 on an island in the middle of the Mississippi River. Because these structures
22 are single-circuit structures, they would be smaller than the double-circuit
23 structures required for other alternatives. It is anticipated that the foundations
24 for these single-circuit structures would use a specialty type foundation, likely
25 helical piles with a steel grillage. These foundation types require smaller

1 equipment than drilled concrete piers and driven piles required for larger
2 double-circuit structures. This route is shown in Figure 9 below.

3 **Figure 9**
4 **Eastern Crossing Option**



7 Q. WHAT WERE THE RESULTS OF THE APPLICANTS' ANALYSIS FOR THE EASTERN
8 CROSSING OPTION?

9 A. Due to the need to construct and install structures on an island, the Eastern
10 Crossing Option has many of the same construction and maintenance
11 constraints identified and discussed above for MnDNR Option 1. This option
12 has the highest acreage of identified Sites of High or Moderate Biodiversity

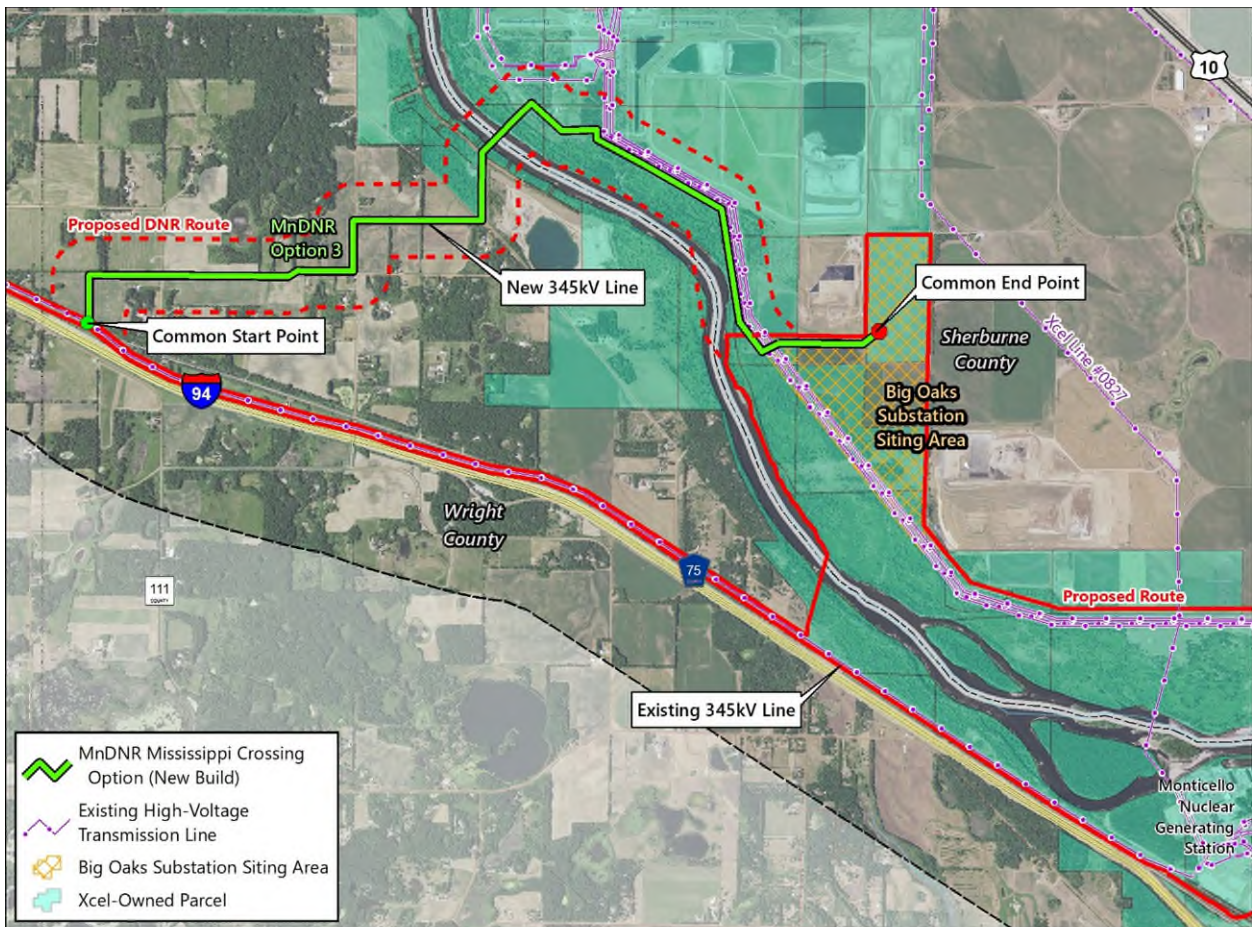
1 within the proposed right-of-way of all of the alternatives. This option will
2 similarly require coordination with the University of Minnesota due to the
3 location of its research building near this route. This option also traverses
4 nearly 2 miles in the local Wild & Scenic River District, increasing the potential
5 for adverse ecological impacts in that area. Given these constraints, and similar
6 to MnDNR Option 1, the Applicants have determined that this route does
7 not align with many routing factors in comparison to other options identified
8 in this testimony.

9
10 Q. PLEASE DESCRIBE MNDNR OPTION 3 IN MORE DETAIL.

11 A. This option was identified by MnDNR in its January 8, 2024 scoping
12 comment. MnDNR Option 3 is the northernmost option and would depart
13 from the existing 345 kV transmission line structures and then travel east
14 across private land before crossing the Mississippi River north of the
15 proposed Big Oaks Substation. This route option would place structures very
16 near the river bluff on the east side of the Mississippi River and is shown
17 below in Figure 10.

1
2

Figure 10
MnDNR Option 3



3
4

5 Q. WHAT WERE THE RESULTS OF THE APPLICANTS' ANALYSIS FOR MN DNR
6 OPTION 3?

7 A. The Applicants have identified significant constraints with this option.
8 Construction issues include limited safe working areas alongside the river
9 bluff, where certain structures would be placed, and proximity to potentially
10 steep slopes that may increase the size and depth of foundations required for
11 the various structures to be constructed. This option would also require tree
12 and vegetation clearing along the east side of the river, which could increase

1 the potential for river erosion and visually impact the local Wild & Scenic
 2 River District. Further, this option traverses 2 miles of the Wild & Scenic River
 3 District, the most of any option currently under consideration.

4
 5 This option also has the most residences and landowners located within 500
 6 feet of the proposed transmission line centerline, so those individuals may be
 7 impacted by construction and ongoing maintenance activities and may
 8 additionally experience visual and aesthetic impacts. Unlike other options
 9 discussed above, this option would also require nearly 35 acres of new
 10 easements across private property, as the land on which this option would be
 11 constructed is not already owned by Xcel Energy. Considering these
 12 constraints, the Applicants do not recommend that this route be selected.

13
 14 Q. HAVE THE APPLICANTS PREPARED A COMPARING THE POTENTIAL IMPACTS OF
 15 THE DIFFERENT RIVER CROSSING ALTERNATIVES?

16 A. Yes. The Applicants’ Mississippi River Crossing Analysis includes a table
 17 summarizing the potential impacts of the different river crossing options. This
 18 table is reproduced below as Table 2.

19 **Table 2**

20 **Summary of Impacts of Mississippi River Route Alternatives**

Route Alternative	Applicants Western Option (Single-Circuit)	Applicants Eastern Option	MnDNR Option 1	MnDNR Option 2	MnDNR Option 3	Applicants Western Option (Double-Circuit) *	MnDNR's Option 2 (Double-Circuit) *
Length (miles)	4.6	7.4	8	3.7	4.4	7.2	7.4
Stringing 2nd Circuit (345kV) on Existing Structures	3.2	4.5	4.9	2.2	-	3.2	2.2
Stringing 2nd Circuit (115kV) on Existing Structures	-	-	-	-	-	1.8	2.8

Route Alternative	Applicants Western Option (Single-Circuit)	Applicants Eastern Option	MnDNR Option 1	MnDNR Option 2	MnDNR Option 3	Applicants Western Option (Double-Circuit) *	MnDNR's Option 2 (Double-Circuit) *
Single Circuit 345kV	1.4	2.9	2.2	1.6	4.4	-	-
Double Circuit (345kV/115kV)	-	-	0.7	-	-	1.4	1.6
Triple Circuit (345kV/345kV/115 kV)	-	-	0.3	-	-	-	-
Single Circuit 115kV	-	-	-	-	-	0.8	0.8
Structure Count	27	42	45	23	26	45	46
Existing 345kV Structures (Stringing 2nd Circuit - 345kV)	17	24	26	12	-	17	12
Existing 345kV Structures (Stringing 2nd Circuit - 115kV)	-	-	-	-	-	9	14
Single Circuit 345kV Structures	10	18	14	11	26	-	-
Double Circuit (345kV/115kV) Structures	-	-	3	-	-	10	11
Triple Circuit (345kV/345kV/115 kV) Structures	-	-	2	-	-	-	-
Single Circuit 115kV Structures	-	-	-	-	-	9	9
Estimated Cost	\$10,130,000	\$15,310,000	\$26,960,000	\$10,140,000	\$21,170,000	\$14,380,000	\$14,660,000
Sites of Biodiversity in right-of-way (acres)	11.6	37.4	34.0	3.4	2.2	22.3 (25.8**)	14.1 (16.2**)
150-foot right-of-way (existing) - Moderate	0	0	0	0	0	0	0
150-foot right-of-way (existing) – High	0	10.0	10.9	0	0	10.7	10.7
Using 150-foot right-of-way (new) - Moderate	5.9	19.0	19.6	0	2.2	5.9	0
Using 150-foot right-of-way (new) - High	5.7	8.4	3.4	3.4	0	5.7	3.4
Using 230-foot right-of-way (at crossing) (new) - Moderate	NA	NA	NA	NA	NA	8.0**	0**

Route Alternative	Applicants Western Option (Single-Circuit)	Applicants Eastern Option	MnDNR Option 1	MnDNR Option 2	MnDNR Option 3	Applicants Western Option (Double-Circuit) *	MnDNR's Option 2 (Double-Circuit) *
Using 230-foot right-of-way (at crossing) (new) - High	NA	NA	NA	NA	NA	7.1**	5.5**
New Lenth in Wild & Scenic River District (miles)	0.7	1.9	1.8	0.6	2.0	0.7	0.6
New Private Property Easements							
Total Parcels	0	0	0	2	19	0	2 (5**)
Unique Landowners	0	0	0	2	14	0	2 (5**)
Acres of new Easement	0	0	0	6.9	34.5	0	6.9 (7.6**)
New Residence Offset Distances	0	0	0	2	7	0	2
0 - 75 Feet	0	0	0	0	0	0	0
75 - 300 feet	0	0	0	0	1	0	0
300 - 500 feet	0	0	0	2	6	0	2
*Option includes two potential structure configurations at the river crossing. 1) Two H-frames side-by-side to reduce the number of vertical planes in the flyway. This would require a 230' right-of-way 2) Single pole double-circuit to maintain a right-of-way width of 150'							
** Two H-frame side-by-side configuration							

1

2 Q. HAVE THE APPLICANTS ENGAGED WITH MNDNR REGARDING THE RIVER
3 CROSSING ROUTE ALTERNATIVES DESCRIBED IN THIS TESTIMONY?

4 A. Yes. Xcel Energy has coordinated and consulted with MnDNR related to
5 these alternatives via a meeting with MnDNR personnel. The Applicants
6 understand that MnDNR will review the merits of the various river crossing
7 options and provide comments during the written comment period associated
8 with the public hearings.

9

1 **III. CONCLUSION**

2
3 Q. PLEASE SUMMARIZE THE APPLICANTS’ CONCLUSIONS WITH REGARD TO THE
4 MISSISSIPPI RIVER CROSSING ROUTE ALTERNATIVES.

5 A. Based on extensive analysis of each river crossing route alternative being
6 proposed—including single- and double-circuit options for several
7 alternatives—the Applicants have concluded that Western Crossing Option B
8 (Double-Circuit) most appropriately aligns with and balances construction,
9 ecological, land use, and other factors outlined in the Minn. R. 7850.4100
10 routing factors. Specifically, this option will impact the fewest nearby
11 residences and will have fewer construction constraints than those options
12 that require construction on an island or near a river bluff. Because Xcel
13 Energy owns all the property on which this option will be located, this option
14 would also require no new land rights to be obtained and would allow the
15 Applicants to restore the right-of-way more easily and readily on both sides of
16 the Mississippi River if needed.

17
18 The Applicants also concluded that MnDNR Option 2B (Double-Circuit) also
19 aligns with these concerns, although the holistic analysis of each option
20 indicates that Western Crossing Option B (Double-Circuit) is the preferred
21 alternative at this time. The Applicants therefore support Western Crossing
22 Option B (Double-Circuit) as its preferred Mississippi River crossing route
23 alternative, with its next preferred alternative being MnDNR Option 2B
24 (Double-Circuit).

25

- 1 Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?
- 2 A. Yes.

M A T T H E W A . L A N G A N

Xcel Energy, 414 Nicollet Mall, Minneapolis, MN 55401
612-330-6954 • matthew.a.langan@xcelenergy.com

Professional Summary

For the last twenty years, I have been in the regulated energy industry, directly involved with State and Federal environmental review and permitting of transmission line, wind farm, solar farm and pipeline projects through my employment with Xcel Energy, the Minnesota Department of Commerce and the Minnesota Department of Natural Resources. These positions have required high-end skills in technical writing, verbal communications, negotiations and project management, and a valid driver's license. My educational background comes from the University of Minnesota where I majored in Natural Resource Management, with an emphasis in Planning, Policy, and Law.

PROFESSIONAL EXPERIENCE

Xcel Energy • Minneapolis, MN 55401 • October 2012 - Present

Xcel Energy provides our customers the safe, clean, reliable energy services they want and value at a competitive price, while protecting the environment as a core value of the Company.

Principal Land Agent (March 2018-present,) Senior Land Agent (October 2012-March 2018)

This position has required I lead planning, route alternatives analysis, site selection, and management of sites and corridors for major energy facilities, including transmission lines. It has also frequently required I interact with, and represent S&LR's interests, on multi-disciplinary internal project teams, involving engineering, legal, regulatory, and project management staff. I have lead preparation of applications and negotiated for and obtained applicable permits from federal, state and local government agencies for approvals to construct major energy facilities. These include necessary land use and environmental permits from local, state and federal government jurisdictions. This position has required I represent the company before federal, state and local regulatory and land management agencies, boards, planning commissions, councils, and legislative committees. I have prepared project descriptions and summaries, respond to data requests and make presentations to the governing jurisdictions in public hearings to obtain approval for projects, and have acted as primary spokesperson on all permitting-related activities for a variety of projects. The projects I have worked on have required I act as an expert witness in preparing and presenting written and oral testimony in state certification proceedings (CON, CPCN, CCN) and other regulatory proceedings. This requires a high level of technical knowledge and understanding of applicable federal, state and local land rights laws, codes, ordinances and regulations. This position has allowed me to serve as technical resource and advisor to other Siting & Land Rights, and Company, staff. And the project work has allowed me to administer and consult with other agents and team members on complex project issues regarding land rights and siting issues. I have contributed to process teams concerning budget and regulatory compliance and have provided assistance to other internal Xcel Energy departments and subsidiaries involving permitting activities while developing, refining and implementing the strategic goals and objectives of Xcel Energy. I have helped prepare requests for proposals, contract agreements, and project estimates for projects, and have led the selection of consultants and contractors, as well as managed consultants on major projects. These essential responsibilities have been required in the project work listed below. I also represented Xcel Energy on the Mn Public Utilities Commission's Permit Reform Task Force and testified at legislative committees in support of the 2024 Permit Reform Bill, known as the Energy Infrastructure Permitting Act.

Project and Permit Accomplishments

- Xcel Energy Permit Leader for the Mn Energy Connection 345kV transmission line and MISO's LRTP-2 345kV transmission line.
- Secured all permits for the Nobles, Grand Meadow, and Pleasant Valley Wind Farm Re-power projects
- Secured all permits for the Rosemount, Cottage Grove and Vonco transmission line re-location projects.
- Siting and Land Rights Project Team Lead on all FERC 1000, MISO competitive bid projects (Dry Run, Duff-Coleman, Hartburg-New Sabine.)
- Siting and Land Rights Permitting Lead on NSP's Renewable Portfolio Wind Expansion.

- Secured a CPCN approval from the North Dakota Public Service Commission and Route Permit approval from the City of Fargo for the Maple River to Red River 115kV Transmission Line Project in Fargo, North Dakota.
- Secured a High Voltage Transmission Line Permit for the Scott County 345kV Tap Line and Substation Expansion project in Scott County, Minnesota.
- Secured a CPCN approval from the North Dakota Public Service Commission for the Prairie Substation Expansion project in Grand Forks, North Dakota.
- Xcel Energy permitting lead on the Badger Coulee CPCN application (PSC-W Order April 2015.)

Minnesota Department of Commerce • St. Paul, MN 55101 • May 2009 - October 2012

Minnesota Department of Commerce reviews transmission line, pipeline, wind farm, and power plant permit applications submitted by utility companies, prepares state environmental review documents, participates in public and contested case hearings, and guides the public and other governmental units through the state permitting process.

Planning Director

The purpose of this position is to lead utility companies, local government units, state and federal agencies, various interest groups, landowners and the public through the State of Minnesota environmental review and permitting process per the Power Plant Siting Act and Minnesota Rules Chapter 7850. The skills required for this position include technical writing aptitude, effective public speaking, customer service, technical knowledge of construction and operational design, technical knowledge of potential resource impacts and mitigation strategies associated with different kinds of energy projects, ability to lead a team of specialized experts, knowledge of the state environmental review process, and knowledge of various federal, state, and local permitting processes and requirements.

Accomplishments

- Permitted six high voltage transmission line and large wind energy conversion system projects, including the CapX Hampton-LaCrosse 345kV transmission line project.
- Department of Commerce Technical Representative to the Minnesota Environmental Quality Board.
- Named 2012 State of Minnesota Emerging Leader by Minnesota Management and Budget

Minnesota Department of Natural Resources • St. Paul, MN 55155 • July 1999 - May 2009

The Minnesota Department of Natural Resources' (MDNR) mission is "to work with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life." I held positions with increasing responsibility in environmental planning and regulation during my ten years with the Department.

Principal Planner (May 2004 - May 2009)

The primary responsibilities of this position were to: 1) prepare environmental review documents in compliance with the Minnesota Environmental Protection Act (MEPA, Minn. Stat 116D) and; 2) coordinate Department-wide review of transmission line, pipeline, power plant, and wind energy projects in all areas of the state.

Accomplishments

- Department of Natural Resources Technical Representative to the MN Environmental Quality Board.
- 2008 MDNR Supervisor School Graduate
- Context Sensitive (Planning) Design Certification

Senior Planner (June 2002 - May 2004)

The primary responsibility of this position was to prepare environmental review documents in compliance with MEPA, with an emphasis on All-Terrain Vehicle Recreational Trails.

Senior Planner (June 2000 - June 2002)

The primary responsibility of this position was to develop, in coordination with the public and governmental units, State Park Management Plans for two newly created State Parks - Big Bog and Red River - in compliance with the MN Outdoor Recreation Act (Minn. State 86A).

Accomplishments

- Published the Big Bog, Red River, and Cascade River State Park Management Plans
- 2001 DNR Teamwork and Partnership Award

Planner (July 1999 - June 2000)

Student Worker position included assisting Senior Planners develop maps and research sections of State Park Management Plans. Assisted with the development of the 2000 MDNR State Park Systemwide Management Plan.

EDUCATION

University of Minnesota (1995-1999)

Natural Resources and Environmental Studies
Forestry Minor
Area of Emphasis in Planning, Policy and Law.

Mississippi River Crossing Analysis

Alexandria – Big Oaks 345 kV Transmission Project

Docket No. E002, E017, ET2, E015, ET10/TL-23-159

I. OVERVIEW

On September 29, 2023, Northern States Power Company doing business as Xcel Energy, Great River Energy, Minnesota Power, Otter Tail Power Company, and Missouri River Energy Services on behalf of Western Minnesota Municipal Power Agency (Applicants) filed a route permit application with the Minnesota Public Utilities Commission for approval to construct the Alexandria – Big Oaks Transmission Project (Project). The Project involves construction of an approximately 105 to 108-mile long, 345 kV transmission line from the existing Alexandria Substation located in Alexandria, Douglas County to the new Big Oaks Substation that will be constructed on the north side of the Mississippi River in Becker, Sherburne County. The majority of the Applicants' Proposed Route for the new 345 kV transmission line from the existing Alexandria Substation to the new Big Oaks Substation follows existing transmission line right-of-way as the Project involves placing this new 345 kV transmission circuit on existing CapX2020 transmission line structures that were previously permitted and constructed as double-circuit capable as part of the Monticello to St. Cloud 345 kV Transmission Project (E002, ET2/TL-09-246) and the Fargo to St. Cloud 345 kV Transmission Project (E002, ET2/TL-09-1056).

One portion of the Proposed Route that will deviate from existing transmission right-of-way is at the Mississippi River where new right-of-way will be required to connect the new 345 kV transmission line from where it deviates from the existing transmission line structures to the new Big Oaks Substation located northwest of the Monticello Nuclear Generating Plant (Monticello Plant) in Becker. Five route alternatives for the Mississippi River crossing are currently being evaluated and are included in the scope of the Environmental Assessment (EA) that is being prepared by the Minnesota Department of Commerce, Energy Environmental Review and Analysis (EERA). Two of these route alternatives were included in the Applicants' Route Permit application and three were proposed by the Minnesota Department of Natural Resources (MnDNR) in its January 8, 2024 scoping comment and were modified by the Applicants. These five route alternatives are:

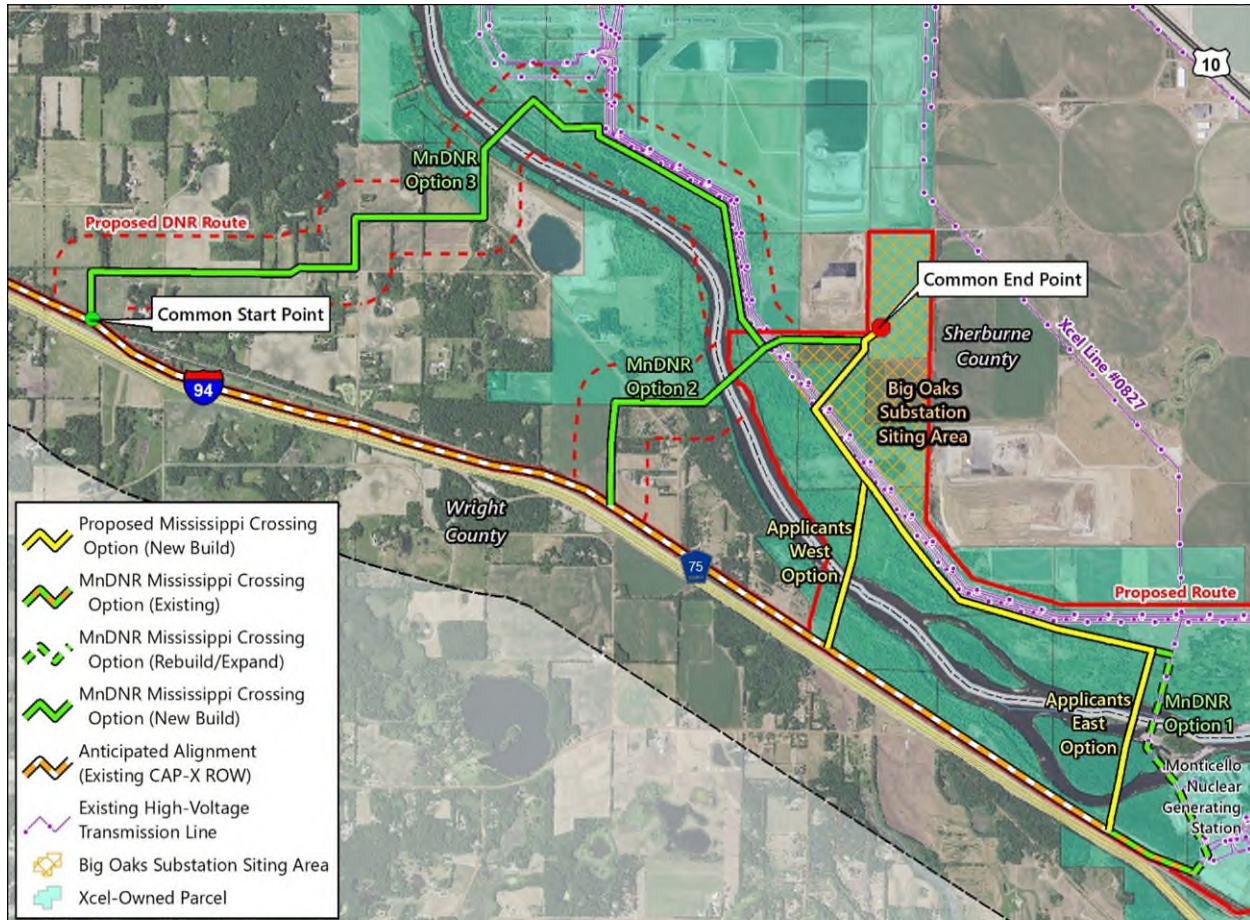
- Applicants Western Option: The Western Option would construct a new crossing of the Mississippi River directly south of the proposed Big Oaks Substation. This alignment would include 1.4 miles of new right-of-way located entirely on Xcel Energy-owned land. There are two different design options for the Western Crossing Option. The first option, as proposed in the Route Permit Application, would construct the new 345 kV transmission line as a single-circuit line across the Mississippi River (Western Crossing Single Circuit Option). The second option would be to double-circuit the new 345 kV line with an existing 115 kV transmission line (Western Crossing Option B Double-Circuit Option).
- Applicants Eastern Option: The Eastern Option would construct a new crossing of the Mississippi River just west of the Monticello Plant. This option would parallel an existing 115 kV transmission line. This option would include 2.9 miles of new transmission line right-of-way and be located entirely on Xcel Energy-owned land; it would require two separate structures to be placed on an island in the Mississippi River.
- MnDNR Option 1: MnDNR Option 1 would rebuild the existing 115 kV transmission line directly west of the Monticello Plant so that these structures can accommodate the new double-circuit 345/115 kV line across the river. In its January 8, 2024 scoping comment,

the MnDNR stated that this was the MnDNR's preferred route alternative for the Mississippi River crossing. This option would include 2.2 miles of new transmission line right-of-way, plus one mile of existing right-of-way that would need to be expanded from 75 feet in width to 150 feet in width.

- MnDNR Option 2: MnDNR Option 2 would cross the Mississippi River northwest of the existing Monticello Plant. There are two different design options for the MnDNR Option 2. The first option, as proposed by the MnDNR, would construct the new 345 kV transmission line as a single-circuit line across the Mississippi River (MnDNR Option 2 (Single Circuit Option)). The second option would be to double-circuit the new 345 kV line with an existing 115 kV transmission line (MnDNR Option 2B (Double-Circuit Option)). Both options would include 1.6 miles of new right-of-way.
- MnDNR's Option 3: MnDNR Option 3 is the northernmost option and would depart from the existing 345 kV transmission line structures and then travel east across private land before crossing the Mississippi River north of the proposed Big Oaks Substation. This option would include 4.4 miles of new right-of-way.

A map of all of these route options for the Mississippi River crossing is provided below.

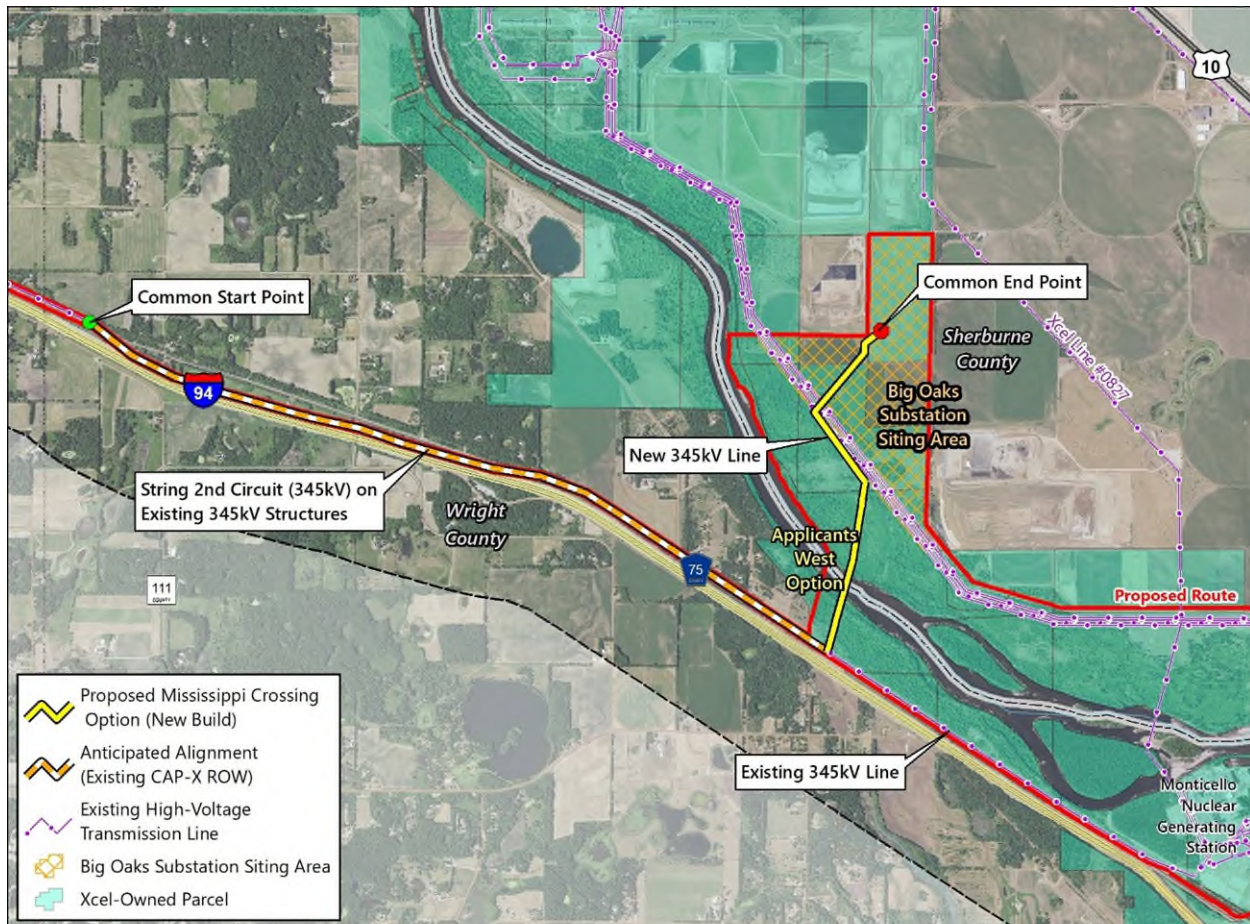
Figure 1
Overview of River Crossing Options



II. APPLICANTS WESTERN OPTION (SINGLE-CIRCUIT)

The Applicants Western Crossing (Single-Circuit Option) was included and discussed in the Route Permit application. The Western Crossing Option would construct a new crossing of the Mississippi River directly south of the proposed Big Oaks Substation. This route option would be located entirely on Xcel Energy-owned land and is shown in the figure below.

Figure 2
Applicants Western Option (Single-Circuit)



Key construction, maintenance, constraints, and potential impacts of this crossing option are:

- **Constructability Issues**

- This option avoids the access and installation issues present with other Mississippi River crossing options. This is because this option would not require structures to be placed either on an island in the middle of the Mississippi River or on the river bluffs.

- **Potential Environmental Impacts**

- There are 11.6 acres of Minnesota Biological Survey identified Sites of High or Moderate Biodiversity within the new 150-foot-wide right-of-way for this option and 0 acres of Sites of High or Moderate Biodiversity within the existing 150-foot right-of-way.
- There are 0.7 miles of new right-of-way within a Wild & Scenic River District.

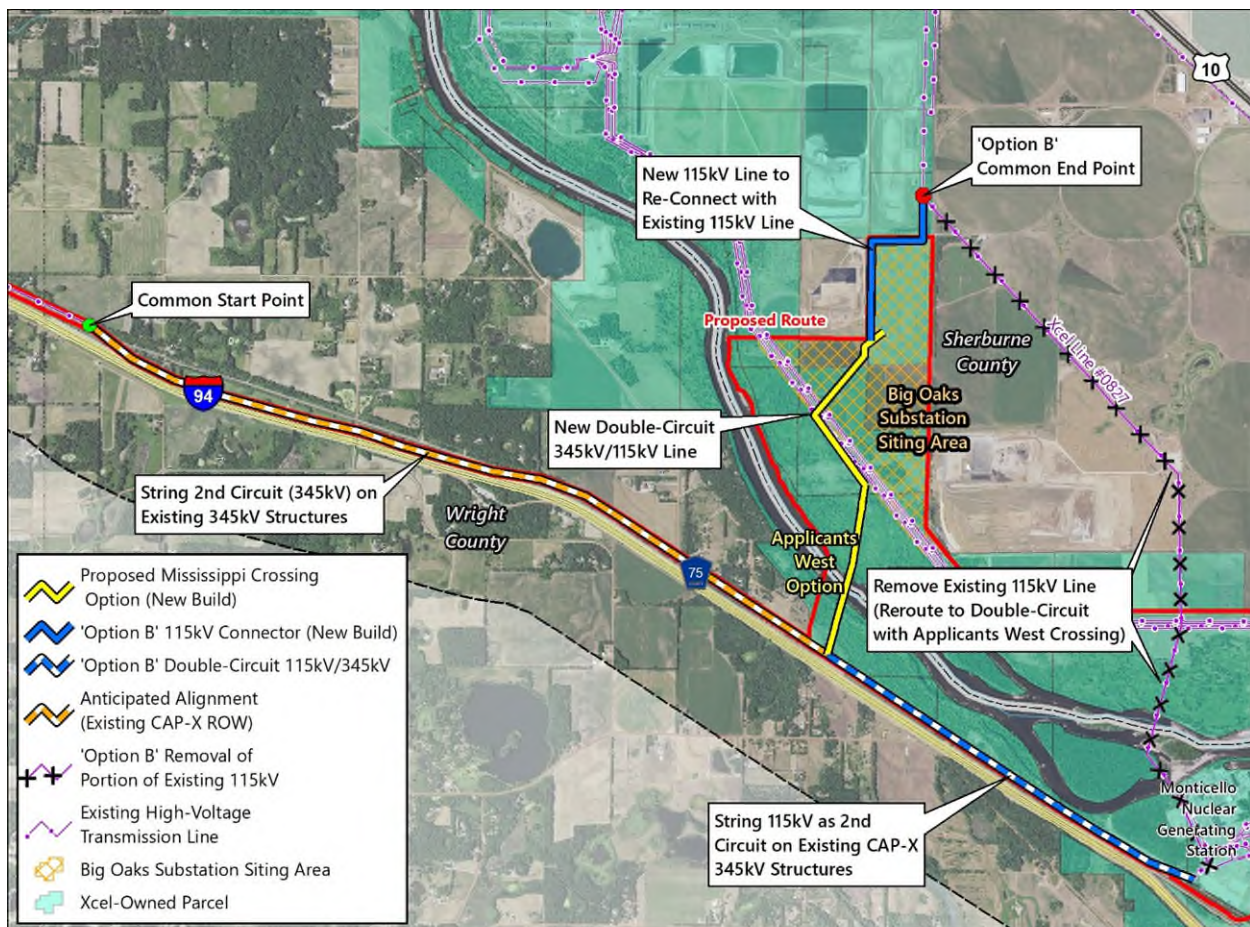
- **Potential Land Use Impacts**

- This option is located entirely on Xcel Energy-owned land.

III. APPLICANTS WESTERN OPTION B (DOUBLE-CIRCUIT)

The Applicants Western Option B (Double-Circuit) is a modification to the Western Option included in the Route Permit Application. This option involves stringing a new 115 kV circuit on existing 345 kV structures from the Monticello Substation north to where the new 345 kV transmission line deviates from the existing 345/345 kV structures to cross the Mississippi River. At this point, the new 345 kV transmission line would be double-circuited with an existing 115 kV transmission line across the Mississippi River to the Big Oaks Substation. At the Big Oaks Substation, the 115 kV circuit would then route north around the new Big Oaks Substation to reconnect with the existing 115 kV transmission alignment. The existing 115 kV transmission line crossing the Mississippi River would be removed. This option is shown in the figure below.

Figure 3
Applicants' Western Option B (Double-Circuit)



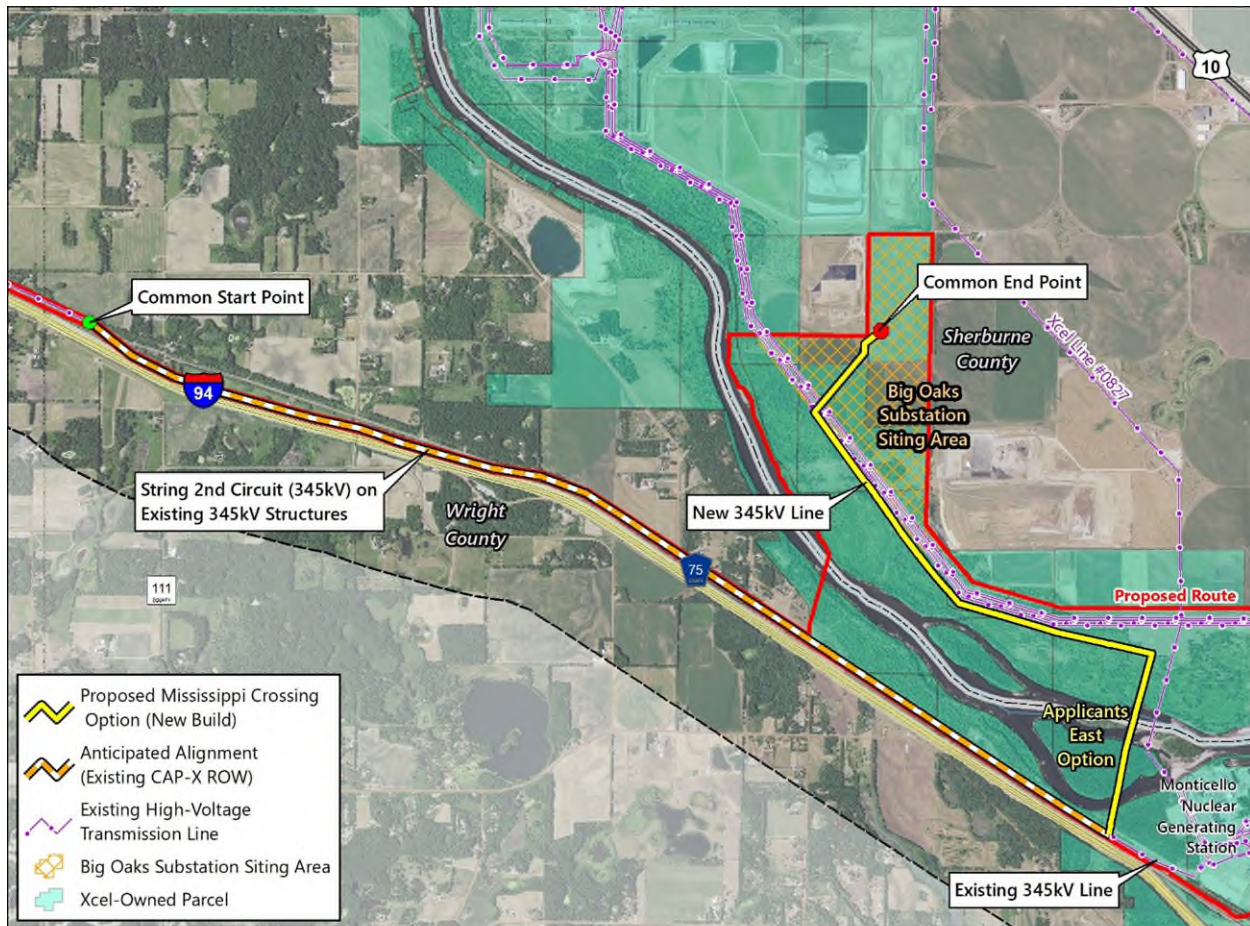
Key construction, maintenance, constraints, and potential impacts of this crossing option are:

- **Potential Construction and Maintenance Issues**
 - This option would not require any new structures to be placed either on an island in the middle of the Mississippi River or on the river bluffs.
 - This option would require the removal of the existing 115 kV structure on the island north of the Monticello Substation location. It is anticipated that access with heavy equipment would not be required for this work. The existing lattice structure could be disassembled and removed in pieces.
 - Removing the existing 115 kV circuit from the island will eliminate the need for future access to the island for maintenance work.
- **Potential Environmental Impacts**
 - There are 11.6 acres of identified Sites of High or Moderate Biodiversity within the new 150-foot-wide right-of-way for this option and 10.7 acres of Sites of High or Moderate Biodiversity within the existing 150 right-of-way.
 - This option minimizes long-term impacts to ecologically significant areas and a Wild & Scenic River District by consolidating transmission line crossings of the Mississippi River.
 - This option would remove an existing 115 kV transmission line crossing the Mississippi River.
 - There are 0.7 miles of new right-of-way within a Wild & Scenic River District.
- **Potential Land Use Impacts**
 - This option is located entirely on Xcel Energy-owned land.

IV. APPLICANTS EASTERN OPTION

The Applicants Eastern Option was included in the Route Permit application and is shown in the figure below. The Eastern Option would construct a new crossing of the Mississippi River just west of the Monticello Plant and would parallel an existing 115 kV transmission line. This option would require two structures to be placed on an island in the middle of the Mississippi River.

Figure 4
Applicants Eastern Crossing Option



Key construction, maintenance, constraints, and potential impacts of this crossing option are:

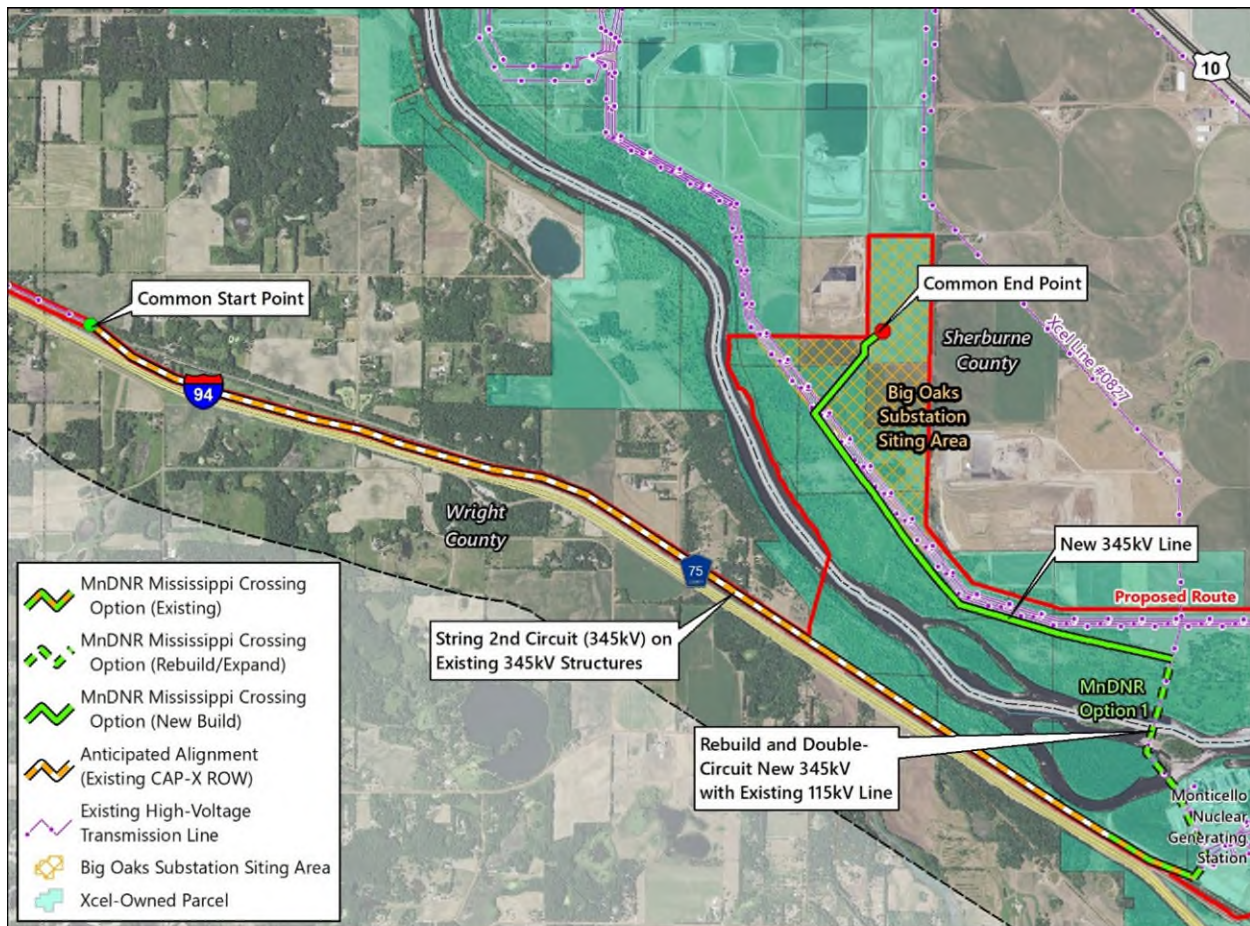
- **Potential Construction and Maintenance Issues**
 - This alternative will require installation of two tangent single-circuit structures on an island in the middle of the Mississippi River. As these structures are single-circuit structures, they would be smaller than the double-circuit structures required for other alternatives. It is anticipated that the foundations for these single-circuit structures would use a specialty type foundation, likely helical piles with a steel grillage. These foundation types require smaller equipment than drilled concrete piers and driven piles required for larger double-circuit structures.
 - This alternative will require access to the island for both construction and maintenance of the transmission facilities. This will require the use of barges that can only be operated during certain times of the year and under certain river conditions. As a result, construction and maintenance will be limited to the spring, summer, and fall months and to times when the Mississippi River is both deep enough and has proper flow to accommodate barge traffic.

- Structure installation would require heavy equipment to access the island. The use of helicopters could be considered but would likely increase the cost of the structure to provide small enough sections for the helicopter to lift into place. Helicopter use near the Monticello Plant would require coordination and approval.
- **Potential Environmental Impacts**
 - There is 37.4 acres of identified Sites of High or Moderate Biodiversity within the new 150-foot-wide right-of-way for this option and 0 acres of Sites of High or Moderate Biodiversity within the existing 150 right-of-way.
 - This option crosses multiple channels of the Mississippi River.
 - There are 1.9 miles of new right-of-way within a Wild & Scenic River District.
- **Potential Land Use Impacts**
 - This option is located entirely on Xcel Energy-owned land.
 - The University of Minnesota research building is located adjacent to this alternative after it crosses the Mississippi River. This will require coordination with the University of Minnesota during the detailed design and construction phase to mitigate any potential impacts to their crop research at this site.

V. **MNDNR OPTION 1**

MnDNR Option 1 would remove the existing 115 kV transmission line directly west of the Monticello Plant and re-build new structures that can accommodate a new double-circuit 345/115 kV line across the Mississippi River. In its January 8, 2024 scoping comment letter, the MnDNR stated that this was the MnDNR's preferred route alternative for the Mississippi River crossing. This option is shown in the figure below.

Figure 5
MnDNR Option 1



Key construction, maintenance, constraints, and potential impacts of this crossing option are:

- **Potential Construction and Maintenance Issues**

- This alternative requires installing one, unique multi-pole angle structure, similar to an H-frame structure, on the island in the middle of the Mississippi River. This structure is needed to reduce the lateral loading on the foundation, given the anticipated poor soil conditions at this location. Phase wires would be located at two levels horizontally, with both levels containing phases from each circuit to maintain proper separation between the circuits. This phasing configuration will require both the 345 kV and the 115 kV line to be deenergized simultaneously if maintenance is required on either line. It is anticipated that the foundations for these structures would use multiple driven piles with a large concrete pile cap, requiring the use of heavy equipment and concrete trucks.
- This alternative will require access to the island for both construction and maintenance of the transmission facilities. This will require the use of barges that can only be operated during certain times of the year and under certain river

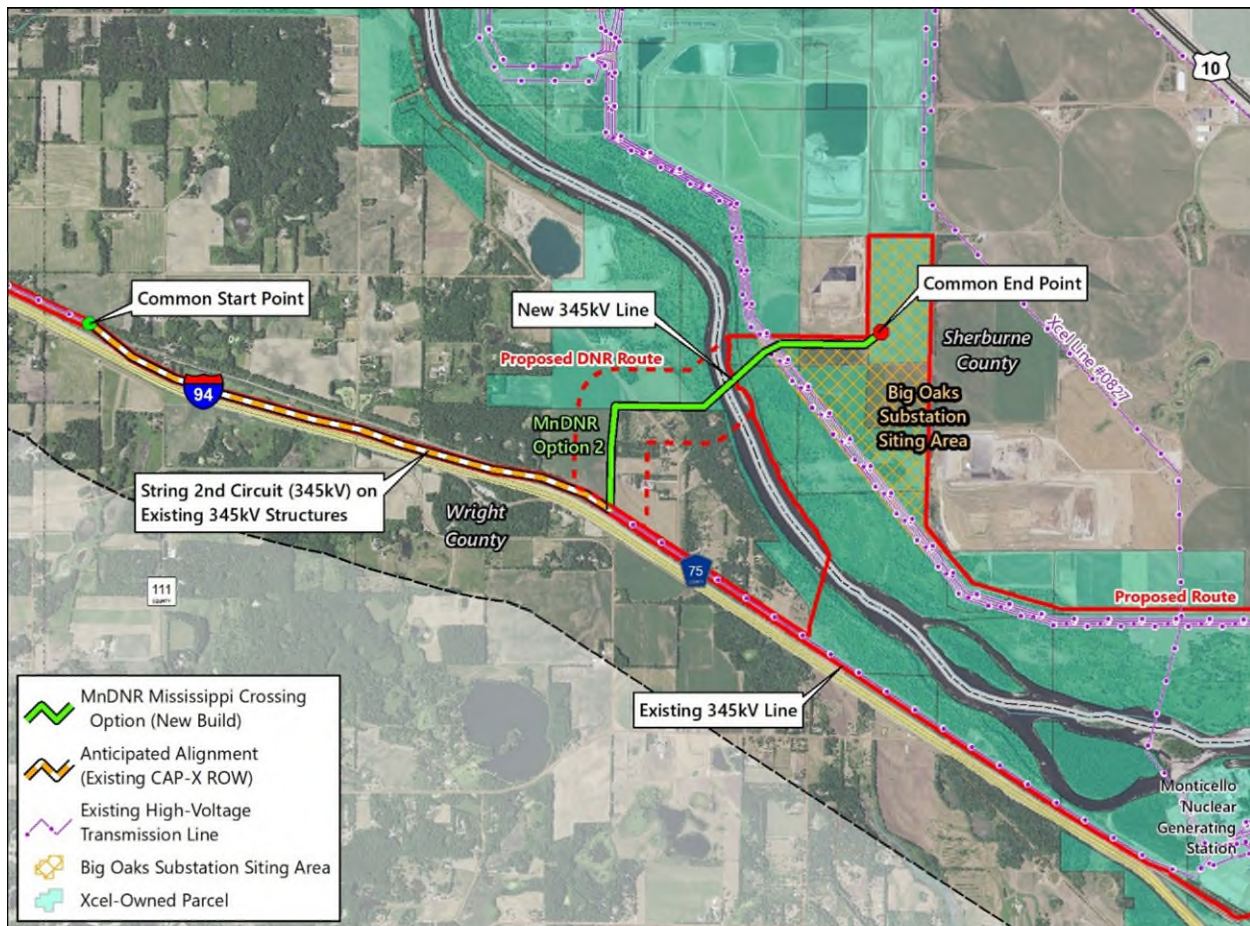
conditions. As a result, construction and maintenance will be limited to the spring, summer, and fall months and to times when the Mississippi River is both deep enough and has proper flow to accommodate barge traffic.

- Structure installation during construction would require heavy equipment to access the island. The use of helicopters could be considered but would likely increase the cost of the structure to provide small enough sections for the helicopter to lift into place. Helicopter use near the Monticello Plant would require coordination and approval.
 - This route option requires approximately 0.3 miles of triple-circuit 345/345/115 kV through the Monticello Plant between the main plant facilities and the nuclear waste storage area. Triple-circuiting is required to reduce the required right-of-way width in this narrow corridor. All three lines would need to be deenergized if maintenance is required on any one of the three lines. Significant coordination with the Monticello Plant during construction and future maintenance of any of these lines would be required.
 - This route option has the highest estimated construction cost.
- **Potential Environmental Impacts**
 - There are 23.0 acres of identified Sites of High or Moderate Biodiversity within the new 150-foot-wide right-of-way for this option and 10.9 acres of Sites of High or Moderate Biodiversity within the existing 150 right-of-way. This option has the highest acreage of identified Sites of High or Moderate Biodiversity within the right-of-way.
 - This option crosses multiple channels of the Mississippi River.
 - There are 1.8 miles of new right-of-way within a Wild & Scenic River District.
- **Potential Land Use Impacts**
 - The University of Minnesota research building is located adjacent to this alternative after it crosses the Mississippi River. This will require coordination with the University of Minnesota during the detailed design and construction phase to mitigate any potential impacts to their crop research at this site.
 - This option is located entirely on Xcel Energy-owned land.

VI. MNDNR OPTION 2 (SINGLE-CIRCUIT)

MnDNR Option 2 (Single-Circuit) would cross the Mississippi River northwest of the existing Monticello Plant as a single-circuit 345 kV transmission line.

Figure 6
MnDNR Option 2 (Single-Circuit)



Key construction, maintenance, constraints, and potential impacts of this crossing option are:

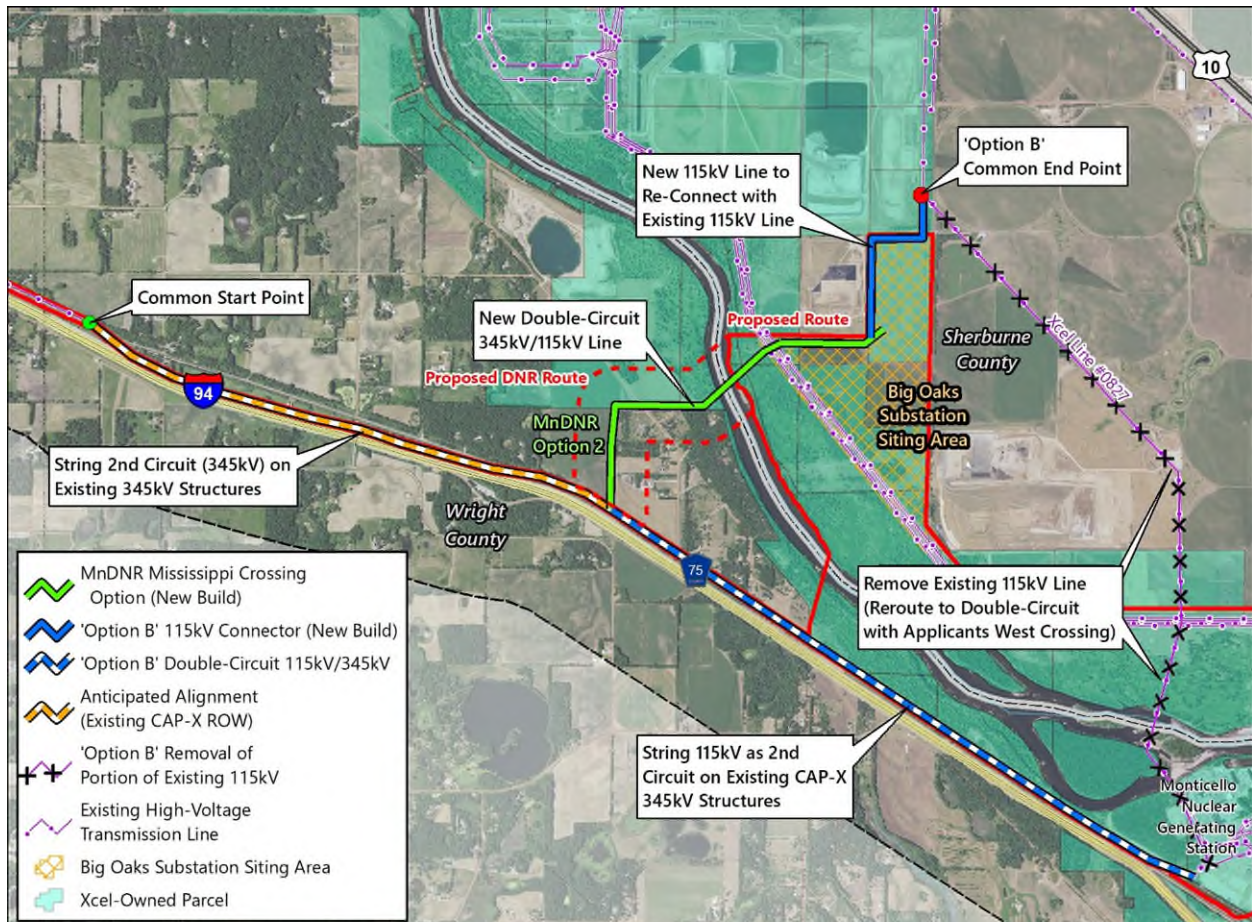
- **Potential Construction and Maintenance Issues**
 - This option does not present any unique constructability or maintenance concerns.
- **Potential Environmental Impacts**
 - There are 3.4 acres of identified Sites of High Biodiversity within the new 150-foot-wide right-of-way for this option and 0 acres of Sites of High or Moderate Biodiversity within the existing 150 right-of-way.
 - There are 0.6 miles of new right-of-way within a Wild & Scenic River District.
- **Potential Land Use Impacts**
 - There are 2 residences located within 500 feet of the proposed transmission line centerline.

- This option would require 6.9 acres of new easements across private property.
- The design of this option will need to account for a large center pivot irrigation system just north of the proposed tap location. This could be mitigated by shifting the alignment east or with a change to the pivot irrigation system. Shifting the alignment east will require tree-clearing on private property.

VII. MNDNR OPTION 2B (DOUBLE-CIRCUIT)

The MnDNR Option 2B (Double-Circuit Option) is a modification to the MnDNR Option 2 that was included in the MnDNR’s January 8, 2024 scoping comment. This option involves stringing a new 115 kV circuit on existing 345 kV structures from the Monticello Substation north to where the new 345 kV transmission line deviates from the existing 345/345 kV structures to cross the Mississippi River. At this point, the new 345 kV transmission line would be double-circuited with the 115 kV transmission line across the Mississippi River to the Big Oaks Substation. At the Big Oaks Substation, the 115 kV circuit would then route north around the new Big Oaks Substation to reconnect with the existing 115 kV alignment. The existing 115 kV transmission line crossing the Mississippi River would be removed. This option is shown in the figure below.

Figure 7
MnDNR Option 2B (Double-Circuit)



Key construction, maintenance, constraints, and potential impacts of this crossing option are:

- **Potential Construction and Maintenance Issues**
 - This option would not require any new structures to be placed either on an island in the middle of the Mississippi River or on the river bluffs.
 - This option would require the removal of the existing 115 kV structure on the island north of the Monticello Substation location. It is anticipated that access with heavy equipment would not be required for this work. The existing lattice structure could be disassembled and removed in pieces.
 - Removing the existing 115 kV circuit from the island will eliminate the need for future access for maintenance work.

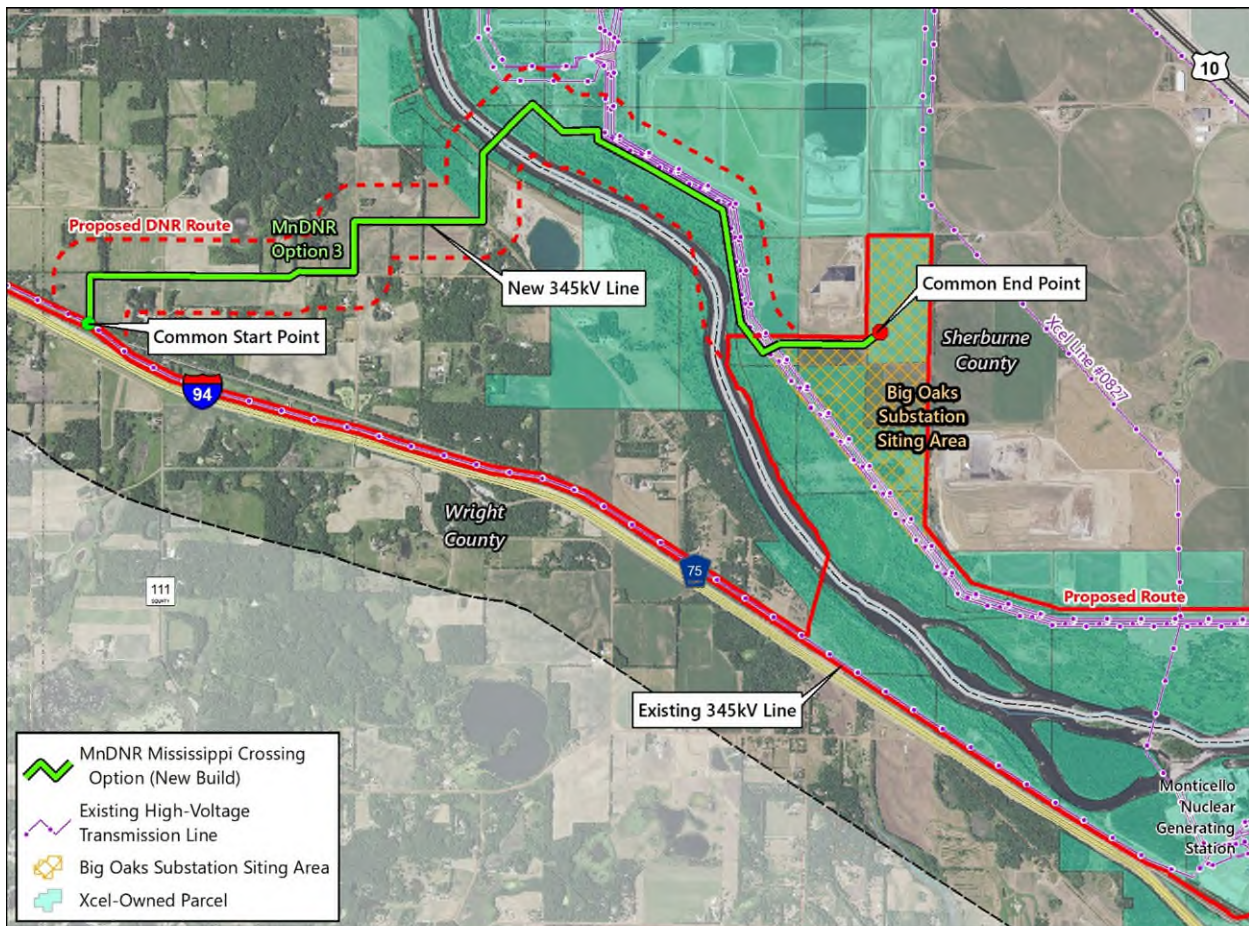
- **Potential Environmental Impacts**
 - There are 3.4 acres of identified Sites of High Biodiversity within the new 150-foot-wide right-of-way for this option and 10.7 acres of Sites of High or Moderate Biodiversity within the existing 150 right-of-way.
 - This option minimizes long-term impacts to ecologically significant areas and a Wild & Scenic River District by consolidating transmission line crossings of the Mississippi River.
 - This option would remove an existing 115 kV transmission line crossing the Mississippi River.
 - There are 0.6 miles of new right-of-way within a Wild & Scenic River District.

- **Potential Landowner Impact**
 - There are 2 residences located within 500 feet of the proposed transmission line centerline.
 - This option would require 6.9 acres of new easements across private property.

VIII. MNDNR'S OPTION 3

This river crossing option is the DNR's Option 3 and was included in the MnDNR's January 8, 2024 scoping comment. MnDNR Option 3 is the northernmost option and would depart from the existing 345 kV transmission line structures and then travel east across private land before crossing the Mississippi River north of the proposed Big Oaks Substation.

Figure 8
MnDNR Option 3



Key construction, maintenance, constraints, and potential impacts of this crossing option are:

- Potential Construction and Maintenance Issues
 - This route option would place structures very near the river bluff on the east side of the Mississippi River. There is limited safe working area along this section of the river bluff due to existing 345kV lines.
 - The proximity of potentially steep slopes could increase the size and depth of structure foundations required.
- Potential Environmental Impacts
 - There is 2.2 acres of identified Sites of Moderate Biodiversity within the new 150 foot wide right-of-way for this option and 0 acres of Sites of High or Moderate Biodiversity within the existing 150 right-of-way.

- The section of this route option along the east side of the Mississippi River would trees and vegetation to be cleared immediately adjacent to the river, which could increase the potential for river erosion in this area. This vegetation clearing would visually impact a Wild & Scenic River District.
- There are 2.0 miles of new right-of-way within a Wild & Scenic River District.
- Potential Land Use Impacts
 - There is 1 residence located between 75-300 feet of the proposed transmission line centerline and 6 residences located between 300-500 feet of the proposed centerline. This route option has the most landowners located within 500 feet of the proposed centerline.
 - This option would require 34.5 acres of new easements across private property.

IX. SUMMARY OF POTENTIAL IMPACTS

The following table summarizes the potential impacts of each of the Mississippi River crossing options and the estimated construction costs.

**Table 1
 Route Options Summary of Impacts**

Route Option	Applicants Western Option (Single-Circuit)	Applicants Eastern Option	MnDNR Option 1	MnDNR Option 2	MnDNR Option 3	Applicants Western Option (Double-Circuit) *	MnDNR's Option 2 (Double-Circuit) *
Length (miles)	4.6	7.4	8	3.7	4.4	7.2	7.4
Stringing 2nd Circuit (345kV) on Existing Structures	3.2	4.5	4.9	2.2	-	3.2	2.2
Stringing 2nd Circuit (115kV) on Existing Structures	-	-	-	-	-	1.8	2.8
Single Circuit 345kV	1.4	2.9	2.2	1.6	4.4	-	-
Double Circuit (345kV/115kV)	-	-	0.7	-	-	1.4	1.6
Triple Circuit (345kV/345kV/115kV)	-	-	0.3	-	-	-	-
Single Circuit 115kV	-	-	-	-	-	0.8	0.8
Structure Count	27	42	45	23	26	45	46
Existing 345kV Structures (Stringing 2nd Circuit - 345kV)	17	24	26	12	-	17	12
Existing 345kV Structures (Stringing 2nd Circuit - 115kV)	-	-	-	-	-	9	14
Single Circuit 345kV Structures	10	18	14	11	26	-	-
Double Circuit (345kV/115kV) Structures	-	-	3	-	-	10	11

Route Option	Applicants Western Option (Single-Circuit)	Applicants Eastern Option	MnDNR Option 1	MnDNR Option 2	MnDNR Option 3	Applicants Western Option (Double-Circuit) *	MnDNR's Option 2 (Double-Circuit) *
Triple Circuit (345kV/345kV/115kV) Structures	-	-	2	-	-	-	-
Single Circuit 115kV Structures	-	-	-	-	-	9	9
Estimated Cost	\$10,130,000	\$15,310,000	\$26,960,000	\$10,140,000	\$21,170,000	\$14,380,000	\$14,660,000
Sites of Biodiversity in right-of-way (acres)	11.6	37.4	34.0	3.4	2.2	22.3 (25.8**)	14.1 (16.2**)
150-foot right-of-way (existing) - Moderate	0	0	0	0	0	0	0
150-foot right-of-way (existing) - High	0	10.0	10.9	0	0	10.7	10.7
Using 150-foot right-of-way (new) - Moderate	5.9	19.0	19.6	0	2.2	5.9	0
Using 150-foot right-of-way (new) - High	5.7	8.4	3.4	3.4	0	5.7	3.4
Using 230-foot right-of-way (at crossing) (new) - Moderate	NA	NA	NA	NA	NA	8.0**	0**
Using 230-foot right-of-way (at crossing) (new) - High	NA	NA	NA	NA	NA	7.1**	5.5**
New Length in Wild & Scenic River District (miles)	0.7	1.9	1.8	0.6	2.0	0.7	0.6
New Private Property Easements							
Total Parcels	0	0	0	2	19	0	2 (5**)
Unique Landowners	0	0	0	2	14	0	2 (5**)
Acres of new Easement	0	0	0	6.9	34.5	0	6.9 (7.6**)
New Residence Offset Distances	0	0	0	2	7	0	2
0 - 75 Feet	0	0	0	0	0	0	0
75 - 300 feet	0	0	0	0	1	0	0
300 - 500 feet	0	0	0	2	6	0	2
*Option includes two potential structure configurations at the river crossing. 1) Two H-frames side-by-side to reduce the number of vertical planes in the flyway. This would require a 230' right-of-way 2) Single pole double-circuit to maintain a right-of-way width of 150'							
** Two H-frame side-by-side configuration							

X. RIVER CROSSING STRUCTURE DESIGNS

There are several different structure designs that are being considered for the Mississippi River crossing. These structure designs depend, in part, on whether the crossing will be constructed as single-circuit design or a double-circuit design. The Applicants Western Crossing (Single-Circuit), Applicants Eastern Crossing, MnDNR Option 2 (Single-Circuit), and MnDNR Option 3 are all proposed to be constructed as a single-circuit 345 kV transmission line across the Mississippi River. The Applicants Western Crossing B (Double-Circuit), MnDNR Option 1, and MnDNR Option 2B (Double-Circuit) are all proposed to be constructed as a double-circuit 345 kV

transmission line across the Mississippi River. The following provides additional details regarding each of these designs.

A. Single-Circuit Structure Design

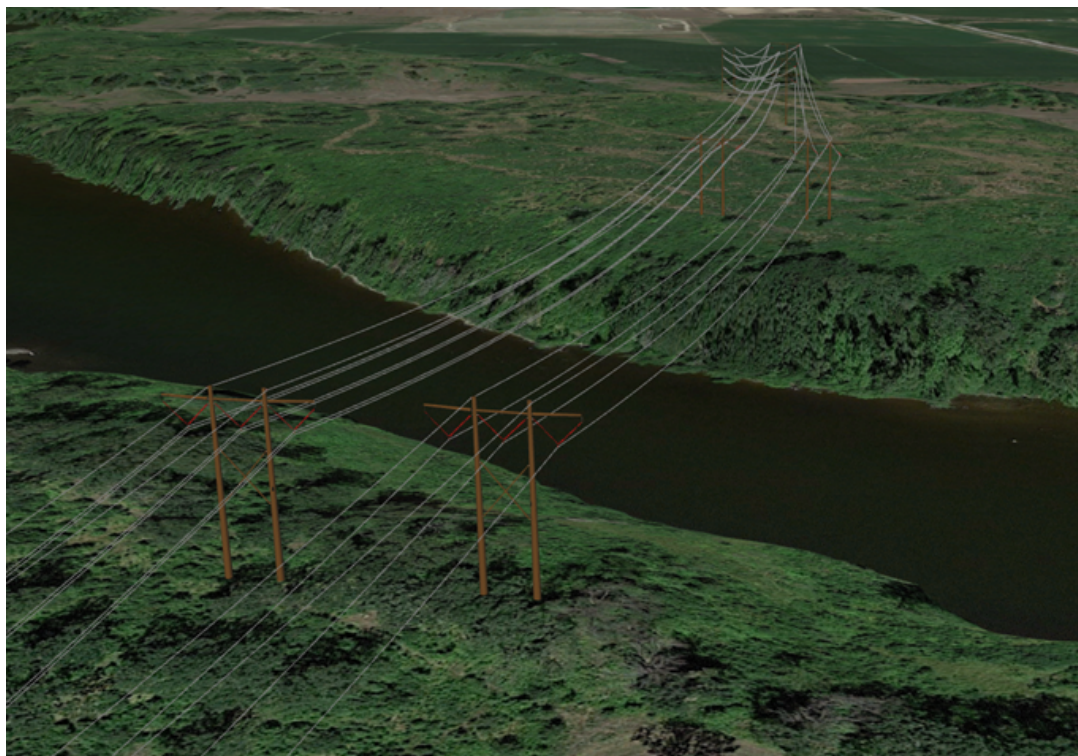
For single-circuit river crossing options, the Applicants propose to use H-frame structure configurations for the structures on either side of the Mississippi River. This structure configuration would consist of two poles connected by a crossarm holding the phase wires, which would put all the phase wires at the same level in a horizontal configuration. This presents the least impactful profile for birds using the Mississippi River flyway. Shielding wires are located on a separate level above the phase wires. The required right-of-way width for this configuration is 150 feet. Trees would be cleared for the entire right-of-way width.

B. Double-Circuit Structure Design

For the double-circuit river crossing options, the Applicants have two different design options at the Mississippi River. For both design options, the Applicants propose to install bird flight diverters on the shield wire plane to reduce the potential for avian interactions with the transmission line.

The first option is to use a side-by-side H-frame design for the structures on either side of the Mississippi River. This would require splitting the 345 kV and 115 kV transmission circuits onto separate side-by-side H-frame structures as they cross the river. These structures would likely use drilled concrete pier foundations because of the small angle introduced as the circuits separate. These H-frame structures will be approximately 120 feet tall and have two sets of vertical planes created by the one conductor phase plane and one shield wire plane, which presents the least impactful profile for birds using the Mississippi River flyway. The two structures would be spaced to provide adequate clearance between wires to meet code requirements during operation of the lines and safety requirements during maintenance of one line while the other line remains energized. The total required right-of-way width for this configuration would be approximately 230 feet. That width would be required for the crossing span, and one additional span out on either side of the river crossing. Trees and vegetation would be cleared for the entire 230-foot-wide right-of-way. This design is depicted in the figure below.

Figure 9
H-Frame Side-by-Side Design



An alternative configuration for the double-circuit river crossing options would be to co-locate both the 345 kV and 115 kV circuits on the same double-circuit structure. This would consist of a monopole structure with davit arms carrying the phase wires vertically stacked with one circuit on either side of the structure. Transmission structures near the river crossing with this vertical configuration will be approximately 150 feet tall and have four sets of vertical planes created by the three conductor phases and shield wire. This would present a similar profile to birds using the flyway as the existing Line #0827 115 kV crossing north of the Monticello Substation, and would be slightly more impactful than a horizontal configuration. The typical right-of-way width required for this configuration is 150 feet. This would be a slightly less expensive alternative than separating out the circuits into two H-frame structures at the river crossing. This is because using double-circuit structures will reduce of the number of poles and foundations and require the clearing of a smaller right-of-way width. This design is depicted in the figure below.

Figure 10
Double-Circuit Monopole Design

