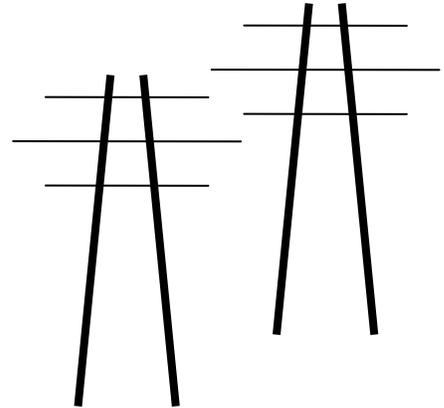


Legalelectric, Inc.

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May 31, 2017

Kate Kahlert, Staff Attorney
Dan Wolf, Executive Secretary
Public Utilities Commission
121 East 7th Place
St. Paul, MN 55101

via eFiling and email: kate.kahlert@state.mn.us

RE: Reply Comments of No CapX 2020, United Citizens Action Network, North Route Group and Goodhue Wind Truth – “Public Intervenors”
PUC Docket 12-1246, Rulemaking, Minn. R. Ch. 7849 & 7850

Dear Ms. Kahlert and Mr. Wolf:

Again, thank you for the opportunity to comment on the Draft rules, Minn. R. Ch. 7849 and 7850. These Reply Comments are filed on behalf of NoCapX 2020 (No CapX) and United Citizens Action Network (U-CAN), as well as North Route Group (NRG) and Goodhue Wind Truth (GWT), and incorporates any separate comments filed by NRG and GWT as if fully related herein. These groups are members of the public who have come together when faced with infrastructure in their communities, and participated in numerous public venues and Commission dockets, including project, PPSA Annual Hearing, and this rulemaking proceeding. We have not only attended rulemaking committee meetings, but held small group meetings over the years and also a public workshop to increase awareness of and interest in this rulemaking and gather public comments (and yes, this representation and work is all pro bono-- what client, other than a utility, would pay for this?).

These parties named will jointly be referred to below as “Public Intervenors” in these comments.

We expressly request the opportunity for oral argument when these Draft Rules come before the Commission for both parties and interested members of the public. It’s my understanding that this is planned, and we want to be clear that it’s expected.

Our Initial Comments dealt with primarily the necessity of notice and public participation opportunities. In these Reply Comments, we’re addressing some of the Comments of the other parties. These comments are not all inclusive -- if points are not addressed, that does not imply approval or agreement. Utility comments will be given little review as they are representing

their corporate interests, usually at odds with the public interest. The Commission's position should be one of regulation, not regulatory capture.

COMMERCE DER-ERP COMMENTS

Recommended changes: Public Intervenors have no objection to the change from "power pool" to "RTO" as requested by DOC-DER-ERP.

Definition of "Associated Facilities:" Based on the language used, it appears that DOC-DER-ERP is referring to "combined actions" rather than associated facilities. Public Intervenors agree that "all aspects of a certificate of need proceeding should address natural gas pipelines necessary to interconnect a large electric generating facility," however, if incorporated into the application, it is not clear if they will be separately addressed. These natural gas pipelines should require a separate Certificate of Need to assure they are fully considered. The application could, and should, contain separate information for the gas plant and gas pipeline, and request two certificates of need.

EERA COMMENTS

In comments regarding 7850.1500, EERA requests editing for consistency. However, it is not clear why solar is treated differently than wind, and why wind projects have been singled out in the rules into Chapter 7854 rather than incorporated into Ch. 7850.

7850.1610: Specific project notice should issue to not only those "within" the route but adjacent to the route. Use of "within" is too limiting, as those contiguous not only will have impacts, but could also be targeted in "minor alterations." See CapX 2020 Brookings and Hampton-La Crosse routing dockets for examples of people not within route being landowners impacted without notice.

7850.1640, Subp. 2. EERA recommends deleting Subp. 2(R). Information regarding the amount of land an applicant has obtained via contract or may obtain through condemnation is important to understand the breadth of potential impacts. Public Intervenors suggest clarification through a change requiring disclosure of "acres of land an applicant would obtain, through contract or condemnation, to build the project, excluding contiguous land that may be acquired as a result of election of Minn. Stat. §216E.12, Subd. 4 (Buy the Farm)."

Public Intervenors agree that any size determination must accompany the project application.

7580.1650: Public Intervenors agree with EERA on the importance of notice containing statement that property could be impacted by site or route. This requirement of notice that property could be affected is mentioned several times, and for each instance in the rules, this notice is necessary for due process and is very important notice for landowners.

7850.1700: Don't delete any notice requirements. People usually do not pay attention until the third time they receive notice, if then!

7850.2300, Subp. 2(J): People do get confused by different notices, and with each, it would help to let them know that there will be separate notices for "meetings" and "hearings" and to pay attention!

7850.2400: What does this mean? Needs clarification:

Subp. 4. Termination of task force

EERA staff recommends that the task force terminate upon Commission designation of sites or routes that will be included in the environmental impact statement or environmental assessment for the project. EERA staff recommends deleting text referring to the possibility of sites or routes being designated by the Commission and discussed at hearing without such sites or routes being included in the environmental review document for the project.

7850.2530; 7850.3730, Subp. 2.; 7850.3740, Subp. 2, et seq: Yes, it's very important to update the landowner list as part of scoping and scoping decision, and providing NOTICE to these landowners. Crucial, and at present there's no requirement that these landowners be provided notice.

7850.2570: Commerce improperly seeks to restrict questions regarding need. The statute is narrow in its restrictions regarding "need" in a siting/routing docket:

Questions of need, including size, type, and timing; alternative system configurations; and voltage must not be included in the scope of environmental review conducted under this chapter.

Minn. Stat. 216E.02, Subd. 3.

The commissioner shall not consider whether or not the project is needed.

Minn. Stat. §216E.03. Subd. 5 (regarding environmental review).

Public Intervenors note that consideration of need is strictly prohibited in **environmental review**, which is EERA's jurisdiction. Improper consideration of need has not been an issue, and more limiting language is not "needed."

Public Intervenors strongly objects to the suggestion of limitation of discussion at public hearing:

EERA staff recommends including language that prevents questions of need from being discussed at the public hearing if the Commission has already determined questions of need for the project

Statutory limitations are on addressing “need” in environmental review and go no further.

Conversely, what has been an issue is prohibition of discussing or allowing commenting on need, and Commission failure to consider need, where there has been no Certificate of Need issued. Since the 2001 statutory changes after Chisago, the ALJs and Commission have not just failed to consider need when there was no restriction, where there was Certificate of Need, but have **refused** to consider need when there had been no determination that a project was needed. For further comments on need determination, see Just Change comments, and Public Intervenor comments regarding consideration of need, below.

7850.2650, Subp. 3 – The FEIS comment opportunity is important, and has proven necessary in cases where inadequate and misleading EIS has lead Commission to almost approve a route contrary to criteria (i.e., identification of area as having pre-existing corridor when there is none, or declaring no transmission corridor where there was obvious large transmission corridor – see CapX 2020 Hampton-La Crosse EIS), where FEIS was not available until after public hearings and no comment opportunity was provided. Public Intervenor have no objection to specifying that FEIS comments are on the “adequacy of the document.”

7850.3800, Subp. 8: Public Intervenor object to any deletion of requirement that ALJ provide comment period after close of hearing. ALJs need to be reminded and the public needs to be aware.

7850.4000: Public Intervenor agree that this language should not be deleted, nor should it be altered. Reference to 116B and 116D is necessary reminder that compliance with Minnesota’s primary environmental law is necessary, and is the foundation of the Power Plant Siting Act.

7850.4200: Public Intervenor object to EERA’s desire to retain the language of Commission prohibition of considering need, because the statutory prohibition of consideration of need found in Minn. Stat. §216E.02 and 216E.03, as above, refers **only** to the scope of environmental review, and applies **only** where a Certificate of Need has been issued.

7850.4400: The deletion of this language conflicts with statutory language. Public Intervenor are also concerned that this deletion would set up a jurisdictional conflict similar to that of Minn. Stat. §216F.081, where local governments are given authority which is then taken away with the “just cause” language. Local control is sacred in Minnesota.

7850.4800: Minor Alteration is distinct from “change.” Minor Alteration is for altering the route/site from that permitted. Clarification that “minor alteration” extends outside of the site/route permit is good. Change encompasses a change in ownership, timing, etc. and this category is distinct from Minor Alteration, and should remain distinct.

Again, on behalf of No CapX 2020, United Citizens Action Network, North Route Group, and Goodhue Wind Truth, thank you for the opportunities to file Reply Comments and the forthcoming opportunity for oral argument before the Commission.

7850.4925: EERA proposes elimination of “redundancy.” The Commission’s Complaint process currently lacks teeth, and is cumbersome and not responsive to those with legitimate complaints (see, e.g., Complaints regarding Bent Tree Wind, PUC Docket WS-08-573). A standard complaint procedure would be useful, but the standard complaint procedure should be reiterated as a part of each rule Chapter, be it PPSA, wind, or pipeline.

GOODHUE WIND TRUTH

Goodhue Wind Truth (GWT) submitted comments separately on May 8, 2017, and Public Intervenors have these Reply Comments:

GWT notes that the term “stakeholder” is used and misused, and that if used, it should be fully inclusive. Public Intervenors agree wholeheartedly.

GWT appreciates increased notice for landowners, interested parties, and the public, and Public Intervenors ever-so-strongly agrees! Notice is essential for due process.

GWT advocates for extension of comment periods for environmental review. Public Intervenors support this extension, because it takes several times for people to become aware of a project, and it takes much more time for non-professionals to review any document and then make relevant and substantive comments. People who do this regularly do not understand how difficult it is for “regular people.”

GWT is appreciative of the requirement that agency comments be filed in the docket. Public Intervenors is appreciative as well, as agency comments have sometimes been hidden in spreadsheets by the name of the commenter, or withheld until release of DEIS or FEIS, and the public has no knowledge of the agency concerns. Environmental review, whether in Certificate of Need or PPSA docket, has an iterative value, and impact of issues raised in agency comments often, usually, extend to substantive issues in the docket that should be considered by the ALJ and the Commission.

GWT advocates project notice via radio press releases. This is something that is easy and cheap, and radio stations are eager to utilize PSAs relevant to their local audience. 7849.0130; 7849.1550. Public Intervenors strongly support this measure.

GWT requests that document of payment to agencies be posted in the docket. This is important not only to verify that applicant has indeed paid the state for services rendered, but to monitor project costs. This information can be obtained with Data Practices Requests, but it is cumbersome and often untimely. Public Intervenors are in favor of this disclosure, contemporaneously, in the dockets.

GWT recommends that both audible noise and inaudible infrasound be documented for generating facilities. Public Intervenors agrees with GWT that this is important to determine impacts of any facility.

GWT notes that Minn. Stat. 116D.04 should be cited frequently, included where applicable. 7850.1000, et seq. The Minnesota Environmental Policy Act is Minnesota's ruling legislation, and though agencies, the Commission, and parties "know what the law is," too often it is ignored. Public Intervenor's emphatically supports this inclusion.

GWT encourages the Commission to consider impacts of language changes that can tip towards regional view rather than Minnesota's interests, over which the Commission has jurisdiction. GWT also urges consideration of state authority and that the Commission should not knowingly or inadvertently give up its authority. Public Intervenor's urges consideration of Commission jurisdiction and authority when making rule changes, including those that may seem only an editing/technical change, and ask that the Commission remember that it is the Minnesota **PUBLIC** Utilities Commission, representing public, taxpayer, and ratepayer interests.

GWT requests that language be added into 7850.4400 that at the time of application, there should be entered into the record whether there has been a demonstration of ordinance work, consideration of an ordinance, whether there has been a decision on an ordinance, that has specifically debated and enacted, or not enacted, a zoning ordinance. In short, an affirmative declaration. Public Intervenor's supports this requirement, particularly given the sticky wicket of Minn. Stat. §216.081 regarding local wind ordinances and resulting appellate court decision.

JUST CHANGE COMMENTS

Public Intervenor's appreciates the focus on need and Chapter 7849 in these comments, as our Initial comments were focused on public participation mostly in the context of routing/siting.

Need criteria should not be eliminated

For example, Just Change notes the following need criteria issues:

Draft rules are based on the perception that measures for capacity, demand and need in existing rules are out-of-date. However, rather than updating standards and criteria, the draft rule eliminates them. Without criteria for "need" based on demand and capacity, ratepayers may end up paying for a company's growing asset base at a fixed rate of return that serves only the company's interests. There are multiple highlighted deletions in the proposed rule reflecting this policy change. (7849.0010, and Parts 0120, 0270, 0275, 0280, 0300)

Existing rule text requiring specific written findings should be restored to maintain intelligibility of the decision to stakeholders and reviewers. (7849.0100)

The draft rule should be revised to restore or update, not eliminate, criteria on which a determination of need is made. The rationale advanced in the committee for eliminating all criteria was that they duplicate an applicable statute, but this is not the case. (7849.0120)

Since criteria in part 7849.0120 have been deleted, the draft rule has also removed content requirements for a CON application. Content requirements should be restored. (7849.0220)

The rule says that an application must include “pertinent data necessary to demonstrate the need for the project” but replaces substantive requirements with what is effectively a requirement to file a model. The rule provides no demand information and no basis upon which regulators or stakeholders could challenge an applicant’s model. (7849.0270)

The draft rule fails to require any specific forecast methodology, parameters or explanation of methodology, only the requirement to file a spreadsheet, which would be unintelligible to the public. The rule also removes requirements to show effects on prices and effects of energy conservation on long-term demand, often areas of great public concern. (7849.0275)

The draft rule removes all substantive requirements related to system capacity, even the basic information on what are planned additions and retirements to the system. Where the existing rule required an applicant to justify the method of determining reserve margins, the proposed rule only asks the applicant to provide information on what method was used. (7849.0280)

The draft rule should be revised to require consideration of conservation that may be an alternative to the project *in combination with* a change in project size or type. Current proposed language is highly limiting. (7849.0290)

The draft rule should be revised to retain requirement to disclose upper and lower confidence levels of expected demand. (7849.0300 and Part 0340)

Specific need-based criteria must be preserved. This is particularly important given the focus in legislative and rate case efforts to alter rates to use of a “business plan” rather than cost-based rates. We have seen the impact of incorporating transmission capital costs into rates, at ratepayer detriment, paying for CapX 2020 and other transmission build-out for the purpose of regional sales rather than need for service in the utility territory. We have seen the whining of Xcel in its e21 Initiative Report that only 55% of the grid is utilized. We have seen the force with which utilities argued to incorporate “regional” into the Certificate of Need criteria. And we have seen what happens when need for a transmission line is challenged.

The criteria is deemed “out-of-date” because it relates to “need” and utilities no longer can demonstrate “need” and instead want to eliminate any necessity of proving up need. But “out-of-date” does not provide justification to delete the statutory criteria. Deletion of the criteria in the draft rules plays to that desire to circumvent demonstration of need. Conversely, the Commission’s job is to approve only those projects that are “needed,” and when need is determined, and a Certificate of Need granted, that also conveys the power of eminent domain, and some level of rate of return paid for by state ratepayers. Where a line is not needed, and is for economic, private, gain, ratepayers should not be stuck with the cost, and landowners should not be imposed upon for right of way. In short, the “need” criteria of capacity, demand and use

of renewable resources should not be eliminated, and if it is, it is contrary to the Certificate of Need statute.

IPPs and transmission companies are not utilities

Just Change also states, and Public Intervenors agree that, “Independent power producers and transmission companies should not be included in the definition of “utility.” (7849.0010)” The statutory definitions do not include a transmission only company or an Independent Power Producer, and any such designation is without statutory authority.

As above, granting of “utility” status conveys the power of eminent domain, which in Minnesota is only given to “public service corporations.” IPPs and transmission companies are not registered with the Secretary of State as a public service corporation. Has this come before the Commission? Yes. Has the Commission expressly considered this point of defining “utility” in its deliberations? No. ITC Midwest, LLC is an example of improper designation of a private company as a “utility.” It is registered under Minn. Stat. Ch. 322B, an LLC.¹ This was at issue in the ITC MVP Line 3 project, and improperly addressed in the ALJ’s Finding of Facts and highlighted in NoCapX 2020’s exceptions:

1. ITC Midwest is a transmission-only utility that owns approximately 6,600 circuit miles of transmission lines and more than 200 transmission substations in Iowa, Minnesota, Illinois, and Missouri. ITC Midwest is a Minnesota “public service corporation,” a “transmission company” and “utility” under state law.² ITC Midwest is also a “public utility” under Section 203 of the Federal Power Act.³ As such, ITC Midwest is subject to plenary rate regulation and other oversight by the Federal Energy Regulatory Commission (FERC).

² Minn. Stat. §§ 301B.01; 216B.02, subd. 10; and 216E.01, subd. 10.

Minn. Stat. Ch. 322B does not equal Minn. Stat. 301B.01 (or Ch. 301B).² When this docket came before the Commission, the Commission adopted the ALJ’s Findings without discussion of the meaning and impact of the de facto declaration that ITC Midwest is a “public service corporation.”³ Without that “Finding,” ITC would not have power of eminent domain.

The importance of this is also conveyed in Ms. Agrimonti’s statement in her new firm bio that she “has obtained state public utility status for a new market entrant”⁴ as a feather in her cap.

Independent power producers and transmission companies should not be included in the definition of “utility” found in Draft Minn. R. 7849.0010. The Commission must not confer utility status without statutory authority.

¹ See SoS listing for ITC Midwest, LLC:

<https://mblsportal.sos.state.mn.us/Business/SearchDetails?filingGuid=e2b736fa-90d4-e011-a886-001ec94ffe7f>

² See No CapX 2020 post: [ITC Midwest is NOT a “Public Service Corporation”](https://nocapx2020.info/?p=5765)

<https://nocapx2020.info/?p=5765> ;

³ See No CapX 2020 post: [Frustrating morning at Public Utilities Commission](https://nocapx2020.info/?p=5773), <https://nocapx2020.info/?p=5773>

⁴ See Fredrickson & Byron page: https://www.fredlaw.com/our_people/lisa_m_agrimonti/#group_0_1010017

Environmental Impact Statement and participation in Certificate of Need proceedings

Just Change also notes the importance of an EIS in Certificate of Need proceedings:

It would seem more consistent with recent case law to require an environmental impact statement, rather than an environmental report. (7849.1400)

The draft timing and process for citizen comments on the environmental report seems truncated and unreasonable. (7849.1550, 1800).

Public Intervenors strongly agrees, though would frame it more strongly, that “An environmental report, rather than an Environmental Impact Statement, is inconsistent with recent case law.”⁵ See MEPA, Minn. Stat. Ch. 116D. It took an appellate decision to address this in pipeline cases, and the Commission is setting itself up for transmission, power plant, wind and solar redux.

Further, the heading of 7849.1800 is important in that it reflects the Minnesota Environmental Policy Act that environmental review is to “accompany project.” In prior dockets it has not, and has not served the iterative function guiding decision making.

Electric and Magnetic Fields must be accurately disclosed in environmental review

Magnetic fields are a topic on which this author has done much research, work, and argued at the appellate court. In the many transmission dockets I’ve worked on, not one has accurately portrayed the level of potential magnetic fields based on the specifications of the conductors and equipment, and when challenged regarding the incorrect information in applications, testimony, and environmental review, the correct values have not been disclosed. In the CapX 2020 Hampton-La Crosse docket, the levels were increased when brought to their attention, but not to cover the full range of potential magnetic fields. Commerce can't be relied on for accuracy.

Just Change makes the following comment regarding EMF:

Electric and magnetic fields should be specifically referenced among environmental effects to be identified in an application and considered in a decision. (7850.1640 and Part 4100)

This is a very important topic for inclusion in environmental review. Prior transmission dockets have demonstrated that the Applicants and Commerce consistently understate potential levels of magnetic fields by using a misleadingly low level of amperage when making the magnetic field calculation. The magnetic field calculations must address the full range of potential levels based on the specifications of the conductor. For example, in the CapX Brookings docket, the applicants used an amperage range of 496-826 amps, which at a 150 foot right of way edge, 75 feet from centerline, the magnetic field calculates to a 11-19 mG level, and not until 200 feet

⁵ See [Sandpiper Appellate Decision-CEA](https://legalelectric.org/f/2016/10/SandpiperAppellateDecision-CEA_20165-120948-01.pdf) at https://legalelectric.org/f/2016/10/SandpiperAppellateDecision-CEA_20165-120948-01.pdf.

produces a magnetic field below the 2 mG level of concern.⁶ However, based upon the conductor specifications, found in the record, the amperage levels would potentially range from 2680-3434 amps, which would be 61-79 mG at 75 feet from center of a 150 foot right of way, and 5-7 mG at 200 feet, which is above the 2mG level of concern.

The magnetic fields were also misrepresented in the Hiawatha Project, not only because calculations were based at a 1 meter height, but because, as above, amperage levels were grossly understated at 138-230.⁷ At the right of way edge, using applicant's calculations, and 138-230 amps, the magnetic field for single circuit was 7-12 mG and double circuit allowing for phase cancellation 13-23 mG. Using the conductor specifications, single circuit from 723-965 amps resulted in 40-40 mG at right of way edge, and double circuit with 1,447-1,930 amps, magnetic field levels of 144-193 mG at right of way edge. Note this does not address levels calculated at heights greater than 1 meter.

Based on experience of misstated magnetic field potential, and failure of Commerce or the Commission to correct the erroneous modeling, and decisions made by the Commission using bad information, not only must EMF be "specifically referenced among environmental effects to be identified in an application and considered in a decision" but accurate calculations must be disclosed and utilized.

Citizen Advisory Task Forces must be populated with a broad range of participants

In 2001, following the Goodhue County nuclear waste and Chisago transmission line task forces, several legislative changes to the PPSA curtailed the role of Citizen Advisory Task Forces. The language of the statute specifies that local government representatives be included, but this is a floor, not a ceiling. Practice, particularly where CATF meetings and process is facilitated by Minnesota Dept. of Administration staff, has been unreasonably restricted, and citizens have not had a seat at the CATF table, claiming it is for "land use professionals." This is wrong. Further, the timing has been foreshortened in the extreme, and participants are not provided with applications and other pertinent information to review prior to the first of what are usually only three meetings, with CATF participation directed to narrow focus and pick "favorite" issues rather than consider issues within the broad scope of environmental review, which is what scoping is all about.

Just Change states that:

Citizen advisory task force provisions should be strengthened to encourage their appointment, include a broad spectrum of citizens, and provide a thorough and timely report on alternatives. (7850.2400)

The role of CATF in assuring thorough review cannot be understated. It is very important to empower any and every CATF with "citizens" and not only public officials, and provide them with the information they need to review the application, make scoping suggestions, and consider alternatives, including but not limited to DOT Policy of

⁶ See Affidavit of Bruce McKay, CapX Brookings, Attachment A (TL-08-1474, Application p. 3-20 to 3-22).

⁷ See Affidavit of Bruce McKay, Hiawatha Project, Attachment B (CN-10-694).

Accommodation, FAA listings of airports, archeological features, existing transmission corridors, etc.

The FEIS must be filed prior to close of hearings and public comment.

Just Change states that:

The process should require that the Final EIS be completed and filed before public and evidentiary hearings are done to reflect the best practices in ALJ cases where the hearings and environmental review have been coordinated. (7850.2650)

Public Intervenors emphatically agree. In several dockets this has been a problem, where a FEIS was not released, and when requested, the ALJ would not extend the comment period to allow comments on the FEIS. In one case in particular, the CapX 2020 Hampton-La Crosse transmission line, the FEIS misrepresented existence and lack of transmission corridor, putting the Commission in the position of making a decision with incorrect information which, when corrected, proved determinative of route selection. Had the comment period remained open, this error would not have occurred, and the ALJ's report based on the record would likely have been different.

Each hearing and meeting must have a record

Just Change states:

The draft rule should be revised to restore language requiring a recording of public hearings. A hearing with no record and no report is not meaningful public participation and creates a poor quality administrative record. (7850.3800)

Public Intervenors strongly agree.

Ownership should not be changed without a public hearing and comments

Just Change recommends restoring language regarding notice and hearing:

The draft rules should be revised to restore existing language providing the commission with prior notice and the opportunity to hold a hearing before ownership is transferred. (7850.5100)

Public Intervenors agree – this has been an issue in wind project dockets where it's been difficult to ascertain the project owner, and with the Excelsior Energy siting permit and with transmission only companies, this could be an issue under PPSA.

Again, these comments are not all inclusive -- if points are not addressed, that does not imply approval or agreement. Utility and transmission company comments have not been dissected because they're comments made in furtherance of their corporate interests, and not the public interest. We've been going at this for years, in many venues, and have an endless supply of

comments on whatever rule exists or is proposed. We may have additional comments and a wider focus by the time these Draft rules reach the Commission, hopefully within our lifetimes.

On behalf of “Public Intervenors” NoCapX 2020, United Citizens Action Network, North Route Group, Goodhue Wind Truth, thank you for this opportunity to file Reply Comments in this rulemaking. We look forward to Oral Arguments and Comments before the Commission.

Very truly yours,

A handwritten signature in cursive script that reads "Carol A. Overland". The signature is written in black ink and is positioned above the printed name.

Carol A. Overland
Attorney at Law

Attachment A

Affidavit of Bruce McKay

Magnetic Field Calculation

CapX Brookings TL-08-1474

**STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS
FOR THE PUBLIC UTILITIES COMMISSION**

In the Matter of the Route Permit Application
by Great River Energy and Xcel Energy for a
345 kV Transmission Line from Brookings
County, South Dakota to Hampton, Minnesota

OAH DOCKET NO. 7-2500-20283-2
PUC DOCKET NO. ET-2/TL-08-1474

AFFIDAVIT OF BRUCE McKAY, P.E.

Bruce McKay, P.E., after affirming or being duly sworn on oath, states and deposes as follows:

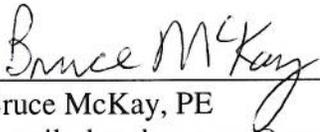
1. My name is Bruce McKay. I am an electrical engineer, and licensed Professional Engineer, in the state of Minnesota.
2. My experience is primarily in the areas of industrial power distribution and industrial automation and control. To date, I have 16 years experience in these areas as a licensed Master Electrician, followed by 14 years as a licensed Professional Engineer.
3. I am a landowner about 3 miles north of the proposed Le Sueur-Henderson crossing and about 7 miles south of the proposed Belle Plaine crossing and therefore am not potentially directly affected by either route proposed for the CapX2020 Brookings transmission line.
4. I have participated in Task Force meetings held in Henderson, attended one day of PUC hearings in St. Paul, and attended, including making comments and submitting statements, all but one of the Public Hearings held in the Le Sueur-Henderson area over the last couple of years.
5. The first purpose of this statement is to point out the fact that the CapX2020 Magnetic Field tables and charts that I've seen at public hearings and been able to find in CapX2020 documents all fail to address the full potential Magnetic Field along the transmission lines. Each table and chart that I've seen displays Magnetic Field data calculated from estimated Peak and estimated Average System Conditions (Current (Amps)) rather than from transmission line design capacities. An example of such a table is presented in the attached "Exhibit A - Table 3-4. Calculated Magnetic Fields - Application", which is from the CapX2020 Engineering Design, Construction and Right-of-Way Acquisition document, December 2008, pages 3-20 through 3-22.
6. The second purpose of this statement is to point out the fact that a problem with a table such as this is that it underestimates the Magnetic Field that would be created if the transmission line was utilized to its full potential capacity. The attached "Exhibit B - CALCULATED MAGNETIC FIELD TABLES" presents an example of

Magnetic Field calculations based on estimated transmission line currents as compared to Magnetic Field calculations based on future potential (design) transmission line currents. By following through STEPS 1, 2, 3, and 4 in Exhibit B, you can see that the Calculated PEAK MAGNETIC FIELDS increase by 414% and the Calculated AVERAGE MAGNETIC FIELDS increase by 540% when design capacities are used for the calculations rather than using estimated load currents. (Please Note: Exhibit B is presented as a conceptual example. Actual design capacities and associated Magnetic Field calculations would need to be and should be provided by the Applicants.)

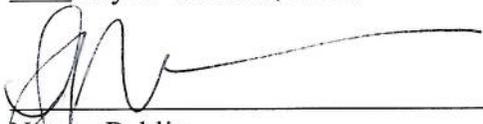
7. The third purpose of this statement is to stress that right-of-way corridor widths along the proposed transmission line need to be based on Calculated Magnetic Fields derived from design capacities, NOT on Calculated Magnetic Fields derived from estimated transmission line currents.
8. It is my opinion that a right-of-way based on low transmission line current estimates does not sufficiently protect people living near the transmission lines from potential negative health effects resulting from the line's Magnetic Field.
9. Please feel free to contact me with any comments or questions you have.

Further your affiant sayeth naught.

Dated: October 16, 2010


Bruce McKay, PE
e-mail: bmckay.aces@gmail.com
cell: 612-386-5983

Signed and sworn to before me this
15th day of October, 2010.



Notary Public

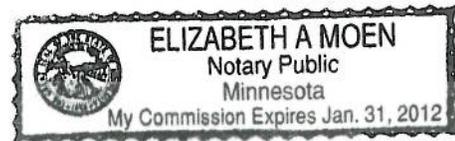


EXHIBIT A

Table 3-4. Calculated Magnetic Fields – Application

Table 3-4. Calculated Magnetic Fields (milligauss) for Proposed Single/Double/Triple Circuit Transmission Line Designs (3.28 feet above ground)

Distance to Proposed Centerline														
Structure Type	Section	System Condition	Current (Amps)	-300'	-200'	-100'	-75'	-50'	0'	50'	75'	100'	200'	300'
Single Pole Davit Arm 345 kV/345 kV Double Circuit with both Circuits In Service	Brookings to Lyon County	Peak	826.7	0.60	1.81	10.40	19.02	37.45	94.04	37.90	19.33	10.61	1.86	0.61
		Average	496.02	0.36	1.08	6.24	11.41	22.47	56.42	22.74	11.60	6.36	1.11	0.36
Single Pole Davit Arm 345 kV/345 kV Double Circuit with one Circuit In Service	Brookings to Lyon County.	Peak	826.7	2.23	4.65	13.88	20.14	30.96	80.21	56.92	34.74	22.25	6.16	2.70
		Average	496.02	1.34	2.79	8.33	12.09	18.58	48.13	34.15	20.85	13.35	3.69	1.62
Single Pole Davit Arm 345 kV/345 kV Double Circuit with both Circuits In Service	Lyon County to Hazel Creek	Peak	644.3	0.47	1.41	8.10	14.83	29.19	73.29	29.54	15.07	8.27	1.45	0.47
		Average	386.58	0.28	0.85	4.86	8.90	17.51	43.97	17.72	9.04	4.96	0.87	0.28
Single Pole Davit Arm 345 kV/345 kV Double Circuit with one Circuit In Service	Lyon County to Hazel Creek	Peak	644.3	1.74	3.62	10.82	15.70	24.13	62.52	44.36	27.08	17.34	4.80	2.10
		Average	386.58	1.04	2.17	6.49	9.42	14.48	37.51	26.62	16.25	10.41	2.88	1.26
Single Pole Davit Arm 345 kV/345 kV Double Circuit with both Circuits In Service	Hazel Creek to Minnesota Valley	Peak	247.4	0.18	0.54	3.11	5.69	11.21	28.14	11.34	5.79	3.17	0.56	0.18
		Average	148.44	0.11	0.32	1.87	3.42	6.72	16.88	6.81	3.47	1.90	0.33	0.11
Single Pole	Hazel	Peak	247.4	0.67	1.39	4.15	6.03	9.27	24.01	17.03	10.40	6.66	1.84	0.81

Distance to Proposed Centerline														
Structure Type	Section	System Condition	Current (Amps)	-300'	-200'	-100'	-75'	-50'	0'	50'	75'	100'	200'	300'
Davit Arm 345 kV/345 kV Double Circuit with one Circuit In Service	Creek to Minnesota Valley	Average	148.44	0.40	0.83	2.49	3.62	5.56	14.40	10.22	6.24	4.00	1.11	0.48
Single Pole Davit Arm 345 kV/345 kV Double Circuit with both Circuits In Service	Helena to Lake Marion	Peak	1005.9	0.73	2.2	12.65	23.15	45.57	114.42	46.12	23.53	12.91	2.26	0.74
		Average	603.54	0.44	1.32	7.56	13.89	27.34	68.65	27.67	14.12	7.74	1.36	0.44
Single Pole Davit Arm 345 kV/345 kV Double Circuit with one Circuit In Service	Helena to Lake Marion	Peak	1005.9	2.71	5.66	16.89	24.51	37.68	97.60	69.26	42.28	27.07	7.49	3.28
		Average	603.54	1.63	3.39	10.13	14.71	22.61	58.56	41.56	25.37	16.24	4.49	1.97
Single Pole Davit Arm 345 kV/345 kV Double Circuit with both Circuits In Service	Lake Marion to Hampton	Peak	354.8	0.26	0.78	4.46	8.16	16.07	40.36	16.27	8.30	4.55	0.80	0.26
		Average	212.88	0.15	0.47	2.68	4.90	9.64	24.21	9.76	4.98	2.73	0.48	0.16
Single Pole Davit Arm 345 kV/345 kV Double Circuit with one Circuit In Service	Lake Marion to Hampton	Peak	354.8	0.96	2.00	5.96	8.65	13.29	34.43	24.43	14.91	9.55	2.64	1.16
		Average	212.88	0.57	1.20	3.57	5.19	7.97	20.66	14.66	8.95	5.73	1.59	0.69
H-Frame 345 kV/345 kV/69kV Triple Circuit	Cedar Mountain to Helena	Peak	776/776/ 138	0.9	2.5	13.5	24.9	48.7	68.1	14.6	6.7	3.5	0.5	0.2
		Average	466/466/ 83	0.5	1.5	8.1	15.0	29.2	40.9	8.8	4.0	2.1	0.3	0.1

Distance to Proposed Centerline														
Structure Type	Section	System Condition	Current (Amps)	-300'	-200'	-100'	-75'	-50'	0'	50'	75'	100'	200'	300'
H-Frame 345 kV/345 kV/115kV Triple Circuit	Lyon County to Cedar Mountain	Peak	841/841/266	1.3	3.2	15.9	28.3	52.9	67.4	15.3	8.0	4.6	1.1	0.6
		Average	505/505/160	0.75	2.0	9.5	17.0	31.8	40.5	9.2	4.8	2.7	0.6	0.3
Single Pole, 115 kV Single Circuit	Redwood Falls – Franklin to Cedar Mountain	Peak	266	0.3	0.6	2.3	3.9	7.7	33.9	7.4	3.8	2.3	0.6	0.3
		Average	150	0.2	0.4	1.4	2.3	4.6	20.4	4.4	2.3	1.4	0.4	0.2
Single Pole, 345 kV / 345 kV Double Circuit with one Circuit strung at 230 kV	Minnesota Valley to Hazel Creek	Peak	247	0.8	1.8	6.5	10.1	16.6	23.8	9.2	6.0	4.2	1.4	0.7
		Average	148	0.5	1.1	3.9	6.1	10.0	14.3	5.5	3.6	2.5	0.8	0.4

EXHIBIT B

Calculated Magnetic Field Tables

STEP 1

THIS TABLE CONTAINS THE COLUMN HEADINGS AND DATA FROM THE TOP ENTRY IN THE TABLE FROM EXHIBIT A1

TABLE 3-4. Calculated Magnetic Fields (milligauss) for Proposed Single/Double/Triple Circuit Transmission Line Designs (3.28 feet above ground)

STRUCTURE TYPE	SECTION	SYSTEM CONDITION	CURRENT (AMPS)	DISTANCE TO PROPOSED CENTERLINES											
				-300'	-200'	-100'	-75'	-50'	0'	50'	75'	100'	200'	300'	
SINGLE POLE DAVIT ARM 345 kV / 345 kV DOUBLE CIRCUIT W/ BOTH CIGUITS IN SERVICE	BROOKINGS TO LYON COUNTY	PEAK	826.70	0.60	1.81	10.40	19.02	37.45	94.04	37.90	19.33	10.61	1.86	0.61	
		AVERAGE	496.02	0.36	1.08	6.24	11.41	22.47	56.42	22.74	11.60	6.36	1.11	0.36	

STEP 2

MVA CALCULATED FROM THE CURRENTS IN TABLE 3-4:

345.00 kV
 826.70 Amps PEAK ESTIMATED
 1.73 3 Phase
 493.42 MVA PEAK CALCULATED

345.00 kV
 496.02 Amps AVERAGE ESTIMATED
 1.73 3 Phase
 296.05 MVA AVERAGE CALCULATED

STEP 4

THIS TABLE CONTAINS DATA SCALED FROM THE TABLE ABOVE USING CURRENTS CALCULATED IN STEP 3

TABLE 3-4 SCALED. Calculated Magnetic Fields (milligauss) for Proposed Single/Double/Triple Circuit Transmission Line Designs (3.28 feet above ground)

STRUCTURE TYPE	SECTION	SYSTEM CONDITION	CURRENT (AMPS)	DISTANCE TO PROPOSED CENTERLINES											
				-300'	-200'	-100'	-75'	-50'	0'	50'	75'	100'	200'	300'	
SINGLE POLE DAVIT ARM 345 kV / 345 kV DOUBLE CIRCUIT W/ BOTH CIGUITS IN SERVICE	BROOKINGS TO LYON COUNTY	PEAK	3434.70	2.49	7.52	43.21	79.02	155.59	390.71	157.46	80.31	44.08	7.73	2.53	
		AVERAGE	2680.74	1.95	5.84	33.72	61.67	121.44	304.92	122.90	62.69	34.37	6.00	1.95	

STEP 3

CURRENT CALCULATED FROM MVA DESIGN CAPACITY:

2050.00 *MVA PEAK DESIGN
 345.00 kV
 1.73 3 Phase
 3434.70 Amps PEAK CALCULATED

1600.00 **MVA AVERAGE DESIGN
 345.00 kV
 1.73 3 Phase
 2680.74 Amps AVERAGE CALCULATED

- NOTES: 1. $MVA = (kV * Amps * 1.73) / 1000$
 2. $Amps = (MVA * 1000) / (kV * 1.73)$
 3. For a given physical and electrical configuration, milligauss at one location is proportional to current (Amps) (for example, double the current and the milligauss level also doubles).
 4. For a given physical and electrical configuration and constant current, the milligauss level changes as the inverse square of the distance from away from the source (for example, move 2 times as far away and the milligauss level decreases to 1/4 of what it was).
 *. MVA PEAK DESIGN CAPACITY IS FROM Docket No. E002/CN-06-1115, TRANSMISSION CAPACITY
 **. MVA AVERAGE DESIGN CAPACITY WAS CHOSEN TO BE ABOUT 80% OF PEAK DESIGN CAPACITY

Attachment B

Affidavit of Bruce McKay

Magnetic Field Calculation

Hiawatha Project

CN-10-694

**STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS
FOR THE PUBLIC UTILITIES COMMISSION**

In the Matter of the Northern States Power Company
Certificate of Need Application for Two 115kV High
Voltage Transmission Lines known as the
Hiawatha Project

OAH DOCKET NO. _____
PUC DOCKET NO. E002/CN-10-694

AFFIDAVIT OF BRUCE McKAY, P.E.

Bruce McKay, P.E., after affirming or being duly sworn on oath, states and deposes as follows:

1. My name is Bruce McKay. I am an electrical engineer, and licensed Professional Engineer, in the state of Minnesota.
2. My experience is primarily in the areas of industrial power distribution and industrial automation and control. I have 16 years experience in these areas as a licensed Master Electrician, followed by 14 years as a licensed Professional Engineer to date.
3. I am a landowner near Henderson, MN, and therefore am not directly affected by the proposed Hiawatha Project transmission line.
4. I am filing this scoping comment for the Hiawatha Project Transmission Line to request that the Environmental Report address the full range of potential magnetic fields.
5. Attached as Exhibit A is a true and correct copy of the line configurations and specifications found on p. 15-27 of the Certificate of Need Application for the Hiawatha Project.
6. Attached as Exhibit B is a true and correct copy of Direct Testimony of Larry L. Schedin, Attachment J, showing the Summer Thermal Ampacity Rating and Summer Thermal MVA Rating for various conductor specifications, including, at the top of the chart on p. 3, Single 795 kcm 26/7 ACSR, 115 KV (963 amps and 192 MVA) and on pages 4-5, Winter Ratings (1286 amps and 256 VMA). For the purposes of this Affidavit, I am using the lower summer ratings, but it should be noted that winter ratings are approximately an additional 30%, and the magnetic field levels presented are not the higher potential winter levels.
7. The first purpose of this statement is to point out the fact that the Hiawatha Project Magnetic Field tables and charts that I've seen in Hiawatha Project documents all fail to address the full potential Magnetic Field along the transmission lines. Each table and chart that I've seen displays Magnetic Field data calculated from estimated Peak and estimated Average System Conditions (Current (Amps)) rather than from transmission line design capacities. An example of such a table is presented in the attached Exhibit C, a true and correct copy of Hiawatha Project Figure 41- Calculated Magnetic Flux Density Chart, which is from the Hiawatha Project Certificate of Need Application, page 102.
8. The second purpose of this statement is to point out the fact that a table such as this underestimates the Magnetic Field that would be created if the transmission line was utilized

to its full potential capacity, or 75% of its full potential capacity. The attached Exhibit D is a true and correct copy of "McKay Magnetic Field Calculations" which presents an example of Magnetic Field calculations for the A, B and C Route options based on estimated transmission line currents as compared to Magnetic Field calculations based on future potential (design) transmission line currents. By following through STEPS 1, 2, 3, and 4 in Exhibit D, you can see that for Route A, Double-Circuited, the Calculated PEAK MAGNETIC FIELDS increase by 839% and the Calculated AVERAGE MAGNETIC FIELDS increase by 1049%. For Routes B and C, both single circuit, the Calculated PEAK MAGNETIC FIELDS increase by 419% and the Calculated AVERAGE MAGNETIC FIELDS increase by 524% when design capacities are used for the calculations rather than using estimated load currents. (Please Note: Exhibit D is presented as a conceptual example. Actual design capacities and associated Magnetic Field calculations would need to be and should be provided by the Applicants.)

9. The third purpose of this statement is to point out the fact that no calculations were presented for modeled magnetic field levels at the same distances from centerline but higher off the ground to represent second or third floor locations of apartment buildings or condos that the proposed transmission lines would be passing near.
10. The fourth purpose of this statement is to stress that right-of-way widths to protect the health and safety of those along the proposed transmission line need to be based on Calculated Magnetic Field's derived from design capacities, NOT on Calculated Magnetic Field's derived from estimated transmission line currents. A right-of-way based on the Applicant's low transmission line current estimates does not sufficiently protect people near the transmission lines.
11. Please feel free to contact me with any comments or questions you have.

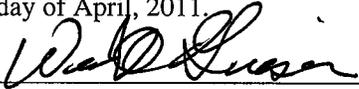
Further your affiant sayeth naught.

Dated: April 6, 2011



Bruce McKay, PE
e-mail: bmckay.aces@gmail.com
cell: 612-386-5983

Signed and sworn to before me this
6 day of April, 2011.



Notary Public

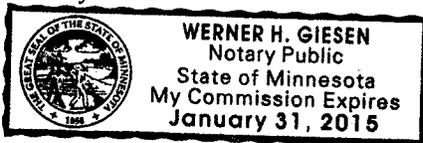


EXHIBIT A

Line Configurations and Specifications

Certificate of Need Application
Section 2.0 Project Description
p. 15-27

2.0 PROJECT DESCRIPTION

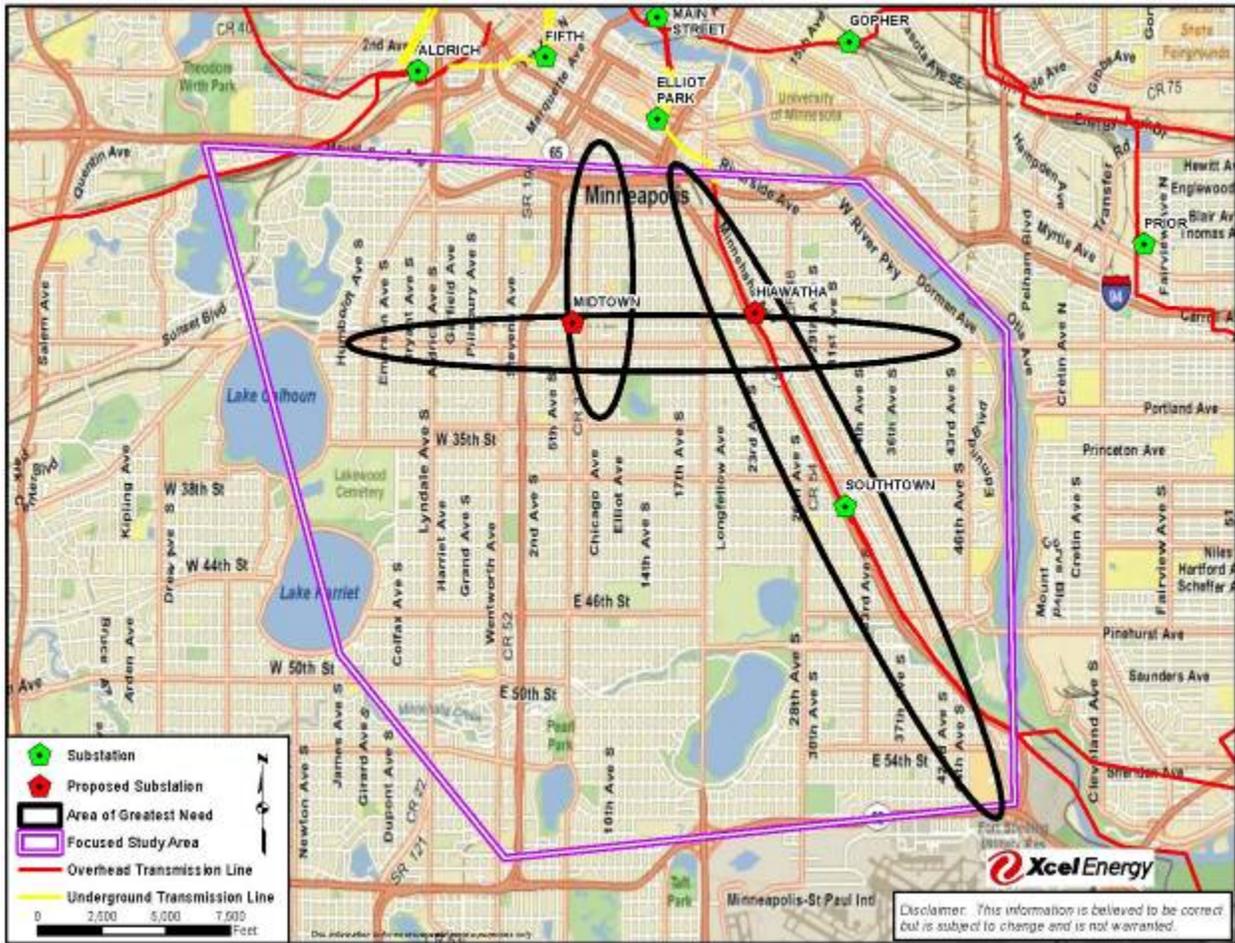
The Project includes two new substations, a Midtown Substation and a Hiawatha Substation, and two 115 kV transmission line connections between the two substations. Xcel Energy's proposal is to construct the transmission lines along Route A, build the Midtown Substation at the Midtown North site and the Hiawatha Substation at the Hiawatha West location. This double circuit design maximizes efficiencies and reduces overall right-of-way requirements. Detailed descriptions of the Project components and transmission line characteristics are provided in this chapter. This chapter also includes information regarding schedule, costs and rate impact.

2.1 FACILITIES TO BE CONSTRUCTED

2.1.1 SUBSTATIONS

The Company identified a need for additional sources in the Project Area, specifically in the areas of high load concentrations along Hiawatha Avenue, Lake Street and along Chicago Avenue and Park Avenue corridors. To address this need the two new substations are proposed to be located in the concentrated load areas, as shown in Figure 4.

Figure 4: Substation Locations Within Concentrated Load Areas



On the west end, the Midtown Substation is proposed to be located on the northwest corner of the intersection of Oakland Avenue and the Midtown Greenway. It is proposed to be a high profile design of approximately three quarters of an acre. Equipment at the substation would include:

Two 115 kV transmission line steel box structures and related substation equipment and structures;

One 70 MVA, 118-14.4 kV, LTC distribution transformer; and

One electrical equipment enclosure containing 13.8 kV distribution feeder equipment, electrical controls, protective relaying, and auxiliary equipment for the operation of the substation.

The Midtown Substation alternatives will be surrounded by an architecturally-designed, decorative wall which will aid in mitigating noise generated by the operation of the substation. In addition, the Company plans to install lower noise transformers, sound absorbing materials for the transformer fire walls and rubber matting under the substation transformers.

A new Hiawatha Substation is proposed on the east end of the Project. The Hiawatha Substation is proposed as a low profile design, approximately two (2) acres in size. The Hiawatha Substation would initially consist of the following equipment:

115 kV transmission line dead-end structures and related substation equipment and structures.

One 13.8 kV transformer termination structure;

One 50 MVA, 118-14.4 kV, Load Tap Changer (“LTC”) distribution transformer;

One switchgear enclosure containing 13.8 kV distribution equipment; and

One electrical equipment enclosure containing electrical controls, protective relaying, and auxiliary equipment for the operation of the substation.

Conceptual layouts for the Midtown Substation and the Hiawatha Substation are provided in Appendix D.

2.1.2 TRANSMISSION LINES

2.1.2.1 ROUTE A

Xcel Energy proposes to construct two 115 kV transmission lines along Route A. There are three potential alignments along Route A. Alignment A1 follows 29th Street and consists of two overhead 115 kV transmission lines on double circuit structures. Alignment A2 is an underground design along 29th Street, parallel to the Midtown Greenway. Alignment A3 is an underground design on an alignment under the bike/walking path along the north edge of the Midtown Greenway.

For Route A—Alignment A1, Xcel Energy proposes to use galvanized, self-weathering/rust-colored steel double circuit structures with davit arms. For areas where the Project will cross existing and future light rail, auto, and pedestrian paths, custom designed structures will be used.

The right-of-way required would be 50 feet, 25 feet on each side of the pole, and located in public streets and the Midtown Greenway. Average spans between structures will be approximately 500 feet. However, span lengths may vary between structures from as short as 300 feet to as long as 1,000 feet to accommodate future plans for the area, such as future transit within the Midtown Greenway. The proposed conductor is 795 kcmil Aluminum Conductor Steel Reinforced (“ACSR”) 26/7 or conductor of comparable capacity per phase (“kcmil” is a unit of measure representing “thousand circular mils”).

The poles would be approximately 75-feet tall. Depictions of typical tangent and dead-end double circuit structures are shown in Figure 5 and Figure 6. At several locations the lines would cross existing and future light rail, auto and pedestrian paths. There will be custom designed structures for the current and future light rail corridors based on the field requirements at each location. These custom structures would be similar to the dead end structures depicted below with an additional arm to support crossings eliminating the need for an additional structure. These structures have not been designed at the time of filing, but will be designed once Commission approvals are obtained.

Figure 5: Double Circuit Tangent Structure

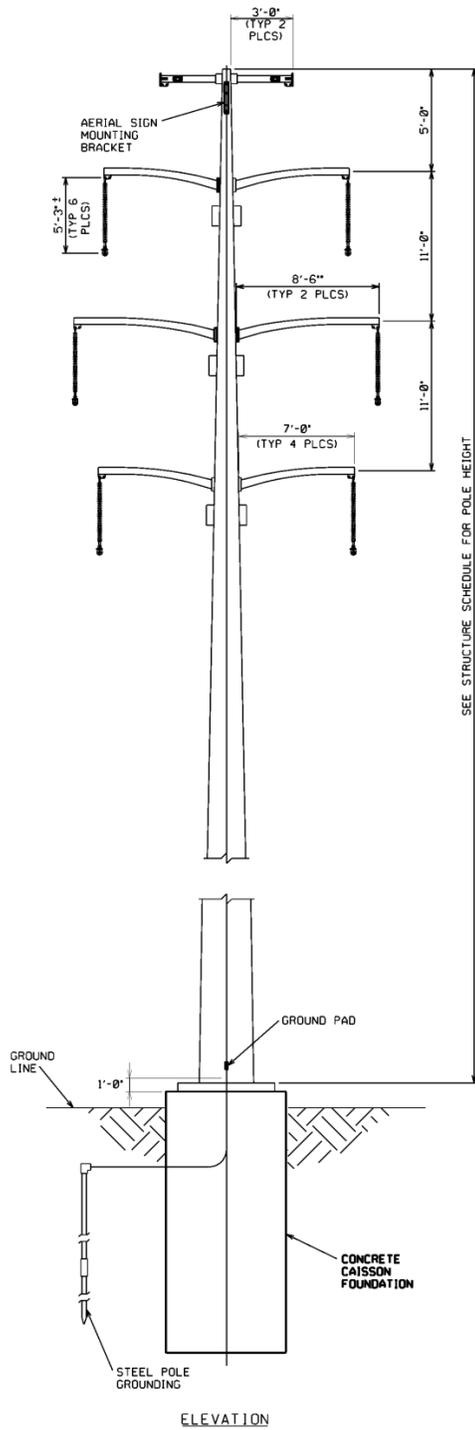


Figure 6: Double Circuit Dead-End Structure

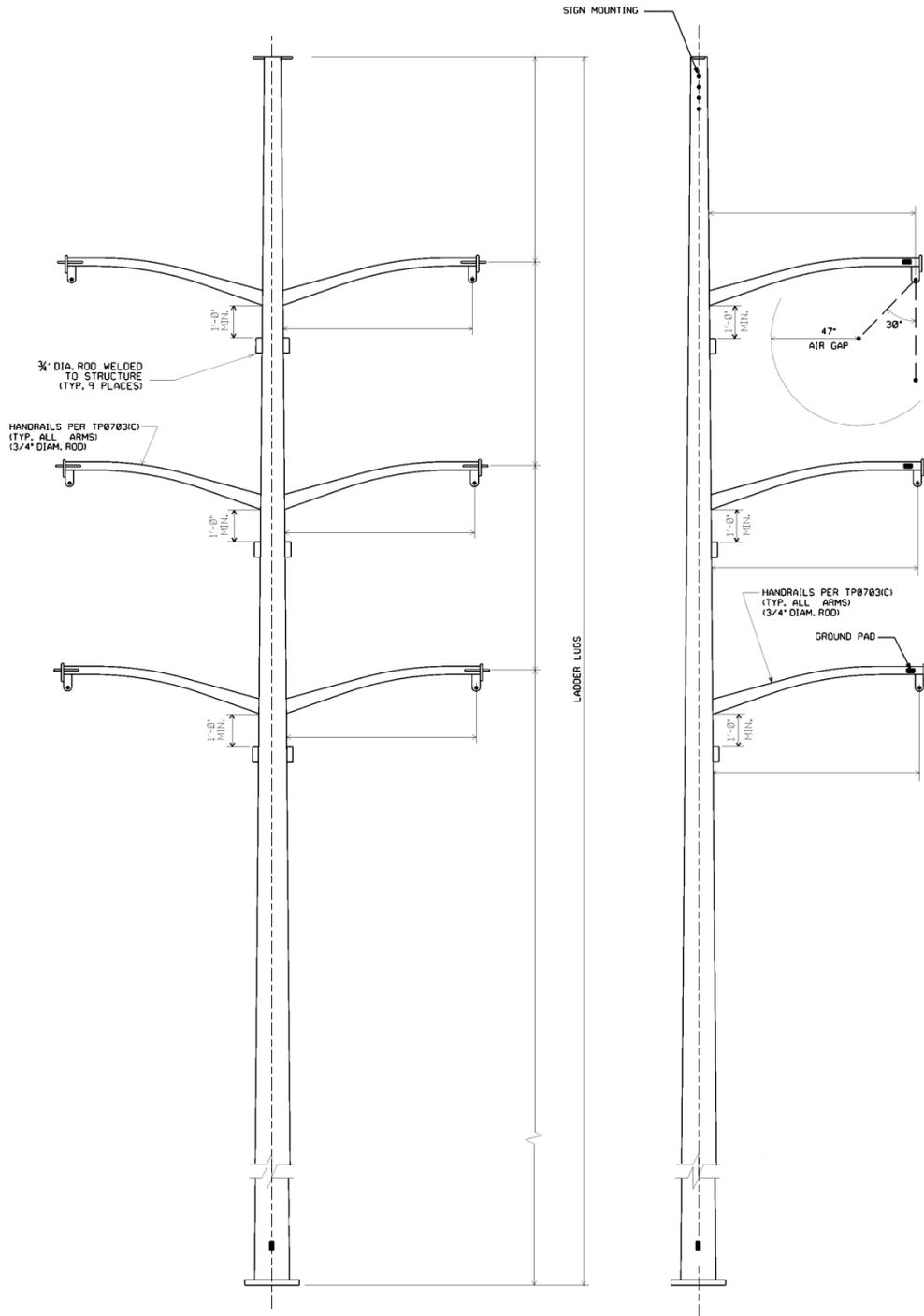


Figure 7 summarizes the structure designs and foundation for Route A.

Figure 7: Route A—Alignment 1 Double Circuit Structure Design Summary

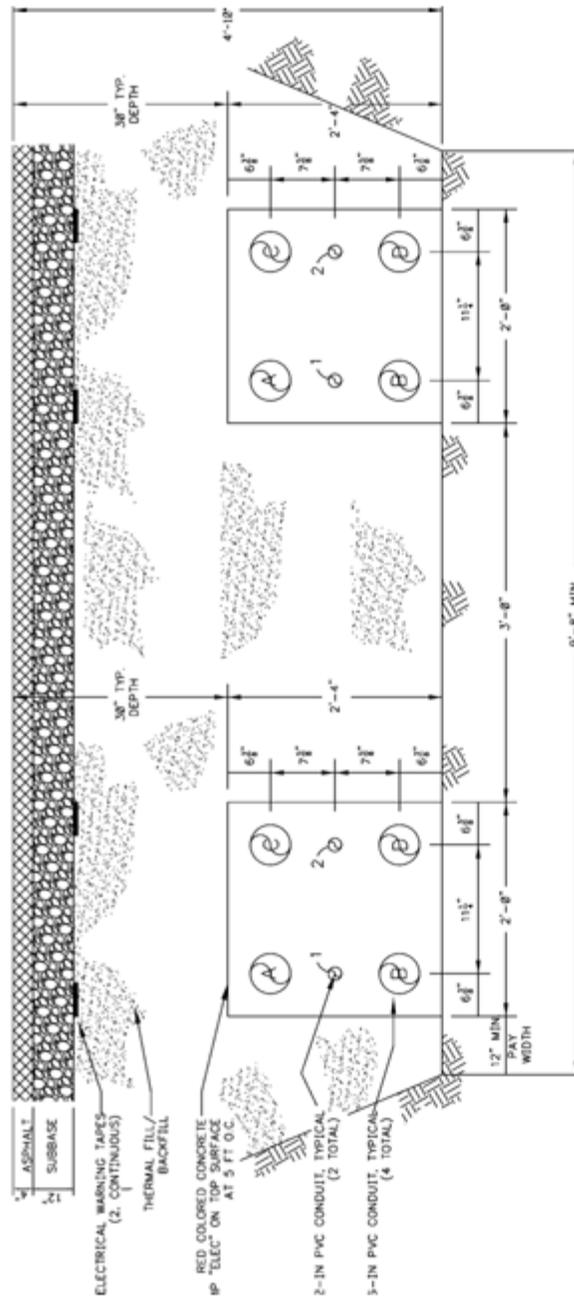
Project Component	Line Voltage	Structure Type	Pole Type	Conductor	Foundation	Average Span Length	Average Height	Maximum Height
Tangent	115 kV	Typical	Steel	795 kcmil 26/7 ACSR	Drilled Pier	500 feet	75 feet	110 feet
Dead-End	115 kV	Crossing	Steel	795 kcmil 26/7 ACSR	Drilled Pier and/or Driven Pile	500 feet	80 feet	115 feet

For the underground alignments on Route A—Alignment A2 and Alignment A3, Xcel Energy proposes to install two identical concrete duct banks containing four 6-inch polyvinyl chloride (“PVC”) conduits for the transmission circuits, and two 2-inch PVC conduits for ground continuity and communication needs. The duct banks are anticipated to be installed adjacent to each other in the same trench unless a different design is dictated by the physical limitations of the route. Cable vaults with manhole access will be required approximately every 1,500 feet and at major changes in direction in the route to facilitate the installation of the cable as well as for future inspection and repairs. The amount of right-of-way required for the underground design for Route A—Alignment A2 and Alignment A3 is 30 feet, or 15 feet on each side of the transmission line centerline.

The proposed cable is a high voltage extruded dielectric (“HVED”) cable, 3000 kcmil. HVED cable consists of stranded copper conductor surrounded by a solid electrostatic conductor shield and insulation. The outermost layers consist of an insulation shield and moisture block and cable shield covered by a layer of polyethylene protective jacket.

Figure 8 and Figure 9 illustrate underground ducts and vaults.

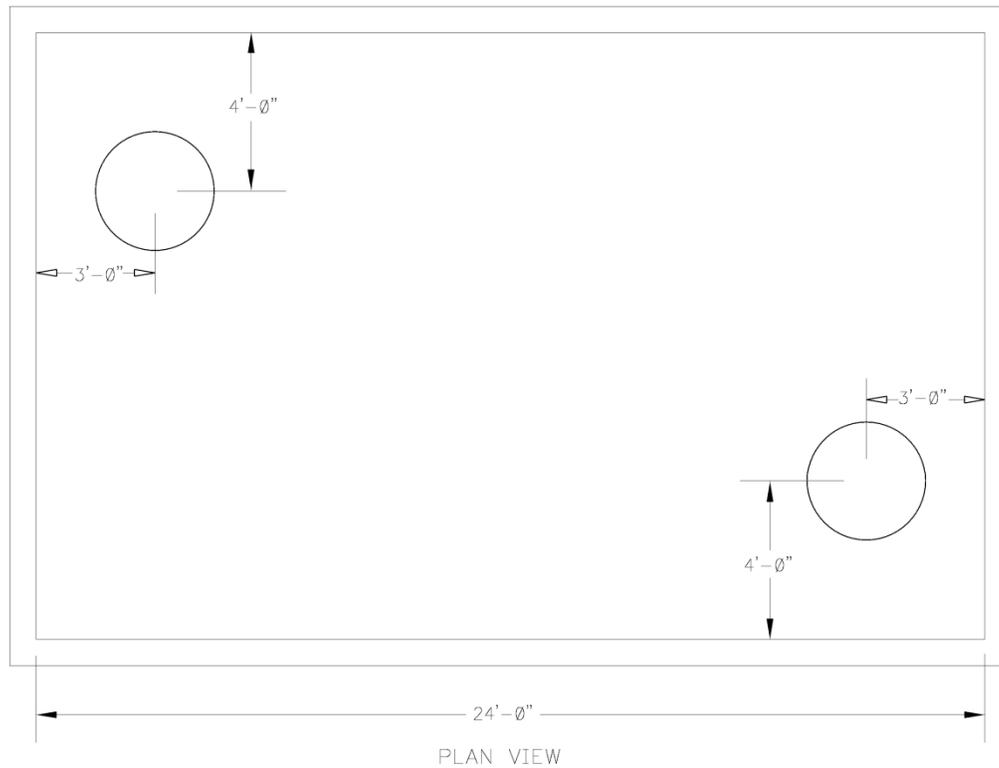
Figure 8: Underground Duct Section



NOTES:
 1. USE 2" PVC CONDUITS WITH PLASTIC SPACERS
 AT 5" MAXIMUM SPACING OF DOUBLE CIRCUIT LINE
 SECTION SHOWN TYPICAL OF DOUBLE CIRCUIT LINE
 MIN. & TYPICAL SPACING SHOW SUBJECT TO
 CHANGE DEPENDENT ON SOIL CONDITIONS.

XCEL TRANSMISSION LINE
 TYPICAL DUCT BANK SECTION
 NO SCALE

Figure 9: Underground Cable Vault



STREET MANHOLE
(14' WIDE X 24' LONG X 7'-6" HIGH)
NO SCALE

Details regarding construction techniques for underground transmission facilities are provided in Chapter 6.

2.1.2.2 OTHER ROUTES EVALUATED IN ROUTE PERMIT PROCEEDING

Overhead Design Single Circuit Route B and Route C

Routes B and C are street routes for two single circuit overhead 115 kV transmission lines. Route B follows 26th Street (1.8 miles) and 28th Street (1.5 miles). Route C follows 28th Street (1.5 miles) and 31st Street (2.3 miles). The same transmission line design for the facilities is proposed along both routes.

For Route B or Route C, a cantilever design is proposed. This design would require the installation of a single pole transmission structure with all davit arms and conductors installed on the side of the pole overhanging the public road or public

right-of-way. The National Electric Safety Code (“NESC”) clearance requirements dictate a 25-foot right-of-way clearance on the side of the pole with the installed davit arms. There is no NESC safety clearance minimum required for the side of the pole without the cantilevered arms and conductors. Xcel Energy will seek 25-feet of right-of-way on the street side and may seek to acquire a right-of-way on the non-arm side of the poles for access and maintenance of the structures up to 25 feet where feasible. Xcel Energy will work to minimize the right-of-way needed from private landowners to the extent possible.

The poles would be approximately 75-feet tall and typical spans will be 500 feet. The proposed conductor is 795 kcmil, 26/7 ACSR, or conductor of similar capacity.

Figure 10: Single Circuit Tangent Structure

(Also depicts direct embedded steel pole installation)

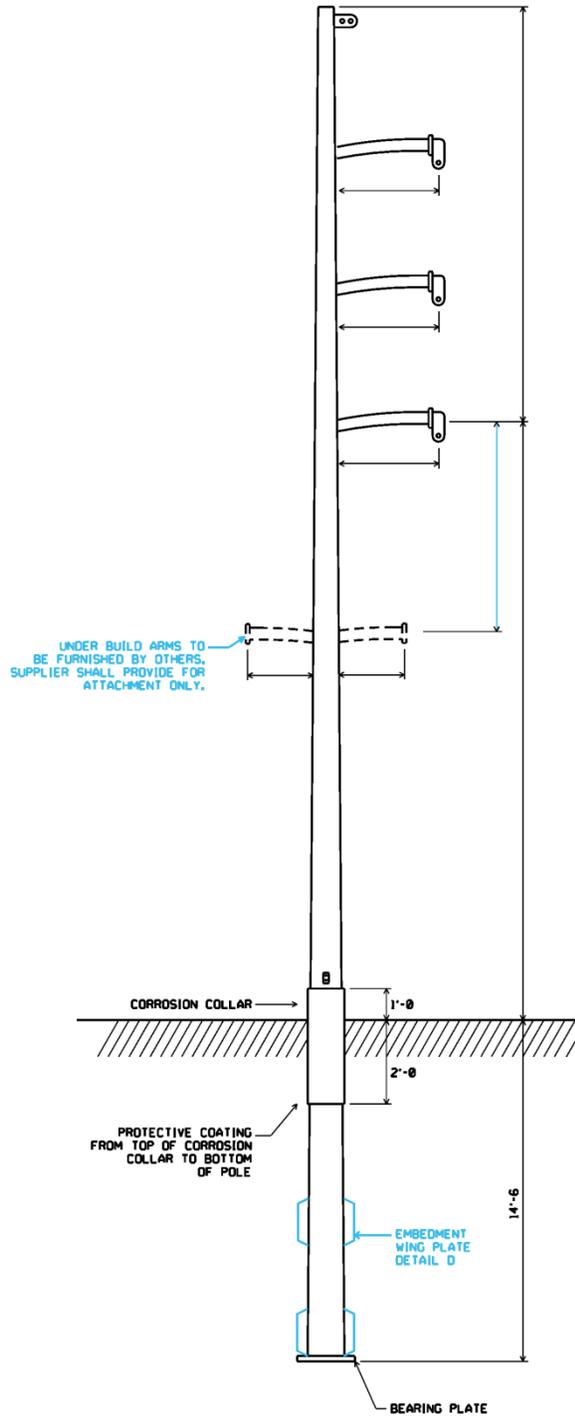


Figure 11: Single Circuit Dead-End 90 Degree Corner Structure

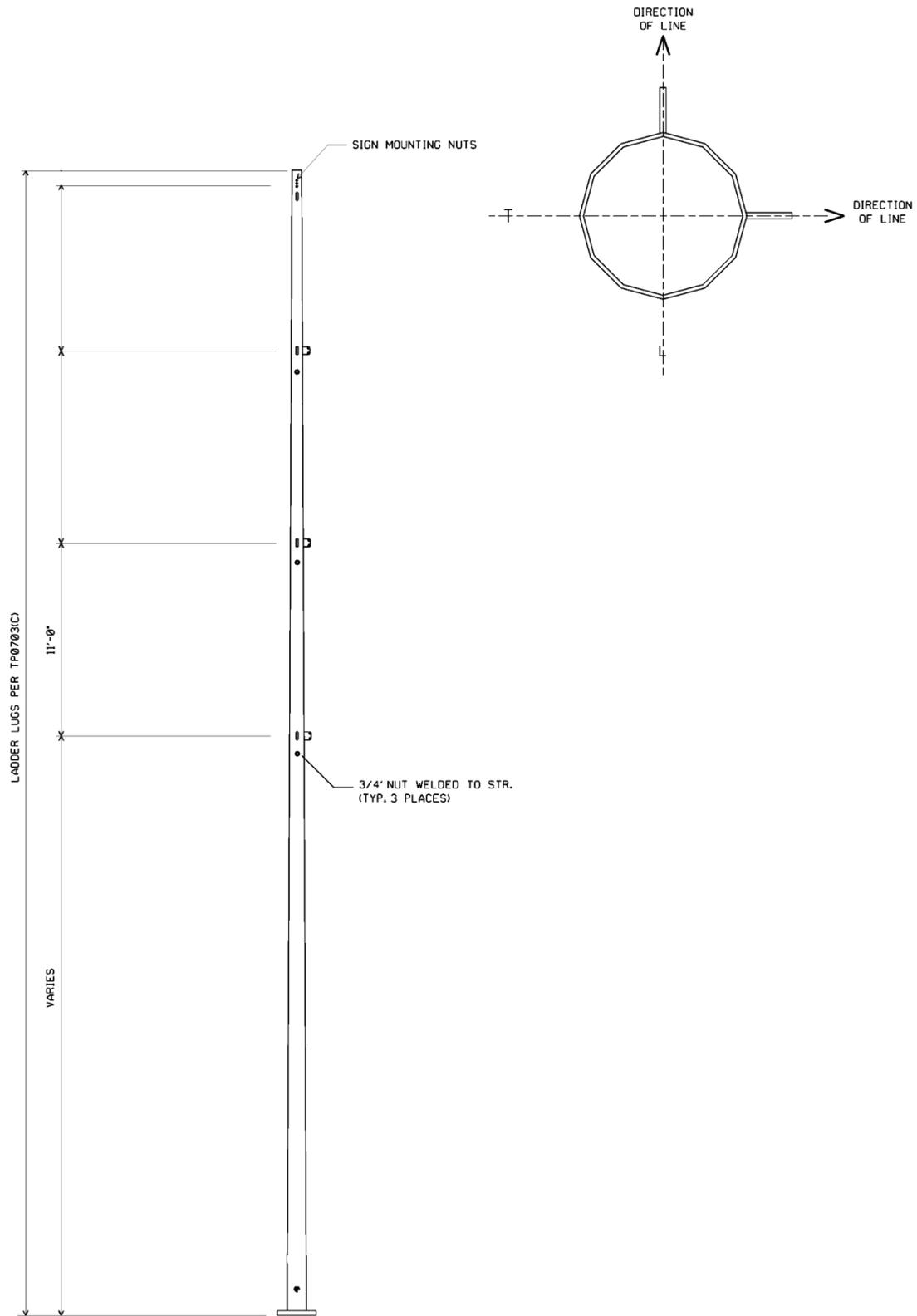


Figure 12: Subgrade Foundation

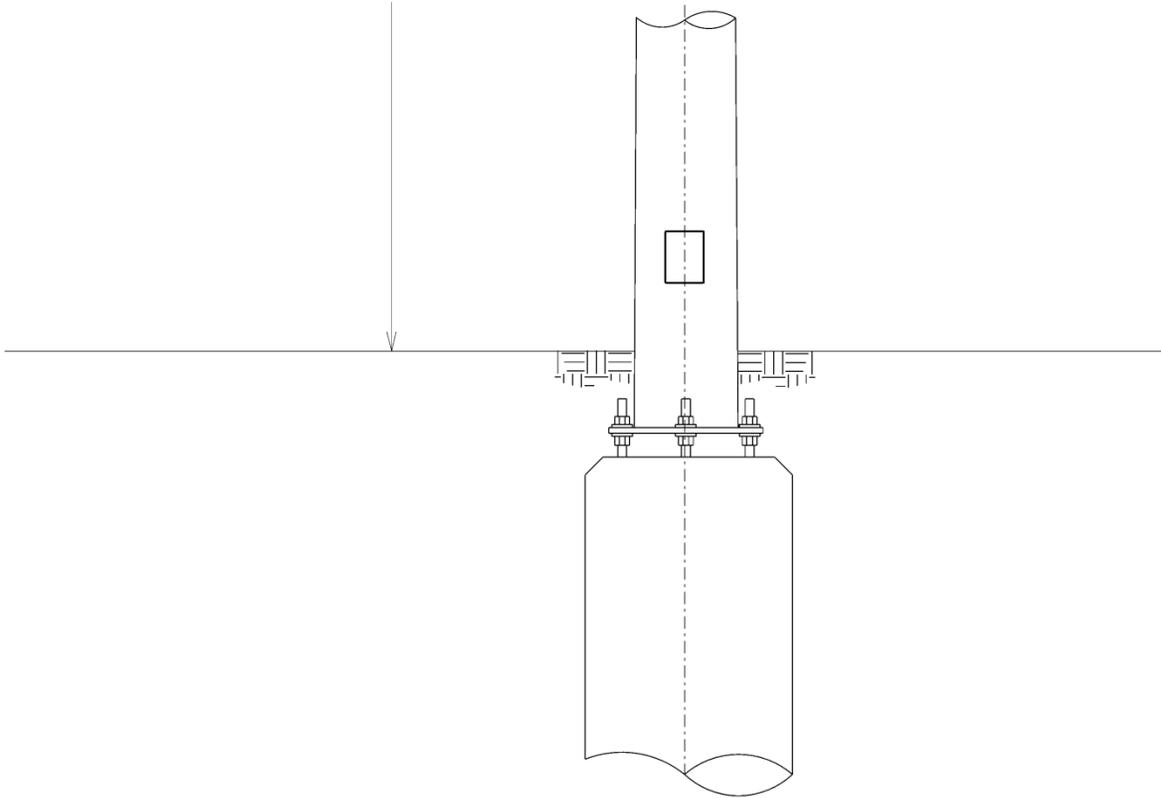


Figure 13 summarizes the structure and foundation designs for the line if constructed along Route B or Route C:

Figure 13: Route B and Route C, Single Circuit Structure Design Summary

Project Component	Line Voltage	Structure Type	Pole Type	Conductor	Foundation	Average Span Length	Average Height
Tangent	115 kV	Typical	Steel	795 kcmil 26/7 ACSR	Drilled Pier or Direct Imbed	500 feet	75 feet
Dead-End	115 kV	Crossing	Steel	795 kcmil 26/7 ACSR	Drilled Pier	500 feet	100 – 110 feet

EXHIBIT B

Amps and MVA for Line Configurations and Specifications

Direct Testimony of Larry L. Schedin, Attachment J
CapX 2020 Certificate of Need
PUC Docket E002, ET2/CN-06-1115

Response:

The thermal ratings of the requested conductors and voltages are noted in the table below. Conductor ratings are based on the “IEEE Standard for calculation of Bare Overhead Conductor Temperature and Ampacity Under Steady-State Conditions,” ANSI/IEEE Standard 738. Alcoa SAG10 Ratekit was used to calculate conductor ratings.

A regulatory authority does not set the conductor steady state thermal rating variables. The CapX2020 Member Utilities Transmission Line Standards Committee (“Committee”) developed the conductor steady state thermal rating variables for summer ratings based upon member utilities’ standard of practice..

The summer steady state thermal rating variables are as follows:

- Conductor orientation relative to north: 90 degrees
- Atmosphere: Clear
- Air Temperature: 40 degrees C for Summer
- Wind Speed: 2 ft/sec
- Wind angle relative to conductor: 90 degrees
- Elevation above sea level: 1000 ft
- Latitude: 45 degrees N
- Date: July 8
- Solar time: 12 hours
- Coefficient of emissivity: 0.7
- Coefficient of absorption: 0.9
- 200 degrees C maximum operating temperature for ACSS
- 100 degrees C maximum operating temperature for ACSR

The Committee defined the Emergency Line Rating as equal to the steady state thermal rating.

The Committee specified that conductors meet minimum clearances to ground based upon voltage and nature of surface under the conductor (*i.e.*, roads, interstate highway, railroads, etc.). The minimum specified clearances were chosen to assure that the final constructed lines meet or exceed the National Electrical Safety Code (“NESC”) minimum clearances. Conductor sags are to be calculated based upon conductor size, conductor temperature, span length, design tension, structure heights and loading conditions. Vertical clearances shall be applied to the greatest sag resulting from either the maximum operating temperature of 200°C (for the ACSS

conductor) and 100°C (for the ACSR conductor) or the maximum loaded condition (ice plus wind).

<u>Conductor</u>	<u>Summer Thermal Ampacity Rating</u>	<u>Summer Thermal MVA Rating</u>
Single 795 kcm 26/7 ACSR, 115 KV	965 amps	192 MVA
Single 795 kcm 26/7 ACSS, 115 KV	1655 amps	330 MVA
Twin bundled 795 kcm 26/7 ACSR, 115 KV	1930 amps	384 MVA
Twin bundled 795 kcm 26/7 ACSS, 115 KV	3310 amps	659 MVA
Single 954 kcm 54/19 ACSS, 115 KV	1850 amps	368 MVA
Single 795 kcm 26/7 ACSS, 161 KV	1655 amps	462 MVA
Single 954 kcm 54/19 ACSS, 161 KV	1850 amps	516 MVA
Single 795 kcm 26/7 ACSR, 230 KV	965 amps	384 MVA
Single 795 kcm 26/7 ACSS, 230 KV	1655 amps	659 MVA
Single 954 kcm 54/19 ACSS, 230 KV	1850 amps	737 MVA
Twin bundled 795 kcm 26/7 ACSR, 345 KV	1930 amps	1153 MVA
Twin bundled 954 kcm 54/19 ACSS, 345 KV	3700 amps	2211 MVA
Triple bundled 954 kcm 54/19 ACSS, 500 KV	5550 amps	4806 MVA
Triple bundled conductor as used on the Forbes – Chisago 500 KV line (Triple bundled 1192.5 kcm 45/7 ACSR)	3648 amps	3159 MVA

The Committee did not develop steady state thermal rating variables for winter ratings. Xcel Energy – NSP Operating Territory uses 0°C for the winter rating air temperature for calculating the rating during the winter operating season of November 1 to April 30. The April 30 date produces the lowest allowable line rating of the winter rating period, so it is used in the following table. The April 30 date and 0°C air temperature were used in conjunction with the other steady state thermal

rating variables developed by the Committee to develop the following winter rating table.

The winter steady state thermal rating variables used for the following Xcel Energy – NSP Operating Territory/ CAPX2020 Member Utilities Transmission Line Standards Committee rating table are as follows:

- Conductor orientation relative to north: 90 degrees
- Atmosphere: Clear
- Air Temperature: 0 degrees C for Winter
- Wind Speed: 2 ft/sec
- Wind angle relative to conductor: 90 degrees
- Elevation above sea level: 1000 ft
- Latitude: 45 degrees N
- Date: April 30
- Solar time: 12 hours
- Coefficient of emissivity: 0.7
- Coefficient of absorption: 0.9
- 200 degrees C maximum operating temperature for ACSS
- 100 degrees C maximum operating temperature for ACSR

<u>Conductor</u>	<u>Winter (April 30) Thermal Ampacity Rating</u>	<u>Winter (April 30) Thermal MVA Rating</u>
Single 795 kcm 26/7 ACSR, 115 KV	1286 amps	256 MVA
Single 795 kcm 26/7 ACSS, 115 KV	1819 amps	362 MVA
Twin bundled 795 kcm 26/7 ACSR, 115 KV	2572 amps	512 MVA
Twin bundled 795 kcm 26/7 ACSS, 115 KV	3638 amps	725 MVA
Single 954 kcm 54/7 ACSS, 115 KV	2032 amps	405 MVA
Single 795 kcm 26/7 ACSS, 161 KV	1819 amps	507 MVA
Single 954 kcm 54/7 ACSS, 161 KV	2032 amps	567 MVA
Single 795 kcm 26/7 ACSR, 230 KV	1286 amps	512 MVA

<u>Conductor</u>	<u>Winter (April 30) Thermal Ampacity Rating</u>	<u>Winter (April 30) Thermal MVA Rating</u>
Single 795 kcm 26/7 ACSS, 230 KV	1819 amps	725 MVA
Single 954 kcm 54/7 ACSS, 230 KV	2032 amps	809 MVA
Twin bundled 795 kcm 26/7 ACSR, 345 KV	2572 amps	1537 MVA
Twin bundled 954 kcm 54/7 ACSS, 345 KV	4064 amps	2428 MVA
Triple bundled 954 kcm 54/7 ACSS, 500 KV	6096 amps	5279 MVA
Triple bundled conductor as used on the Forbes – Chisago 500 KV line (Triple bundled 1192.5 kcm 45/7 ACSR)	4875 amps	4222 MVA

Surge Impedance

The following table shows typical ranges of surge impedances found on the CapX2020 member systems. Designs for the proposed CapX2020 transmission lines are not far enough along to provide more accurate surge impedances for these lines.

Conductor Configuration

Surge Impedance

Single Bundled Conductor – 115, 161 & 230 KV Configurations a, b, f & h	350 – 375 Ohms
Twin bundled Conductor - 115 KV Configurations c & d	250 - 300 Ohms
Twin bundled Conductor - 345 KV Configurations k & l	270 –285 Ohms
Triple bundled Conductor - 500 KV Configuration n	250 – 300 Ohms
Configurations e, g, i, j and m	Not Used

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Date: April 21, 2008

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EXHIBIT C

Applicant Magnetic Field Calculations

Figure 41: Calculated Magnetic Flux Density for Proposed 115 kV Transmission Line Designs
Hiawatha Project Certificate of Need Application

Figure 41: Calculated Magnetic Flux Density (milligauss) for Proposed 115 kV Transmission Line Designs (1 meter or 3.28 feet above ground)

Route	Structure Type	System Condition	Current (Amps)	Distance to Proposed Centerline										
				-200'	-100'	-75'	-50'	-25'	0'	25'	50'	75'	100'	200'
B & C	Horizontal Post 115kV Single Circuit	Peak	230	0.67	2.24	3.50	6.07	12.11	26.16	26.25	12.18	6.10	3.51	0.86
		Average	138	0.42	1.41	2.20	3.82	7.63	16.49	16.54	7.68	3.84	2.21	0.54
A	Davit Arm 115kV/115kV Steel Pole Double Circuit	Peak	230	0.22	1.49	3.13	7.88	23.03	38.44	22.77	7.73	3.05	1.44	0.21
		Average	138	0.13	0.90	1.79	4.73	13.82	23.06	13.66	4.64	1.72	0.87	0.13
A & D (3000 kcmil)	Transmission Duct Bank 115kV/115kV Under ground Double Circuit	Peak	230	0.00	0.01	0.03	0.11	0.84	13.08	0.85	0.11	0.03	0.01	0.00
		Average	138	0.00	0.01	0.02	0.07	0.51	7.85	0.51	0.07	0.02	0.01	0.00
A & D (1250 kcmil)	Transmission Duct Bank 115kV/115kV Under ground Double Circuit	Peak	230	0.00	0.01	0.02	0.05	0.37	19.67	0.37	0.05	0.01	0.01	0.00
		Average	138	0.00	0.00	0.01	0.03	0.22	11.80	0.22	0.03	0.01	0.00	0.00

EXHIBIT D

McKay Magnetic Field Calculations

\Calculated Magnetic Field Tables for Proposed 115 kV Transmission Line Designs

STEP 1														
THIS TABLE CONTAINS THE COLUMN HEADINGS AND DATA FROM THE TOP ENTRIES IN THE TABLE FROM EXHIBIT C														
Figure 41: CALCULATED MAGNETIC FLUX DESNITY (MILLIGAUSSES) FOR PROPOSED 115KV TRANSMISSION LINE DESIGNS (1 METER OR 3.28 FEET ABOVE GROUND)														
Route	Structure Type	System Condition	Current (Amps)	Distance to Proposed Centerline										
				-200'	-100'	-75'	-50'	-25'	0'	25'	50'	75'	100'	200'
B & C	Horizontal Post 115kV Single Circuit	Peak	230.00	0.67	2.24	3.50	6.07	12.11	26.16	26.25	12.18	6.10	3.51	0.86
		Average	138.00	0.42	1.41	2.20	3.82	7.63	16.49	16.54	7.68	3.84	2.21	0.54
A	Davit Arm 115kV/115kV Steel Pole Double Circuit	Peak	230.00	0.22	1.49	3.13	7.88	23.03	38.44	22.77	7.73	3.05	1.44	0.21
		Average	138.00	0.13	0.90	1.79	4.73	13.82	23.06	13.66	4.64	1.72	0.87	0.13

STEP 2- Routes B & C	
MVA CALCULATED FROM THE CURRENTS IN TABLE Figure 41:	
115.00 kV	230.00 Amps PEAK ESTIMATED
1.73 3 Phase	45.76 MVA PEAK CALCULATED
115.00 kV	138.00 Amps AVERAGE ESTIMATED
1.73 3 Phase	27.46 MVA AVERAGE CALCULATED

STEP 2- Route A	
MVA CALCULATED FROM THE CURRENTS IN TABLE Figure 41:	
115.00 kV	230.00 Amps PEAK ESTIMATED
1.73 3 Phase	45.76 MVA PEAK CALCULATED
115.00 kV	138.00 Amps AVERAGE ESTIMATED
1.73 3 Phase	27.46 MVA AVERAGE CALCULATED

STEP 4														
THIS TABLE CONTAINS DATA SCALED FROM THE TABLE ABOVE USING CURRENTS CALCULATED IN STEP 3														
Figure 41: CALCULATED MAGNETIC FLUX DESNITY (MILLIGAUSSES) FOR PROPOSED 115KV TRANSMISSION LINE DESIGNS (1 METER OR 3.28 FEET ABOVE GROUND)														
Route	Structure Type	System Condition	Current (Amps)	Distance to Proposed Centerline										
				-200'	-100'	-75'	-50'	-25'	0'	25'	50'	75'	100'	200'
B & C	Horizontal Post 115kV Single Circuit	Peak	965.07	2.81	9.40	14.69	25.47	50.81	109.77	110.14	51.11	25.60	14.73	3.61
		Average	723.80	2.20	7.40	11.54	20.04	40.02	86.49	86.75	40.28	20.14	11.59	2.83
A	Davit Arm 115kV/115kV Steel Pole Double Circuit	Peak	1930.13	1.85	12.50	26.27	66.13	193.27	322.58	191.08	64.87	25.60	12.08	1.76
		Average	1447.60	1.36	9.44	18.78	49.62	144.97	241.90	143.29	48.67	18.04	9.13	1.36

STEP 3- Routes B & C	
CURRENT CALCULATED FROM MVA DESIGN CAPACITY:	
115.00 kV	192.00 *MVA PEAK DESIGN
1.73 3 Phase	965.07 Amps PEAK CALCULATED
115.00 kV	144.00 **MVA AVERAGE DESIGN
1.73 3 Phase	723.80 Amps AVERAGE CALCULATED

STEP 3- Route A	
CURRENT CALCULATED FROM MVA DESIGN CAPACITY:	
115.00 kV	384.00 *MVA PEAK DESIGN
1.73 3 Phase	1930.13 Amps PEAK CALCULATED
115.00 kV	288.00 **MVA AVERAGE DESIGN
1.73 3 Phase	1447.60 Amps AVERAGE CALCULATED

- NOTES: 1. $MVA = (kV * Amps * 1.73) / 1000$
 2. $Amps = (MVA * 1000) / (kV * 1.73)$
 3. For a given physical and electrical configuration, milligauss at one location is proportional to current (Amps) (for example, double the current and the milligauss level also doubles).
 4. For a given physical and electrical configuration and constant current, the milligauss level changes as the inverse square of the distance from away from the source (for example, move 2 times as far away and the milligauss level decreases to 1/4 of what it was).
 *. MVA PEAK DESIGN CAPACITY IS FROM A COMBINATION OF THE DATA PRESENTED IN EXHIBITS A, B, AND C.
 **. MVA AVERAGE DESIGN CAPACITY WAS CHOSEN TO BE ABOUT 75% OF PEAK DESIGN CAPACITY