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November 2, 2015

Judge James Mortensen
Office of Administrative Hearings
P. O. Box 64620
St. Paul, MN 55164-0620

eFiled and eServed

RE: Comments of Overland for Andersen re: Menahga Project
**In the Matter of the Application of Great River Energy and Minnesota Power for a Certificate of Need and Route Permit for the Menahga Area 115 kV Transmission Project in Hubbard, Wadena and Becker Counties, Minnesota**
OAH Docket: 5-2500-32715
PUC Docket: ET-2, E-015/CN-14-787; PUC Docket: ET-2, E-015/TL-14-797

Dear Judge Mortenson:

Attached and filed via eFiling and eServed, please find Comments of Carol A. Overland for Donna J. Andersen and Curtis Andersen, and the Donna J. Andersen Trust, Donna J. Andersen, Trustee. These are being eFiled and eServed as encouraged in the Comment Period Notice.

If you have any questions, or require further information, please let me know.

Very truly yours,

Carol A. Overland
Attorney at Law

cc: eFiled and eServed

**CERTIFICATE OF SERVICE**

RE: **In the Matter of the Application of Great River Energy and Minnesota Power for a Certificate of Need and Route Permit for the Menahga Area 115 kV Transmission Project in Hubbard, Wadena and Becker Counties, Minnesota**
OAH Docket: 5-2500-32715
PUC Docket: ET-2, E-015/CN-14-787 (Certificate of Need)
PUC Docket: ET-2, E-015/TL-14-797 (Route Permit)

I, Carol A. Overland, hereby certify that I have this day served copies of the attached Comments of Carol A. Overland for Andersen re: Menahga Project by electronic filing and eService.

Dated: November 2, 2015

Carol A. Overland #254617
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**STATE OF MINNESOTA**
**OFFICE OF ADMINISTRATIVE HEARINGS**

**FOR THE PUBLIC UTILITIES COMMISSION**

| | |
|---|---|
| **In the Matter of the Application of Great River Energy and Minnesota Power for a Certificate of Need and Route Permit for the Menahga Area 115 kV Transmission Project in ubbard, Wadena and Becker Counties, Minnesota** | **PUC Docket No. ET-2, E-015/CN-14-787**<br>**PUC Docket No. ET-2, E-015/TL-14-797**<br><br>**OAH Docket No. 5-2500-32715** |

**COMMENT OF CAROL A. OVERLAND, ATTORNEY FOR DONNA J. ANDERSEN AND CURTIS ANDERSEN AND THE DONNA J. ANDERSEN TRUST, DONNA J. ANDERSEN TRUSTEE**

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I am representing Donna J. Andersen, Curtis Andersen, and the Donna J. Andersen Trust, Donna J. Andersen, Trustee, in the above captioned-proceeding. Ms. Andersen has separately filed comments regarding the specifics of the impacts of this project and issues not adequately considered or not considered at all, including reports that should be included in the record which have not yet been produced. For my part, there are technical and legal issues that should be noted by the Commission before it makes its decision regarding this line, some of which I addressed in my comments at the public hearing, but additional detail is being provided here.

**Option of commenting/testifying under oath should be available**

I wish to note for the record that frequently in hearings over the last few years, members of the public making comments are not offered the opportunity to make their statements under oath. I've also been present at a hearing where I requested that option be given to members of the public and the ALJ not only refused, but refused to note that refusal in the record. I've been present at one or two Commission meetings when it was asked whether a particular member of the public had made a statement under oath or not, and that influenced the Commissioner's perception of the person's statement and had an impact on the ultimate decision. At public hearings, it should be explained to people the meaning of making a statement under oath, and to those wishing to comment that they can make their statements under oath. Applicant witnesses should also be sworn in, which did not occur in this case. Some of us participating in the ongoing Chapter 7849 and 7850 rulemaking advisory committee have been trying to address this practice in that venue (PUC Docket 12-1246).

**Map of property not entered into record**

Donna J. Andersen's request to enter a close up map of her property into the hearing record was rejected, based on that map already incorporated into the record. However, it is standard practice to allow landowners to enter a close-up map of their land, and to refer to it when testifying about specific features or areas to be avoided and to suggest alignment options. For example, on the Andersen property, it is clear from the map that there is no distribution line on their property or

on the other side of the road, and it is clear that their property is wooded and that the property across the road is not. Landowners must be allowed to point out specifics about their property.

**NEED**

There are a number of issues that call the "need" for this project into question.

**Rating of line is evidence of oversized project**

The claimed need for this project is small, under 20 MW, and is not in keeping with the much larger capacity rating for the line as proposed. For example, the rating of the line is based on the specification of the project, which is found in the Application, p. 4-6:

> Conductors
>
> The single circuit structures will have three single conductor phase wires and one shield wire. It is anticipated that the phase wires will be 477 thousand circular mil ACSR with seven steel core strands and 26 outer aluminum strands.
>
> The shield wire will be 0.528 optical ground wire.

Great River Energy states that the ACSR would provide 196 MVA of capacity, also in the Application, p. 6-5:

> Great River Energy uses several types of conductors for system transmission lines. The standard bare aluminum overhead transmission conductors, ACSR and aluminum conductor steel supported (ACSS), offer known reliable power performance, operating at temperatures up to 100°C and 200°C, respectively. At these temperatures, for the 115 kV line proposed for the Project, ACSR would provide 196 MVA of capacity and ACSS would provide 315 MVA of capacity. ACSS typically costs approximately 10 percent more than ACSR conductor. Great River Energy is proposing to use 477 ACSR conductor for the Menahga Area 115 kV Project.

However, at the public hearing, the GRE engineer stated that the correct MVA was 140 MVA, as shown in the first Exhibit I presented. See Public Hearing Exhibit 53, which was originally Ex. 35, Application, Appendix 7, from PUC Docket 01-1958. Look for "477" on far left side, then follow left to the "MVA" column for a 115 kV line, this chart says 140 (the relevant portions have been highlighted in pink on Exhibit 53, attached). GRE's estimate is consistent with this chart from a prior docket, but the explanation of the statement in the Application of 196 MVA is not clear (see Transcript). The GRE engineer agreed that MVA is essentially MW, and that the line would have a rating for about 140 MW. This 140 MW rating for an expected 20 MW load is overbuilding.

The Application shows that peak demand is below 20 megawatts (see section on Peak Demand below for additional detail):

**Table 5-3. Historical Monthly Coincident Peak Demand for Affected Load Area (MW)**

| | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 15.90 | 14.20 | 13.23 | 10.18 | 8.63 | 10.73 | 10.24 | 11.47 | 9.08 | 9.98 | 13.41 | 14.56 |
| 2011 | 16.78 | 15.24 | 15.76 | 11.58 | 11.28 | 10.28 | 13.16 | 9.64 | 9.23 | 10.54 | 13.47 | 14.05 |
| 2012 | 15.86 | 16.37 | 14.40 | 11.08 | 8.49 | 10.28 | 12.61 | 12.96 | 10.17 | 11.58 | 14.36 | 14.90 |
| 2013 | 17.58 | 16.90 | 14.78 | 12.95 | 10.79 | 9.80 | 13.02 | 12.56 | 11.42 | 9.78 | 14.50 | 16.48 |
| 2014 | 19.66 | 18.47 | 19.19 | 11.73 | 10.99 | 8.90 | 12.37 | 11.11 | 8.27 | 10.73 | 15.05 | N/A |

If the load is under 20 MW, as stated in the application, why is a 115 kV line with a capacity of essentially 140 MW wanted, why is it claimed needed?

Another reason that establishing the capacity of the line, the MVA, is important is because the Exhibit 53 chart shows, and GRE's engineer agreed, that the amp level for this conductor at this MVA would be roughly 700 amps.

**The project proposed is NOT that proposed as 2007-NE-N3 in Biennial Transmission Report**

The project Application also misrepresents the project as proposed as 2007-NE-N3 first listed in the 2007 Biennial Transmission Projects Report. Application, p. 1-10. The 2007, 2009, 2011, and 2013 versions of 2007-NE-N3 were entered at the public hearing as Exhibit 57, Biennial Transmission Plan/Report (selected), attached. Looking at the map associated with 2007-NE-N3, there's little relation between them, because the 2007 project begins at Hubbard and then wanders SW to a spot west of Menahga. The 2007 report states that "Project 2007-NE-N3 would be the start of a Hubbard-Menahga-Wadena/Compton-Wing River 115 kV line." For a map showing the geographic locations of Wadena/Compton and Wing River – see p. 1-8 of the Application. That line would be essentially a north/south line, and not anything like the proposed project's circuitous route.

The 2009 version of 2007-NE-N3 (Ex. 57) again proposes a Hubbard – Wing River 115 kV line.

In the 2011 report for 2007-NE-N3 (Ex. 57) states that this would be a "MN Pipeline-Menahga 115 kV project, yet there is no map or narrative description showing this change.

**Pumping station, if added to load, is still not sufficient "need" to justify this project**

The load of the existing pumping stations, per the testimony of the GRE engineer, is approximately 4 MW. The new pumping station is said to be 10 MW. 10 MW, when added to a less than 20 MW load does not justify the project with capacity more than four times demand.

**New substations are not necessary – there are two pre-existing pumping stations in the area**

There is an existing pumping station near where the Straight River substation is proposed to be added. P. 4-9 these 2 sections:

> The new Minnesota Power Straight River Substation in the vicinity of the existing Minnesota Power Pipeline Substation;

And:

> Minnesota Power proposes to construct the Straight River 115/34.5 kV Substation near the existing MPL Park Rapids Pump Station to re-establish 34.5 kV service to the Minnesota Power Pipeline Substation after removal of the 34.5 kV source from Hubbard. The 34.5 kV 522 feeder line from the Hubbard Substation to the Pipeline Substation will be removed to accommodate the interconnection and routing of the new 115 kV transmission line.

There is also a second existing pipeline substation in the area, to the south near the Thomastown substation, visible in the far south of the larger area map, Application, p. 1-8. No explanation has been provided as to why a new substation and new pumping station site is required, when it appears that there is physical room at either of the two existing pipeline substations in the area to accommodate another pump for any of the pipelines buried on that corridor, and no evidence has been entered into the record that this is not possible.

There is no evidence in the record explaining why the new pumping station could not be added at either of the two existing pumping station sites in the immediate project area.

**Future "phased and connected" project to the north should be disclosed and considered**

The Application, p. 1-1, references a "future project to the north." That is likely a pumping station or other associated facility for the Sandpiper pipeline, Applicants would not deny this at the hearing.

This is also referenced in the EA, p. 32: "The applicants indicate that a new oil pumping station could not be served by the existing 34.5 kV transmission system in the project area." How did Commerce take into account the "future project to the north" as a driver for this project? A review of the Application and the EA does not reveal the extent to which this "future project to the north" is a driver for this project, other than to state that it is. This project should be considered as a phased and connected action to that project, and to the MinnCan pipeline, and vice versa. I do not believe that this project has been considered in relation to the Sandpiper project in that project's docket, but I have not reviewed that immense docket thoroughly.

**Distribution system requires upgrades, and should be completed prior to any transmission addition. Distribution upgrade is a viable and practical alternative to the proposed project, and will be required whether this project is built or not!**

The application admits that the distribution system in the area is old and in need of repair and upgrades to bring it up to date. Upgrade of existing facilities, App. p. 6-3; Age of 34.5 system 5-3; Discusses upgrade of the entire 34.5 system. Looking at Exhibit D, the 2008 Great River Energy Long-Range Transmission Plan, it focuses on reliability and transmission age issues. Cited as reason addition of generation would not improve reliability, p. 6-2. Page 10-1:

> System overload concerns in the Menahga area are due to the growth of the peak electrical demand that has surpassed the level that can be served, and the age of the 34.5 kV transmission lines combined with the overall length of the 34.5 kV network. The load area served from the Hubbard-Verndale 34.5 kV system has shown growth rate in the past five years. As discussed in **Section 5.6**, the load area is growing at a weighted annual average rate of about 1.0 percent.

Upgrade of the existing facilities was rejected, App. p. 6-3. Given the age of the distribution system, won't that have to be done anyway?

Peaking generation was rejected because "a rebuild of this system would be necessary if generation were added to the system." Because the system requires a rebuild already, whether or not this project goes forward, and because the system has voltage regulation problems due to insufficient reactive power, addition of generation in the area would address both of these problems. The addition of generation in the area should be considered as an alternative.

In the Application, p. 6-4, reconductoring with use of a larger conductor for the Hubbard-Verndale 34.5 system was rejected because the transformer would limit capacity, but addition of a higher rated transformer would be a logical part of any reconductoring and rebuild of the 34.5 system. This option should not have been rejected, and demands further consideration.

**Applicants' claims regarding growth of peak demand are misrepresentation, or worse**.

The applicants characterize peak demand as growing significantly, from 3-5% annually both generally, and in the individual service areas of local utilities. This is a gross overstatement, and misrepresentative of the peak demand over time. This was accomplished by using "five year" growth, which should not be used at all because it does not address the higher demand and then the recession severe drop. This also does not fairly characterize the demand growth because it is only a growth of a few megawatts, which in electrical terms, is not consequential. Applicants cherry picked data, and used data showing that level of increase, and improperly omitted the data showing peak demand over the years preceding those years selected, which were much higher than the first year (2010) used in their charts. By omitting the previous years' higher peak demand, they give the false impression that demand is rising. This "we're going to freeze in the dark in an incubator without a job" hysteria is shameful.

For example, see App. p. 5-11, from which they draw their demand growth information, and note that the table only starts with 2010.

**Table 5-3. Historical Monthly Coincident Peak Demand for Affected Load Area (MW)**

| | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 15.90 | 14.20 | 13.23 | 10.18 | 8.63 | 10.73 | 10.24 | 11.47 | 9.08 | 9.98 | 13.41 | 14.56 |
| 2011 | 16.78 | 15.24 | 15.76 | 11.58 | 11.28 | 10.28 | 13.16 | 9.64 | 9.23 | 10.54 | 13.47 | 14.05 |
| 2012 | 15.86 | 16.37 | 14.40 | 11.08 | 8.49 | 10.28 | 12.61 | 12.96 | 10.17 | 11.58 | 14.36 | 14.90 |
| 2013 | 17.58 | 16.90 | 14.78 | 12.95 | 10.79 | 9.80 | 13.02 | 12.56 | 11.42 | 9.78 | 14.50 | 16.48 |
| 2014 | 19.66 | 18.47 | 19.19 | 11.73 | 10.99 | 8.90 | 12.37 | 11.11 | 8.27 | 10.73 | 15.05 | N/A |

The peaks at issue for the entire "Affected Load Area" range from 15.90 in 2010 to 19.66 in 2010, or just over 4 MW. That 4 MW is a nominal increase.

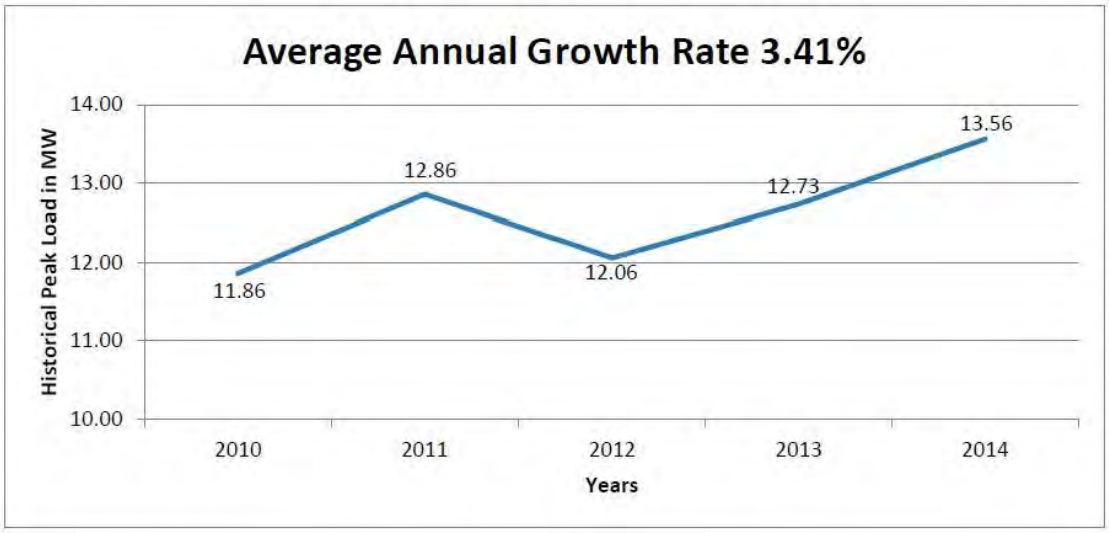
Looking at rest of tables shows how misleading this presentation of peak demand is. Starting with the Todd-Wadena load, App. p. 5-14, showing Historic Coincident Peak covering 2005 – 2014, we see the more complete story -- the previous Todd-Wadena peak was in 2009.

**Table 5-5. Affected Load Area 10-Year Historical Coincident Peak Load Served by Todd-Wadena (MW)**

| Substation | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sebeka | 1.958 | 2.077 | 2.182 | 2.312 | 2.570 | 2.214 | 2.425 | 2.237 | 2.247 | 2.498 |
| Menahga | 3.389 | 3.412 | 3.855 | 3.907 | 4.210 | 3.396 | 3.654 | 3.495 | 3.662 | 3.974 |
| Leaf River | 2.786 | 2.605 | 2.690 | 3.058 | 3.189 | 3.190 | 3.426 | 3.001 | 3.287 | 3.433 |
| Twin Lakes | 1.008 | 0.978 | 0.985 | 1.015 | 0.944 | 1.324 | 1.507 | 1.493 | 1.526 | 1.550 |
| Orton | 1.659 | 1.682 | 1.741 | 1.927 | 1.941 | 1.737 | 1.844 | 1.833 | 2.010 | 2.106 |
| **Total** | **10.80** | **10.75** | **11.45** | **12.22** | **12.85** | **11.86** | **12.86** | **12.06** | **12.73** | **13.56** |

For the Todd-Wadena load, there's been an increase from 10.80 MW to 13.56 MW, an increase of just 2.76 MW! Yet table 5-6 starts in 2010, and is "misleading" at best, because by excluding the previous 2009 peak and the build-up to it, one might believe their hysterical claims of increased demand. Even in this table, this is an increase of just 1.70 MW:

**Figure 5-7. Affected Load Area Five-Year Historical Coincident Peak Load Growth Trend – Todd-Wadena**



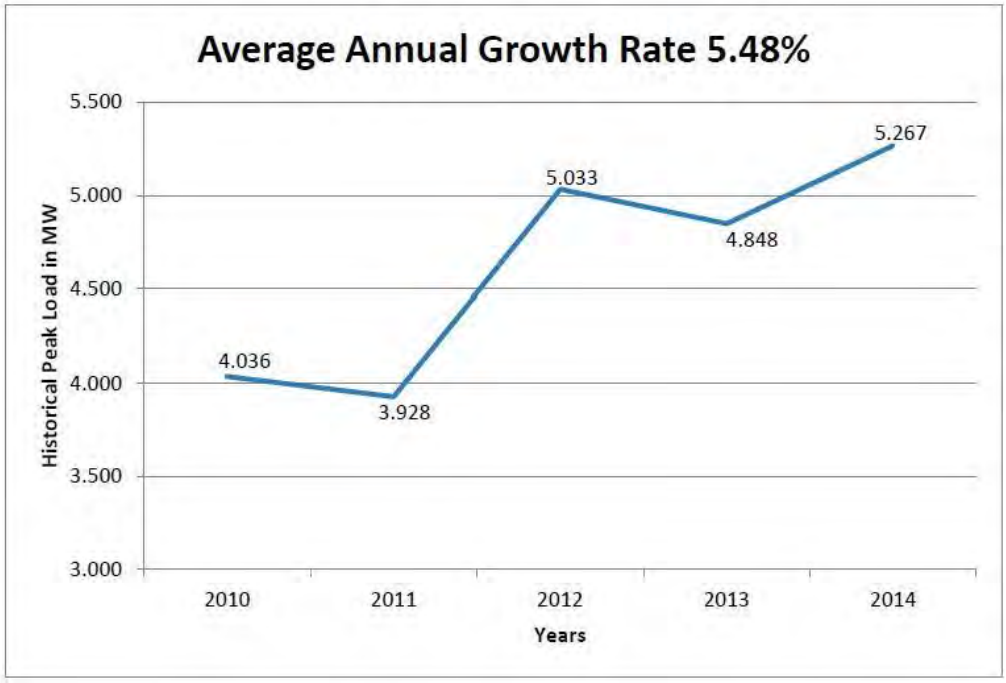

Any use of "Five-Year" Growth trend is misleading. Applicants do disclose ten year coincident peak demand levels, and these are all that should be used. The ten-year coincident peak demand levels show that longer term trend and more accurately depict growth.

**Table 5-9. 9-Year Historical Coincident Peak Load Data for Affected Load Area Served by Minnesota Power (MW)**

| Substation | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|---|---|---|---|---|---|---|---|---|
| Verndale | 0.819 | 0.890 | 0.736 | 0.742 | 0.658 | 0.507 | 0.779 | 0.899 | 1.138 |
| Blue Grass | 0.043 | 0.046 | 0.038 | 0.039 | 0.034 | 0.026 | 0.040 | 0.047 | 0.059 |
| Menahga | 0.375 | 0.421 | 0.390 | 0.495 | 0.389 | 0.395 | 0.490 | 0.454 | 0.473 |
| Spirit Lake | 1.636 | 1.834 | 1.699 | 2.159 | 1.695 | 1.721 | 2.136 | 1.978 | 2.063 |
| Sebeka | 1.216 | 1.364 | 1.263 | 1.605 | 1.260 | 1.279 | 1.588 | 1.470 | 1.534 |
| **Total** | **4.089** | **4.555** | **4.126** | **5.040** | **4.036** | **3.928** | **5.033** | **4.848** | **5.267** |

App p. 5-18 Table 5-9, MP Historical Coincident Peak Load. This table for features nine years of peak demand, ranging from a low of 3.928 MW and high of 5.267 MW. This is a growth of just 1.339 MW! This table also shows 2009 peak, but p. 5-19, Figure 5-9 for MP uses this information, again in a very misleading way:

**Figure 5-9. Affected Load Area Five-Year Historical Peak Demand Growth Trend Served by Minnesota Power**




The only growth at issue is the former peak of 5.040 to the most recent peak of 5.267, or a growth of 0.227 MW! And looking back to 2006, a low of 3.928 MW and high of 5.267 MW. This is a growth of just 1.339 MW!

Any way you look at peak demand, it is not something to get hysterical about, nor is it sufficient to justify a transmission project that costs $23 million dollars with transmission criss-crossing the area in a round-about way, fragmenting forests, destroying habitat, and ruining viewsheds and wrecking landowners peaceful enjoyment of their property, and one that does NOT do the

necessary work to the distribution that has been needed for decades – upgrade of the 34.5 kV system in the area!

**<u>No Build Alternative as presented in Environmental Assessment is inadequate</u>:**

"No Build" means that the 115 kV line as proposed is not built. The EA is inadequate because it does not present options of actions which could/would result in the proposed project not being built. For example, an upgrade of the 34.5 kV distribution system, which is unquestionably needed, with different options for powering pumping stations, was not considered. Failure to consider this option is not reasonable because34.5 kV upgrade would address the voltage and overloading problems reported in 2008 study, and given aging/aged system presenting problems, upgrade is overdue. Because it must be done, that distribution system upgrade should be the first presumption, and then after that is complete, then determine what's necessary to address the pumping station and "future project."

**<u>Range of magnetic field is grossly understated by Applicants and in ER</u>**

The magnetic field charts in the application, Table 8-3, are based on the amp levels and voltage levels of this project. As stated above, Applicant's engineer agreed that the MVA rating of the line would be 140, and the amps associated with that MVA rating would be 700However, for the magnetic field chart, that uses various levels of amps, none over 138.

**Table 8-3. Calculated Magnetic Fields (mG) for Proposed Transmission Line Designs(One meter (3.28 feet) above ground)**

| Scenario | Max. Operating Voltage (kV) | Line Current (Amps) | Distance to Proposed Centerline | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | -300' | -200' | -100' | -50' | -25' | Max. | 25' | 50' | 100' | 200' | 300' |
| 115/115 kV Double Circuit Peak Load (Figure 8-5) | 121/121 | 115 kV: 110<br>115 kV: 138 | 0.28 | 0.62 | 2.36 | 7.64 | 17.33 | 28.52 | 16.62 | 7.38 | 2.31 | 0.62 | 0.28 |
| 115/115 kV Double Circuit Average Load (Figure 8-5) | 121/121 | 115 kV: 80<br>115 kV: 82 | 0.18 | 0.41 | 1.53 | 4.92 | 11.11 | 18.61 | 11.06 | 4.90 | 1.52 | 0.41 | 0.18 |
| 115 kV with 7.2 kV Underbuild Peak Load (Figure 8-6) | 121/8 | 115 kV: 110<br>7.2 kV: 26 | 0.55 | 0.84 | 1.94 | 4.76 | 9.36 | 17.11 | 12.35 | 6.54 | 2.63 | 1.05 | 0.65 |
| 115 with 7.2 kV Underbuild Average Load (Figure 8-6) | 121/8 | 115 kV: 80<br>7.2 kV: 17 | 0.36 | 0.56 | 1.31 | 3.30 | 6.51 | 11.83 | 8.54 | 4.51 | 1.79 | 0.71 | 0.43 |
| 115 kV Single Circuit Line Peak Load (Figure 8-7) | 121 | 110 | 0.13 | 0.29 | 1.08 | 3.45 | 7.92 | 15.88 | 9.38 | 3.94 | 1.17 | 0.31 | 0.14 |
| 115 kV Single Circuit Line Average Load (Figure 8-7) | 121 | 80 | 0.10 | 0.21 | 0.79 | 2.51 | 5.76 | 11.55 | 6.82 | 2.86 | 0.85 | 0.22 | 0.10 |

Table 8-3. The GRE engineer agreed that, all other things being equal, if the amps were higher than the values used in the magnetic field chart, then they magnetic fields calculated would be higher. That means that the range of potential magnetic field for this project could go much higher than was disclosed in the application.

The Environmental Assessment for this project is inadequate because it also misreports potential

magnetic fields for this project, and merely takes the information provided in the application and presents it in a different, reversed, order.

| Transmission Line / Loading | Current (amps) | Distance from Centerline (feet) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | -300 | -100 | -50 | -25 | 0 | 25 | 50 | 100 | 300 |
| Single Circuit 115 kV Line / Average Load | 80 | 0.10 | 0.79 | 2.51 | 5.76 | 11.55 | 6.82 | 2.86 | 0.85 | 0.10 |
| Single Circuit 115 kV Line / Peak Load | 110 | 0.13 | 1.08 | 3.45 | 7.92 | 15.88 | 9.38 | 3.94 | 1.17 | 0.14 |
| Single Circuit 115 kV Line with 7.2 kV Underbuild / Average Load | 80/17 | 0.36 | 1.31 | 3.30 | 6.51 | 11.83 | 8.54 | 4.51 | 1.79 | 0.43 |
| Single Circuit 115 kV Line with 7.2 kV Underbuild / Peak Load | 110/26 | 0.55 | 1.94 | 4.76 | 9.36 | 17.11 | 12.35 | 6.54 | 2.63 | 0.65 |
| Double Circuit 115 kV Line / Average Load | 80/82 | 0.18 | 1.53 | 4.92 | 11.11 | 18.61 | 11.06 | 4.90 | 1.52 | 0.18 |
| Double Circuit 115 kV Line / Peak Load | 110/138 | 0.28 | 2.36 | 7.64 | 17.33 | 28.52 | 16.62 | 7.38 | 2.31 | 0.28 |

**<u>The Environmental Assessment is inadequate, and an Environmental Impact Statement is necessary</u>**

An Environmental Impact Statement is required for a major governmental action.[1] The Appellate Court recently issued a decision with an impact on Commission decisions, noting that an EIS was a requirement for any Commission major governmental action, such as a permit, in this case, a Certificate of Need. From the Opinion:

> Minn. Stat. § 116D.04, subd. 2a (2014), requires the responsible governmental unit to prepare a detailed EIS before engaging in any "major governmental action" that creates the "potential for significant environmental effects." MEPA defines "governmental action" as "activities, including projects wholly or partially conducted, permitted, assisted, financed, regulated, or approved by units of government." Minn. Stat. § 116D.04, subd. 1a(d) (2014).

*In the Matter of the Application of North Dakota Pipeline Company LLC for a Certificate of Need and Routing Permit for the Sandpiper Pipeline Project in Minnesota*, A15-0016, p. 8 (September 14, 2015) (attached). The Certificate of Need and Route Permit applications at issue in the above-captioned dockets are each a "major governmental action." And Environmental Impact Statement is a necessary step to inform the record, a step that should be taken here.

**A. Transmission Infrastructure is presumed to have a Significant Environmental Impact, and an Environmental Impact Statement is necessary.**

[1] See In the Matter of the Application of North Dakota Pipeline Company LLC for a Certificate of Need for the Sandpiper Pipeline Project in Minnesota A15-0016 (September 14, 2015) http://mn.gov/web/prod/static/lawlib/live/archive/ctappub/2015/opa150016-091415.pdf

Roughly forty years ago, the Power Plant Siting Act was a response to citizen frustration with transmission proposals and the permitting process, and focused on increasing opportunities for public participation:

> **PUBLIC PARTICIPATION.**
>
> The commission shall adopt broad spectrum citizen participation as a principal of operation. The form of public participation shall not be limited to public hearings and advisory task forces and shall be consistent with the commission's rules and guidelines as provided for in section 216E.16.

Minn. Stat §216E.08, Subd. 2. That need for ways to be heard and to contribute is as important today.

The Minnesota Environmental Policy Act requires an Environmental Impact Statement where significant environmental impacts might occur:

> **Subd. 2a.When prepared.**
>
> Where there is potential for significant environmental effects resulting from any major governmental action, the action shall be preceded by a detailed environmental impact statement prepared by the responsible governmental unit. The environmental impact statement shall be an analytical rather than an encyclopedic document which describes the proposed action in detail, analyzes its significant environmental impacts, discusses appropriate alternatives to the proposed action and their impacts, and explores methods by which adverse environmental impacts of an action could be mitigated. The environmental impact statement shall also analyze those economic, employment, and sociological effects that cannot be avoided should the action be implemented. To ensure its use in the decision-making process, the environmental impact statement shall be prepared as early as practical in the formulation of an action.

Minn. Stat. §116D.04, Subd. 2a.

The Power Plant Siting Act begins with the simple acknowledgement of the significant environmental impact of transmission lines, and focuses on avoiding, minimizing, and mitigating that impact:

> **216E.02 SITING AUTHORITY.**
>
> **Subdivision 1. Policy.**
>
> The legislature hereby declares it to be the policy of the state to locate large electric power facilities in an orderly manner **compatible with environmental preservation** and the efficient use of resources. In accordance with this policy the commission shall choose locations **that minimize adverse human and environmental impact** while insuring continuing electric power system

> reliability and integrity and insuring that electric energy needs are met and fulfilled in an orderly and timely fashion.

Minn. Stat. 216E.02, Subd. 1 (emphasis added); see also Minn. R. 7850.1000.

Under the Minnesota Environmental Policy Act, agencies are charged with protection of the environment, including a mandate to:

> …identify and develop methods and procedures that will ensure that environmental amenities and values, whether quantified or not, will be given at least equal consideration in decision making along with economic and technical considerations…

Minn. Stat. §116D.03, Subd. 2(3).

The impacts of transmission and the importance of protection of the environment is stressed in the routing rules. There have been only two rulemaking proceedings in this area of environmental rules, following the 2001 statutory changes, published February 10, 2003 in 27 SR 1295 and February 2, 2004 in 28 SR 951.[2] There have been no rulemakings in this area since these changes, and none following the extensive 2005 statutory changes.

> **STANDARDS AND CRITERIA.**
> No site permit or route permit shall be issued in violation of the site selection standards and criteria established in Minnesota Statutes, sections 216E.03 and 216E.04, and in rules adopted by the commission. The commission shall issue a permit for a proposed facility when the commission finds, in keeping with the requirements of the Minnesota Environmental Policy Act, Minnesota Statutes, chapter 116D, and the Minnesota Environmental Rights Act, Minnesota Statutes, chapter 116B, that the facility is **consistent with state goals to conserve resources, minimize environmental impacts, and minimize human settlement and other land use conflicts** and ensures the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure.
>
> ***Statutory Authority:*** MS s 116C.66; 216E.16
> ***History:*** 27 SR 1295; L 2005 c 97 art 3 s 19

Minn. R. 7850.4000 (emphasis added).

The Environmental Quality Board was charged under MEPA with promulgating rules setting out accepted and authorized forms of alternate environmental review:

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[2] 27 SR 1295 online at http://www.comm.media.state.mn.us/bookstore/stateregister/27_33.pdf#page=5 and 28 SR 951 at http://www.comm.media.state.mn.us/bookstore/stateregister/28_31.pdf#page=5 . (Attached) This writer has actively participated in the rulemaking advisory committees for both rulemaking proceedings.

**Alternative review.**

The board shall by rule identify alternative forms of environmental review which will address the same issues and utilize similar procedures as an environmental impact statement in a more timely or more efficient manner to be utilized in lieu of an environmental impact statement.

Minn. Stat. §116D.04, Subd. 4a.

The concept of "Environmental Report" was part of a 2004 rulemaking, but this rule below, Minn. R. 7849.1200, is not part of that 2004 *28 SR 951* rulemaking and authorization by the Environmental Quality Board of preparation of an Environmental Report by the EQB:

**ENVIRONMENTAL REPORT.**

The commissioner of the Department of Commerce shall prepare an environmental report on a proposed high voltage transmission line or a proposed large electric power generating plant at the need stage. The environmental report must contain information on the human and environmental impacts of the proposed project associated with the size, type, and timing of the project, system configurations, and voltage. The environmental report must also contain information on alternatives to the proposed project and shall address mitigating measures for anticipated adverse impacts. The commissioner shall be responsible for the completeness and accuracy of all information in the environmental report.

***Statutory Authority:*** MS s 116D.04
***History:*** 28 SR 951; L 2005 c 97 art 3 s 19

Minn. R. 7849.1200.

This "history" for the rule above is very odd, because there has been no rulemaking since passage of the 2005 Energy Omnibus Bill, and the history does not reflect any changes since the 2003 and 2004 changes. Only now, over the last two years, has a Rulemaking Advisory Committee been working on rule updates. These rule changes have yet to reach "final draft" stage, and it has yet to be brought before the Commission for release for public comment.[3]

This rulemaking authority is expressly delegated under MEPA to the Environmental Quality Board, yet rules state:

**PURPOSE AND AUTHORITY.**

Parts 7850.1000 to 7850.5600 are prescribed by the Minnesota Public Utilities Commission pursuant to the authority granted to the commission in the Power

[3] See PUC Docket R-12-1246, in which this writer has been participating, representing No CapX 2020 and United Citizens Action Network, pro bono, for nearly three years.

> Plant Siting Act, as amended, Minnesota Statutes, chapter 216E, to give effect to the purposes of the act.

Minn. R. 7850.1100. And another bizarre rule, mixing Certificate of Need rules with Route Permit rules:

> **APPLICABILITY.**
>
> Parts 7850.1000 to 7850.5600 establish the requirements for the processing of permit applications by the Public Utilities Commission for large electric power generating plants and high voltage transmission lines. Requirements for environmental review of such projects before the commission are established in the applicable requirements of chapter 4410 and parts 7849.1000 to 7849.2100.
>
> ***Statutory Authority: MS s 116C.66; 216E.16***
>
> ***History: 27 SR 1295; L 2005 c 97 art 3 s 19***

Minn. R. 7850.1200.

The Minnesota Environmental Policy Act requires alternate environmental review to be authorized by the Environmental Quality Board, and to be performed by the Environmental Quality Board. However, environmental review under the Power Plant Siting Act was legislatively transferred to the Department of Commerce, and taken away from the Environmental Quality Board. The transfer of environmental review has yet to be acknowledged in rule.

More importantly, under MEPA, environmental review must "address the same issues and utilize similar procedures as an environmental impact statement" if it is to substitute for an EIS.

In only certain situations is a transmission project route application exempted from an Environmental Impact Statement, and in this case, because the Applicant applied for Alternative Review for routing in a joint proceeding with the Certificate of Need application, the Commission agreed that review would be an "Alternate Review" under Minn. Stat. §216E.04, only an "Environmental Assessment" is required. The Environmental Quality Board did adopt rules allowing an "Environmental Assessment" for those projects under a Joint Proceeding where the project qualifies for "alternate review by the EQB." See 27 SR 1295 (2004).[4] However, the rules adopted for "Joint Proceedings" state that:

> In the event the EQB combines the two processes pursuant to subpart 1 or 2, the procedures of chapter 4400 shall be followed in conducting the environmental review.

Minn. R. 4410.7060, Subp. 2 (as adopted by EQB 27 SR 1295 ). Those rules have since been

[4] Online at http://www.comm.media.state.mn.us/bookstore/stateregister/27_33.pdf#page=5

repealed.[5] The EQB no longer performs the environmental review for the Commission.

The rule authorizing "Alternate Form of Review" was not part of the referenced 2004 rulemaking at the EQB, and 2004 changes could not have incorporated 2005 legislative changes:

> **7849.2000 ALTERNATIVE FORM OF REVIEW.**
>
> The requirements under parts 7849.1000 to 7849.2100 for preparation of an environmental report on a LEPGP or HVTL for which a determination of need by the Public Utilities Commission has been requested is approved as an alternative form of review.
>
> ***Statutory Authority: MS s 116D.04***
> ***History: 28 SR 951***

Further complicating matters, the "Joint Proceeding" rule promulgated in 2004 by the EQB was under the heading of "Local Review" and addressed use of both Environmental Assessment and Environmental Impact Statement, and directed that if EQB combined the Environmental Assessment and Environmental Impact Statement, the EQB was to use the "procedures of chapter 4400" to conduct environmental review:

> **Procedures.**
>
> In the event the commissioner combines the two processes pursuant to subpart 1 or 2, the procedures of chapter 4400 be followed in conducting the environmental review.

Minn. R. 4410.7060, Subp. 3 (2004).

However, the rule now utilized references an entirely different type of review, "Joint Review" as Certificate of Need and Routing together, not a combination of "Environmental assessment" and "Environmental impact statement," and also utilizes a different set of procedures -- not the "procedures of chapter 4400," which have been "renumbered" but the text has changed:

> **Procedures.**
>
> In the event the commissioner combines the two processes pursuant to subpart 1 or 2, the procedures of parts 7850.1000 to 7850.5600 shall be followed in conducting the environmental review.

Minn. R. 7850.1900, Subp. 3.

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[5] See https://www.revisor.mn.gov/rules/?agency=141 ; see also Minn. R. 4410.7060 "Local Government Review" was renumbered 7849.7100, renumbered 7849.2100 (Costs to Prepare Environmental Report). Presumably this is an error, and should be "7849.1900. However, significant alterations have been made that are not consistent with the rules adopted by the EQB.

A rule ostensibly notes that "Alternate Review" for Certificate of Need is authorized:

**7849.2000 ALTERNATIVE FORM OF REVIEW.**

The requirements under parts 7849.1000 to 7849.2100 for preparation of an environmental report on a LEPGP or HVTL for which a determination of need by the Public Utilities Commission has been requested is approved as an alternative form of review.

**Statutory Authority:** MS s 116D.04
**History:** 28 SR 951

This rule, authorizing "Alternate Form of Review" under these rules is not part of the 2004 EQB rulemaking authorization. The history does not reflect changes that make material changes in environmental review of transmission projects.

**FULL DISCLOSURE:** Upon inquiry, this writer has been told that, "In the rulemaking process, agencies publish the proposed rules in the *State Register* and then later publish a Notice of Adoption When the Notice of Adoption is published, the proposed rules are not re-published." However, if this is the case, and these rules have been properly adopted and modified, this should be reflected in the history reference.

Regarding the environmental review for this joint Certificate of Need and Routing proceeding, there has been no Environmental Impact Statement. A review of the Environmental Assessment, prepared by the **Dept. of Commerce**, not the EQB, shows that the depth of review required by MEPA, addressing the same issues and which utilizes similar procedures, has not occurred. See Minn. Stat. §116D.03, Subd. 2(3); Minn. Stat. §116D.04, Subd. 4a. Neither an Environmental Report for a Certificate of Need, nor an Environmental Assessment for a Route Permit, provide the detail or procedures found in an Environmental Impact Statement, nor the opportunities for public participation.

An Environmental Impact Statement is necessary – it would more completely addresses environmental issues, and would provide procedures allowing for public participation, is both necessary to comply with the Minnesota Environmental Policy Act and the Minnesota Environmental Rights Act, and to comply with the mandate of the Power Plant Siting Act of a broad spectrum of public participation.

**Route must utilize pre-existing corridor under both Minnesota case law and statute.**

The project, as proposed by Applicants over Andersen's property, is not compliant with the transmission non-proliferation requirement of PEER and statute. People for Environmental Enlightenment & Responsibility (PEER), Inc. v. Minnesota Environmental Quality Council, 266 N.W.2d, 858, 868 (Minn. 1978); Minn. Stat. §216E.03, Subd. 7(e).

Public Hearing Exhibit 59 shows obvious existing corridor available for use for routing this project in compliance with PEER, if it is deemed needed. However, the choice of routing

alternatives in the Scoping decision did not incorporate obvious existing corridors into the environmental review for consideration by the Commission. The environmental review is inadequate due to this omission.

The decades old PEER decision set out the Minnesota transmission routing policy of "nonproliferation," to maximize utilization of existing and proposed rights-of-way. In a clear statement of intent, with full knowledge of the impact of establishment of nonproliferation on those near existing corridors, the court held:

> *We therefore concluded that in order to make the route-selection process comport with Minnesota's commitment to the principle of nonproliferation, the MEQC must, as a matter of law, choose a pre-existing route unless there are extremely strong reasons not to do so. We reach this conclusion partly because the utilization of a pre-existing route minimizes the impact of new intrusion by limiting its effects to those who are already accustomed to living with an existing route. More importantly, however, the establishment of a new route today means that in the future, when the principle of nonproliferation is properly applied residents living along this newly established route may have to suffer the burden of additional powerline easements.*

People for Environmental Enlightenment& Responsibility (PEER), Inc. v. Minnesota Environmental Quality Council, 266 N.W.2d, 858, 868 (Minn. 1978). The court compared proliferation with the MEQC's balance of noncompensable impairment of the environment against the compensable damages of number of homes to be condemned, and noted that:

> A*lthough the hearing examiner, the MEQC, and the district court all accepted both their reasoning and their conclusion, condemnation of a number of homes does not, without more, overcome the law's preference for containment of powerlines as expressed in the policy of nonproliferation. Persons who lose their homes can be fully compensated in damages. The destruction of protected environmental resources, however, is noncompensable and injurious to all present and future residents of Minnesota.*

Id., p. 869. In that case, the court emphasized that those along transmission routes "may have to suffer the burden of additional powerline easements." Id. at 868. That is the case in this situation where the route proposed by the Applicants is in large part a greenfield route, and yet Applicants have not provided a compelling reason for this new greenfield route in the area of much existing corridor.

The PEER-based non-proliferation routing policy was recently emphasized by the addition of Minn. Stat. §216E.03, Subd. 7(e) requiring specific findings by the Commission:

> *The commission must make specific findings that it has considered locating a route for a high-voltage transmission line on an existing high-voltage transmission route and the use of parallel existing highway right-of-way and, to the extent those are not used for the route, the commission must state the reasons.*

Minn. Stat. §216E.03, Subd. 7(e).

Route alternatives in compliance with PEER and Minn. Stat. §216E.03, Subd. 7(e) have not been reviewed. There is no basis or explanation by the Applicants for its preference not to utilize existing corridor, there is no basis for omission by Commerce of existing corridors from environmental review, nor is there any basis for a Commission decision to utilize any corridor that is not existing corridor.

## System Alternatives that should be considered

System alternatives must be considered, and there are system alternatives that would obviate the need for this project:

1. Upgrade and modernize the distribution system. This is long overdue and should be done whether or not the project goes forward. When this is completed, the area should be studied to determine if there is residual "need" not met by this upgrade.

2. Upgrade of the distribution system with removal of the existing pumping station from the distribution system should also be evaluated as a system alternative.

3. Where the distribution system is stressed between Hubbard, Menahga, and Sebeka, the Applicants have not addressed rebuild of the distribution system between these points to relieve that stress.

4. The Application does not address the "Existing MN Pipeline Substation" on the northwest end of the proposed project, nor does the Application show the source of that substation's energy. There are no distribution lines shown in that area. The impacts of removal of that pipeline substation, and/or construction of a "Straight River Substation" and ability of that infrastructure to meet the pumping station need must be considered.

5. Use of the new Menahga substation to serve as the pumping station should be considered as a system alternative[6].

6. The impact of the Sandpiper project, proposed to be routed just to the north of this project, must be considered, and the potential of the Sandpiper project and its

[6] In the pipeline pumping station docket, there was little consideration of transmission alternatives or impacts. See "Environmental Review" document, p. 9. The Menahga Project Application also understates the impact of the pumping station additions, which would "increase the capacity of the 305-mile MPL Line 4 from its current throughput capability of approximately 165,000 bpd to its design capacity of approximately 350,000 bpd." See e.g., Commission letter of January 29, 2015 re: State Agency Participation, PUC Docket PL-5/CN-14-320.

electric needs must be addressed as a likely driver for the design, route, and "need" along the northern part of this project.

7. Proposed pumping station location is near Sebeka, the Red Eye substation. Upgrade or replacement of the existing pumping station near Hubbard should be considered, rather than removal of the Hubbard-served pumping station and siting pumping station elsewhere.

8. A direct 69 kV line from the east to the proposed MPL Sebeka Pumping Station should be considered. A 69 kV line with 477 kcmil ACSR would have a rating of 84 MVA, sufficient to meet load serving requirements into the future.

9. An east/west distribution line through Menahga area should be considered, to provide redundancy by adding service from east or west, in addition to the current north and south options which Applicants claim are not sufficient.

Thank you for the opportunity to submit this Comment.

Respectfully submitted:

November 2, 2015

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# OVERLAND ATTACHMENTS

Attachment A – Close up Map of Andersen Property

Public Hearing Ex. 53 – ACSR spec chart, from Xcel SW MN 345 kV – PUC Docket 01-1958.

Public Hearing Ex. 56 – Calculated Magnetic Fields, from Bruce McKay's calculator spreadsheet, entered in record by McKay in CapX 2020 Brookings remand routing docket (PUC 08-1474) and Hiawatha Project docket (09-38); also entered in CapX 2020 La Crosse routing docket (09-1448).

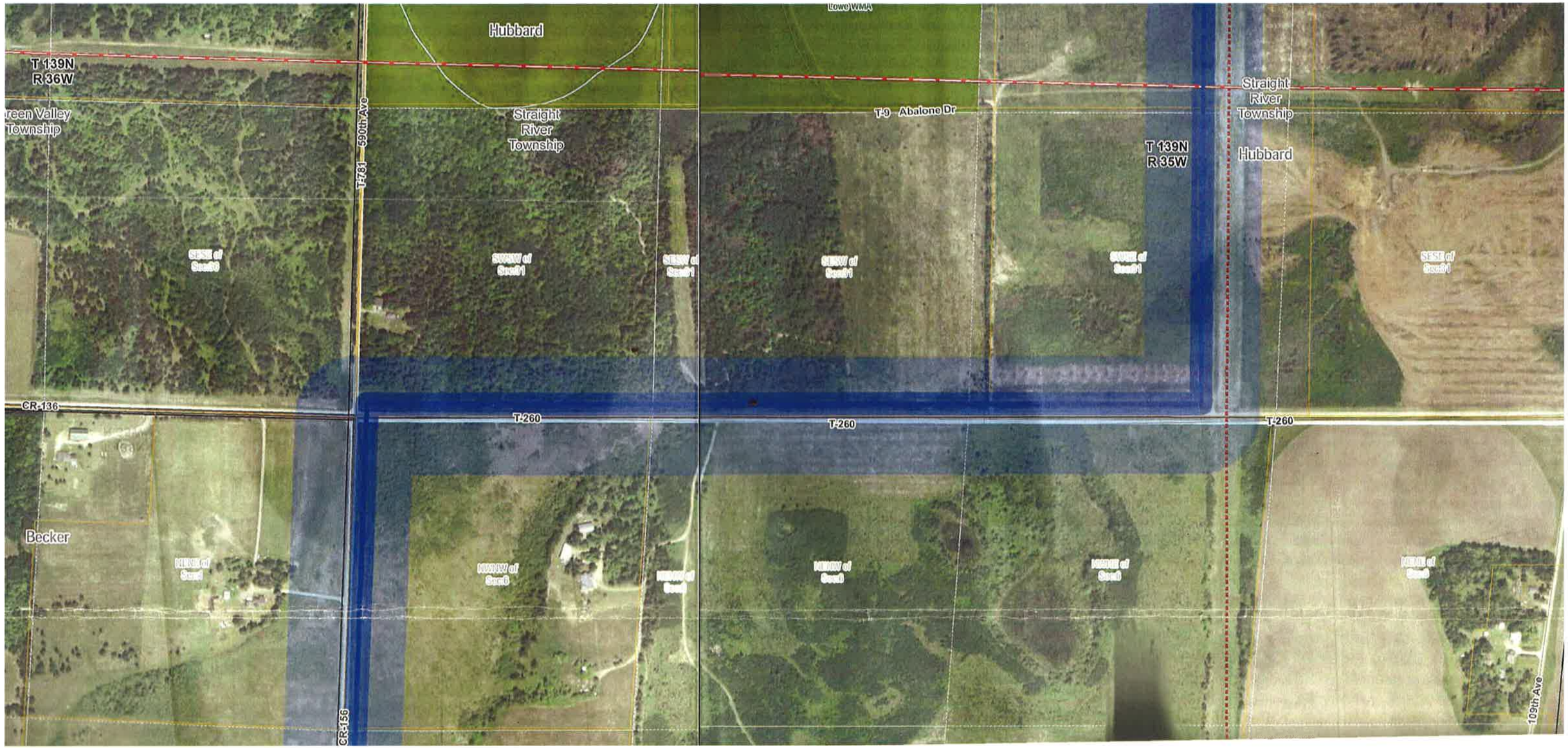
Public Hearing Ex. 57 – Biennial Transmission Plan/Report Listings for 2007-NE-N3 in 2007, 2009, 2011 and 2013 (changed to 2013-NE-N21).

Public Hearing Ex. 58 – GRE 2008 Long-Range Transmission Plan – Verndale-Hubbard 34.5 System.

Public Hearing Ex. 59 – Map showing large available corridors for routing.

# Attachment A

Close-up Map of Andersen Property and Proposed Transmission Corridor


Hubbard
Lowe WMA
T 139N
R 36W
reen Valley
Township
590th Ave
T-781
Straight
River
Township
T-9 Abalone Dr
T 139N
R 35W
Straight
River
Township
Hubbard
SESE of
Sec 6
SWSW of
Sec 1
SESW of
Sec 1
SESW of
Sec 1
SESE of
Sec 1
CR-136
T-260
T-260
T-260
Becker
NENE of
Sec 1
NWNW of
Sec 6
NWNW of
Sec 1
NENW of
Sec 1
NENE of
Sec 1
CR-156
109th Ave

# Public Hearing Ex. 53

ACSR spec chart, from Xcel SW MN 345 kV – PUC Docket 01-1958

Table 1

## Computation of Bare ACSR Overhead Conductor Ampacities (Steady State)

### Per ANSI/IEEE Standard 738-1986

| | mi/hr | ft/s |
|---|---|---|
| Wind speed | 1.36 | 2.00 |
| Coefficient of emissivity | | 0.5 |
| Coefficient of solar absorption | | 0.5 |

| | Temperature C | Temperature F |
|---|---|---|
| Ambient air temp | 40 | 104 |
| Conductor surface temp | 100 | 212 |

| | |
|---|---|
| Latitude | 45 degrees N |
| Azimuth of line | 90 degrees |
| Elev above msl | 1000 ft |

| | | |
|---|---|---|
| Air viscosity @ T ave | 0.04943 | lb/h ft |
| Air density | 0.06192 | lb/ft$^3$ |
| Air thermal conductivity | 0.00898 | W/ft C |
| Altitude of sun | 66.1 | degrees |
| Azimuth of sun | 180 | degrees |
| Heat rec'd by a surface | 94.64 | W/ft$^2$ |
| Elevation correction factor | 1.0340 | |

| Conductor | | | Resistance, Ohm/mi | | | Ohm/kft | Conductor heat transfer, W/ft | | | | | Ampacity | MVA rating @ nominal voltage | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 50 | 100 | 100 | 100 | Forced convection heat loss | | | Radiated | Solar | kV: | 69 | 115 | 138 | 161 | 230 | 345 | 500 | kcm |
| kcm | strand | diam,in | deg C | deg C | deg C | deg C | qc1 | qc2 | max | heat loss | heat gain | cond/ph: | 1 | 1 | 1 | 1 | 1 | 2 | 3 | |
| 4/0 | 6/1 | 0.563 | 0.5920 | 0.6979 | 0.6979 | 0.13216 | 17.43 | 15.27 | 17.43 | 3.79 | 2.30 | 376 | 45 | 75 | 90 | 106 | | | | 4/0 |
| 266 | 6/7 | 0.633 | 0.5520 | 0.6507 | 0.6507 | 0.12324 | 18.49 | 16.36 | 18.49 | 4.26 | 2.58 | 405 | 48 | 81 | 97 | 113 | | | | 266 |
| 336 | 18/1 | 0.684 | 0.3059 | 0.3606 | 0.3606 | 0.06830 | 19.23 | 17.16 | 19.23 | 4.61 | 2.79 | 555 | 66 | 111 | 133 | 155 | | | | 336 |
| 336 | 26/7 | 0.721 | 0.3072 | 0.3623 | 0.3623 | 0.06862 | 19.75 | 17.71 | 19.75 | 4.85 | 2.94 | 562 | 67 | 112 | 134 | 157 | | | | 336 |
| 477 | 26/7 | 0.858 | 0.2169 | 0.2557 | 0.2557 | 0.04843 | 21.57 | 19.66 | 21.57 | 5.78 | 3.50 | 702 | 84 | 140 | 168 | 196 | | | | 477 |
| 477 | 24/7 | 0.846 | 0.2186 | 0.2556 | 0.2556 | 0.04841 | 21.42 | 19.50 | 21.42 | 5.70 | 3.45 | 699 | 84 | 139 | 167 | 195 | | | | 477 |
| 556 | 26/7 | 0.927 | 0.1860 | 0.2192 | 0.2192 | 0.04152 | 22.43 | 20.60 | 22.43 | 6.24 | 3.78 | 774 | 93 | 154 | 185 | 216 | | | | 556 |
| 636 | 24/7 | 0.977 | 0.1631 | 0.1922 | 0.1922 | 0.03640 | 23.04 | 21.26 | 23.04 | 6.58 | 3.98 | 839 | 100 | 167 | 201 | 234 | 334 | | | 636 |
| 795 | 26/7 | 1.108 | 0.1306 | 0.1538 | 0.1538 | 0.02913 | 24.56 | 22.92 | 24.56 | 7.46 | 4.52 | 972 | 116 | 194 | 232 | 271 | 387 | 1161 | 2525 | 795 |
| 795 | 45/7 | 1.115 | 0.1313 | 0.1544 | 0.1544 | 0.02924 | 24.64 | 23.01 | 24.64 | 7.51 | 4.55 | 972 | 116 | 194 | 232 | 271 | 387 | 1161 | 2524 | 795 |
| 795 | 30/19 | 1.140 | 0.1307 | 0.1540 | 0.1540 | 0.02917 | 24.92 | 23.32 | 24.92 | 7.68 | 4.65 | 979 | 117 | 195 | 234 | 273 | 390 | 1170 | 2543 | 795 |
| 954 | 45/7 | 1.165 | 0.1099 | 0.1291 | 0.1291 | 0.02445 | 25.19 | 23.62 | 25.19 | 7.84 | 4.75 | 1076 | 129 | 214 | 257 | 300 | 429 | 1286 | 2795 | 954 |
| 954 | 54/7 | 1.196 | 0.1094 | 0.1287 | 0.1287 | 0.02438 | 25.53 | 24.00 | 25.53 | 8.05 | 4.88 | 1085 | 130 | 216 | 259 | 303 | 432 | 1297 | 2820 | 954 |
| 1192 | 54/19 | 1.338 | 0.0863 | 0.1013 | 0.1013 | 0.01919 | 27.03 | 25.67 | 27.03 | 9.01 | 5.46 | 1263 | 151 | 252 | 302 | 352 | 503 | 1509 | 3281 | 1192 |
| 1272 | 54/19 | 1.382 | 0.0851 | 0.0996 | 0.0996 | 0.01888 | 27.48 | 26.17 | 27.48 | 9.31 | 5.63 | 1285 | 154 | 256 | 307 | 358 | 512 | 1536 | 3339 | 1272 |
| 1590 | 54/19 | 1.545 | 0.0657 | 0.0767 | 0.0767 | 0.01453 | 29.09 | 27.98 | 29.09 | 10.40 | 6.30 | 1512 | 181 | 301 | 361 | 422 | 602 | 1807 | 3928 | 1590 |
| 2312 | 76/19 | 1.802 | 0.0505 | 0.0584 | 0.0584 | 0.01106 | 31.47 | 30.69 | 31.47 | 12.13 | 7.35 | 1811 | 216 | 361 | 433 | 505 | 721 | 2164 | 4704 | 2312 |

Notes:
Sun computations based on noon local sun time
Solar absorption based on "Clear atmosphere"
Azimuth of line: N-S = 0, E-W = 90

Xcel Energy
Delivery System Planning & Engineering



EXHIBIT
53

# Public Hearing Ex. 56

Calculated Magnetic Fields, from Bruce McKay's calculator spreadsheet, entered in record by McKay in CapX 2020 Brookings remand routing docket (PUC 08-1474) and Hiawatha Project docket (09-38); also entered in CapX 2020 La Crosse routing docket (09-1448).

ORIGINAL TABLE

TABLE 5.2-6. Calculated Magnetic Fields (milligauss) for proposed double circuit 345 kV Transmission Line Designs (3.28 feet above ground)

| STRUCTURE TYPE | SYSTEM CONDITION | CURRENT (AMPS) | DISTANCE TO PROPOSED CENTERLINES | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | -300' | -200' | -100' | -75' | -50' | -25' | 0' | 25' | 50' | 75' | 100' | 200' | 300' |
| 1 CIRCUIT | PEAK | 264 | 0.79 | 1.67 | 5.62 | 8.70 | 14.36 | 23.45 | 31.89 | 29.76 | 17.92 | 10.19 | 6.26 | 1.65 | 0.72 |
| DELTA CFG | AVERAGE | 158 | 0.47 | 1.00 | 3.36 | 5.21 | 8.60 | 14.03 | 19.08 | 17.81 | 10.73 | 6.10 | 3.75 | 0.99 | 0.43 |
| 1 CIRCUIT | PEAK | 264 | 0.86 | 1.97 | 7.12 | 11.10 | 18.17 | 27.45 | 25.55 | 16.04 | 9.86 | 6.41 | 4.42 | 1.48 | 0.71 |
| VERT CFG | AVERAGE | 158 | 0.52 | 1.18 | 4.26 | 6.65 | 10.87 | 16.43 | 15.29 | 9.60 | 5.90 | 3.84 | 2.64 | 0.88 | 0.42 |
| 2 CIRCUIT W/ | PEAK | 264 | 0.71 | 1.48 | 4.43 | 6.43 | 9.89 | 16.09 | 25.62 | 27.50 | 18.18 | 11.10 | 7.11 | 1.97 | 0.86 |
| 1 CKT ACTIVE | AVERAGE | 158 | 0.43 | 0.89 | 2.65 | 3.85 | 5.92 | 9.63 | 15.33 | 16.46 | 10.88 | 6.64 | 4.25 | 1.18 | 0.52 |
| 2 CIRCUIT W/ | PEAK | 264 | 0.19 | 0.58 | 3.32 | 6.08 | 11.96 | 22.90 | 30.03 | 23.06 | 12.10 | 6.17 | 3.39 | 0.59 | 0.19 |
| 2 CKTS ACTIVE | AVERAGE | 158 | 0.11 | 0.35 | 1.99 | 3.64 | 7.16 | 13.71 | 17.97 | 13.80 | 7.24 | 3.70 | 2.03 | 0.35 | 0.12 |

MVA CALCULATED FROM CURRENT IN ORIGINAL TABLE:

115.00 kV
700.00 Amps PEAK
1.73 3 Phase
140.00 MVA PEAK CALC'D

115.00 kV
700.00 Amps AVERAGE
1.73 3 Phase
139.27 MVA AVERAGE CALC'D

ADJUSTABLE TABLE

TABLE 5.2-6. Calculated Magnetic Fields (milligauss) for proposed double circuit 115 kV Transmission Line Designs (3.28 feet above ground)

| STRUCTURE TYPE | SYSTEM CONDITION | CURRENT (AMPS) | DISTANCE TO PROPOSED CENTERLINES | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | -300' | -200' | -100' | -75' | -50' | -25' | 0' | 25' | 50' | 75' | 100' | 200' | 300' |
| 1 CIRCUIT | PEAK | 703.69 | 2.11 | 4.45 | 14.98 | 23.19 | 38.28 | 62.51 | 85.00 | 79.33 | 47.77 | 27.16 | 16.69 | 4.40 | 1.92 |
| DELTA CFG | AVERAGE | 422.22 | 1.26 | 2.67 | 8.98 | 13.92 | 22.98 | 37.49 | 50.99 | 47.59 | 28.67 | 16.30 | 10.02 | 2.65 | 1.15 |
| 1 CIRCUIT | PEAK | 703.69 | 2.29 | 5.25 | 18.98 | 29.59 | 48.43 | 73.17 | 68.10 | 42.75 | 26.28 | 17.09 | 11.78 | 3.94 | 1.89 |
| VERT CFG | AVERAGE | 422.22 | 1.39 | 3.15 | 11.38 | 17.77 | 29.05 | 43.91 | 40.86 | 25.65 | 15.77 | 10.26 | 7.05 | 2.35 | 1.12 |
| 2 CIRCUIT W/ | PEAK | 703.69 | 1.89 | 3.94 | 11.81 | 17.14 | 26.36 | 42.89 | 68.29 | 73.30 | 48.46 | 29.59 | 18.95 | 5.25 | 2.29 |
| 1 CKT ACTIVE | AVERAGE | 422.22 | 1.15 | 2.38 | 7.08 | 10.29 | 15.82 | 25.73 | 40.97 | 43.99 | 29.07 | 17.74 | 11.36 | 3.15 | 1.39 |
| 2 CIRCUIT W/ | PEAK | 703.69 | 0.51 | 1.55 | 8.85 | 16.21 | 31.88 | 61.04 | 80.05 | 61.47 | 32.25 | 16.45 | 9.04 | 1.57 | 0.51 |
| 2 CKTS ACTIVE | AVERAGE | 422.22 | 0.29 | 0.94 | 5.32 | 9.73 | 19.13 | 36.64 | 48.02 | 36.88 | 19.35 | 9.89 | 5.42 | 0.94 | 0.32 |

ENTER MVA BELOW TO ADJUST CURRENT IN THE TABLE:

140.00 MVA PEAK
115.00 kV
1.73 3 Phase
703.69 Amps PEAK CALC'D

84.00 MVA AVERAGE
115.00 kV
1.73 3 Phase
422.22 Amps AVERAGE CALC'D

EXHIBIT
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# Public Hearing Ex. 57

Biennial Transmission Plan/Report Listings for 2007-NE-N3 in 2007, 2009, 2011

and 2013 (changed to 2013-NE-N21)

### 7.3.14 Hubbard-Menahga Area

***Tracking Number.*** 2007-NE-N3

***Utility.*** Great River Energy

***Inadequacy.*** The 34.5 kV system between Hubbard and Verndale is incapable of supporting the voltage on contingency for the projected load by 2010.

A map of the area is shown on the following page.

***Alternatives.*** GRE had planned to construct a 34.5 kV line from Hubbard to Menahga. However, due to the potential of ethanol loads on the southern end of the system, a larger line should be developed for meeting potential larger loads in the area. The Hubbard-Menahga 115 kV line would be the start of a Hubbard-Menahga-Wadena/Compton-Wing River 115 kV line.

This area also has some wind potential. The existing 34.5 kV system, due to capacity limitations, would not provide the needs if a large windfarm were to develop in the area. The start of a 115 kV line between Hubbard and Wing River would provide the appropriate capability.

***Analysis.*** The Menahga area sees low voltages on the loss of the Hubbard-Twin Lake 34.5 kV line. Historical load levels indicate that low voltage is already a problem if this critical contingency were to occur. MP is installing a 2.4 MVAR capacitor at Sebeka Regulator Station, which should be complete early in 2008, and this will push the voltage issues out a few years, depending on load growth.

***Schedule.*** GRE is assessing this system as part of its Long Range Planning study, which is schedule to be completed in 2008. GRE may elect to proceed with this line in 2008. A Certificate of Need will be required if the line is longer than 10 miles.



EXHIBIT
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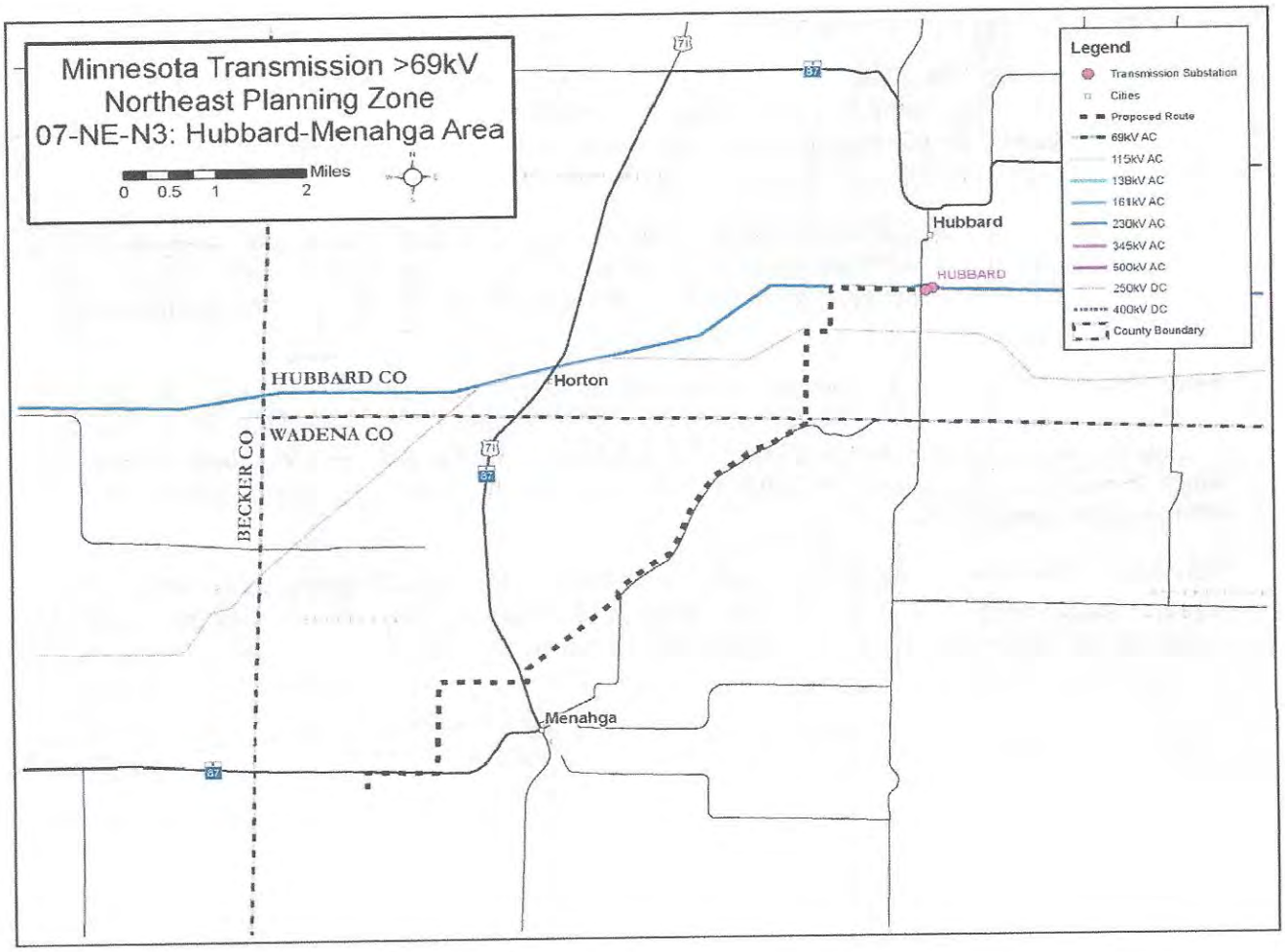

Minnesota Transmission >69kV
Northeast Planning Zone
07-NE-N3: Hubbard-Menahga Area
Miles
0 0.5 1 2
Legend
Transmission Substation
Cities
Proposed Route
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
County Boundary
Hubbard
HUBBARD
HUBBARD CO
WADENA CO
BECKER CO
Horton
Menahga
71
87

### 6.3.11 Hubbard-Menahga Area

***Tracking Number.*** 2007-NE-N3

***Utility.*** Great River Energy

***Inadequacy.*** The 34.5 kV system between Hubbard and Verndale is incapable of supporting the voltage on contingency for the projected load by 2010.

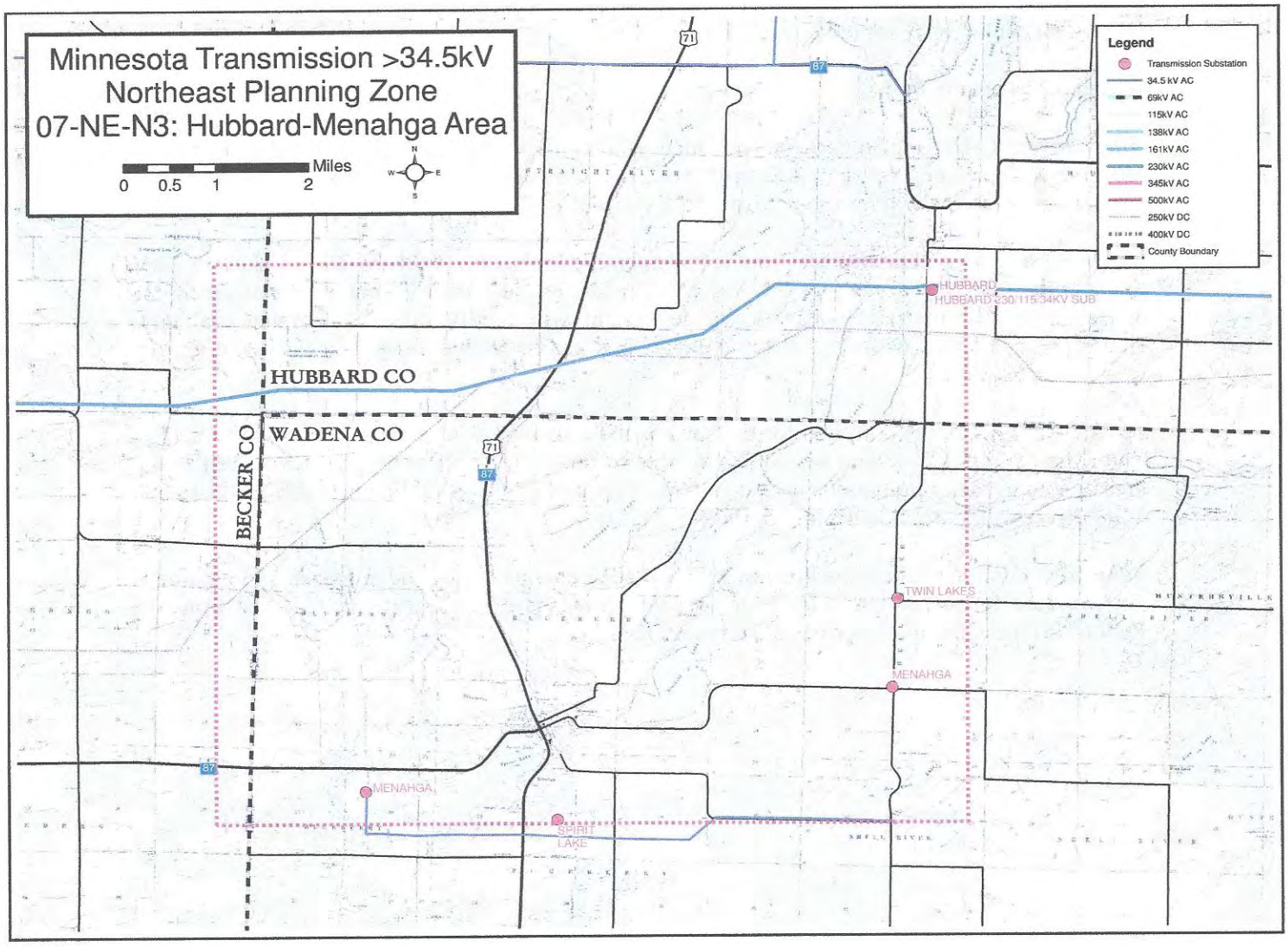
A map of the area is shown on the following page.

***Alternatives.*** GRE is planning on constructing a 115 kV line between the radial Hubbard-Minnesota Pipeline 34.5 kV line and the Todd-Wadena Electric Cooperative Menahga substation. This line will be operated at 34.5 kV initially.

***Analysis.*** The Menahga area sees low voltages on the loss of the Hubbard-Twin Lakes 34.5 kV line and the Leaf River area sees low voltages for loss of the Verndale source. Transferring the Menahga load from the Hubbard-Verndale system will rectify these low system voltages. Historical load levels indicate that low voltage is already a problem if this critical contingency were to occur.

115 kV transmission is proposed for this area as there is some wind potential along the corridor. The existing 34.5 kV system would not be able to serve the needs of a large wind farm in the area, due to capacity limitations on the system. The start of a 115 kV line between Hubbard and Wing River would provide the appropriate capability.

***Schedule.*** GRE has scheduled this project for a 2013 energization. The proposed 115 kV line is not expected to exceed ten miles in length, which means that a Certificate of Need from the Public Utilities Commission will not be required.


Minnesota Transmission >34.5kV
Northeast Planning Zone
07-NE-N3: Hubbard-Menahga Area
Miles
0 0.5 1 2
Legend
Transmission Substation
34.5 kV AC
69kV AC
115kV AC
138kV AC
161kV AC
230kV AC
345kV AC
500kV AC
250kV DC
400kV DC
County Boundary
HUBBARD
HUBBARD 230/115/34KV SUB
HUBBARD CO
WADENA CO
BECKER CO
TWIN LAKES
MENAHGA
MENAHGA
SPIRIT LAKE
71
87

| MPUC Tracking Number | MTEP Year/App | MTEP Project Number | CON? | Utility | Description |
|---|---|---|---|---|---|
| 2005-CX-1 | 2006 / A | 279 | Yes | CapX | Add new 230 kV Line between Boswell and Wilton (Bemidji – Grand Rapids 230 kV Line) to support the Bemidji area and the Red River Valley during winter peak conditions. This project is located in both the Northwest and Northeast zones. PUC Docket No. TL-07-1327 |
| 2007-NE-N1 | 2009/C | 2548 | Yes | MP | New 230/115 kV transformer & transmission line upgrade to 230 kV, Duluth area, St. Louis Co. Recent study indicates this project is not needed until the 2020 timeframe. |
| 2007-NE-N2 | 2010/A | 2547 | No | MP | Transmission for Essar Steel, Grand Rapids-Nashwauk areas, Itasca Co., under construction PUC Docket No. TL-09-512 |
| 2007-NE-N3 | 2011/A | 2571 | Maybe | GRE | MN Pipeline-Menahga 115 kV line (operated at 34.5 kV) This project is impacted by pipeline pumping station voltage drop issues. The line may have to be extended to Hubbard or to RDO-Osage 34.5 kV line, unless voltage drop issues can be corrected. Either option may put line over 10 miles requiring a CON. |
| 2007-NE-N5 | 2010/A | 2576 | No | GRE | Pokegama 115 kV distribution substation |
| 2007-NE-N6 | 2012/B | 2632 | No | GRE | Onigum 115 kV conversion Line is currently less than 10 miles, however CON may be required if route is altered. |
| 2009-NE-N1 | 2009/A | 2552 | No | MP | 3 mile Skibo-Hoyt Lakes 138 kV transmission line, Hoyt Lakes area, St. Louis Co. |

| MPUC Tracking Number | MTEP Year/App | MTEP Project Number | CON? | Utility | Project Description and Timeframe |
|---|---|---|---|---|---|
| **2013-NE-N17**<br><br>*HVDC 750 MW Upgrade* | 2013/C | 3856 | No | MP | Upgrade capacity of existing HVDC line & terminals to 750 MW. Hermantown area, St. Louis Co. |
| **2013-NE-N18**<br><br>*44 Line Upgrade* | 2014/A | 4425 | No | MP | Increase capacity of existing 115 kV line, Forbes – Hibbing, St. Louis Co. |
| **2013-NE-N19**<br><br>*Hoyt Lakes Sub Modernization* | 2014/A | 4426 | No | MP | Rebuild and reconfigure aged Hoyt Lakes Substation to serve new industrial customer. Hoyt Lakes area, St. Louis Co. |
| **2013-NE-N20**<br><br>*Haines Road Capacitor Bank* | 2014/C | 4427 | No | MP | New 115 kV capacitor bank at Haines Road Substation needed for voltage support in the Duluth area, St. Louis Co. |
| **2013-NE-N21**<br><br>*Verndale – Hubbard 115 kV Line* | 2014/B | 2571 | Yes | GRE/<br><br>MP | New Hubbard-Cat River 115 kV line that will replace 2007-NE-N3. Due to motor starting at pumping station, it was decided to immediately operate at 115 kV. To do so, Hubbard 115 kV bus would need the removal of a 115/34.5 kV transformer. This transformer would be moved to the new proposed Cat River Substation. The 115 kV line is expected to be over 20 miles in length and will serve 34.5 kV load between Verndale and Hubbard. |

# Public Hearing Ex. 58

GRE 2008 Long-Range Transmission Plan (selected) – Verndale-Hubbard 34.5 System

# GREAT RIVER ENERGY

GREAT RIVER
ENERGY®
A Touchstone Energy® Cooperative

# LONG-RANGE TRANSMISSION PLAN

## TRANSMISSION PLANNING DIVISION

**OCTOBER, 2008**

EXHIBIT
58

# C: GRE-MP 34.5 kV Region

The GRE-MP 34.5 kV region covers the area that is served in majority by the GRE and MP 34.5 kV integrated transmission system with some substations taking service at 115 kV. Generally the region is centrally located west of the Brainerd area with tourism and agriculture being the main industries in the area. Some of the major towns served from this area on the northern side from west to east are Park Rapids, Walker, and Pequot Lakes. The central towns are Wadena to the far west and the major eastern loads of Baxter and Brainerd. On the southern side of the region, from west to east, are the towns of Long Prairie and Little Falls. Many smaller towns fill in the spaces between these regional communities. The member systems which serve this area are:

- Crow Wing Power (CWP)
- Itasca-Mantrap Cooperative Electric Association (IMCEA)
- Lake Country Power (LCP)
- Stearns Electric Association (SEA)
- Todd-Wadena Electric Cooperative (TWEC)

Located in the heart of Minnesota's lake country, Crow Wing Power serves over 36,000 members in Crow Wing, Cass, and Morrison counties. Crow Wing serves members in an approximately 2,800 square mile area, which includes eastern and northwestern Morrison County, the greater portion of Crow Wing County, and the southern portion of Cass County.

The Itasca-Mantrap service area includes approximately two-thirds of Hubbard County, one-half of Becker county, and small parts of Cass, Wadena, and Clearwater counties.

Lake Country Power serves a large diverse area in Northeastern Minnesota covering nearly 10,000 square miles. The area served varies from bedroom communities to lakeshore properties to remote wilderness. The Onigum substation is the only LCP load in this region.

Stearns Electric Association is located in central Minnesota, serving consumers in all of Stearns county, and portions of Todd, Morrison, Douglas, Pope, and Kandiyohi counties. The northern portion of Stearns is served by this region.

Todd-Wadena Electric Cooperative serves member consumers in a majority of the rural areas of Todd and Wadena counties along with portions of Becker, Cass, Douglas, Hubbard, Otter Tail, and Morrison counties.

This region has a diversified economy consisting largely of agriculture and related agri-businesses. Other economic activity includes logging, tourism, and various service-related businesses. Population growth is occurring in the region due to the region's rural character and the many lakes that are spread across the region.

## Existing System

The load in this region is primarily served by the 34.5 kV sub-transmission system. The 34.5 kV system is supported by a 115 kV system in the area, with a bulk 230 kV system serving the 115 kV system. The 230 kV system parallels the 115 kV system, except the Riverton-Benton County line. The other 230 kV lines are from Riverton to Badoura to Hubbard and Riverton to Wing River. These 230 kV points deliver power into the 115 kV system. The MP 250 kV DC line also passes through the area.

Fourteen 115 kV bulk delivery points to the 34.5 kV system are located at Brainerd, Baxter, Dog Lake, Little Falls, Blanchard, Long Prairie, Verndale, Hubbard, Akeley, Swanville, Eagle Valley, Long Lake, Platte River, and Pequot Lakes. Several 115 kV lines tie these substations together providing the main support to the area. A 69/34.5 kV transformation at Birch Lake provides an additional tie into the 34.5 kV system. Furthermore, the Badoura-Pequot Lakes-Birch Lake 115 kV project will provide further 115 kV support through a 115/69 kV transformer at Birch Lake and a new 115/34.5 kV source at the Pine River substation.

The 34.5 kV system contains several loops between the 115 kV sources from which the majority of the region's load is served. Some loads are served on radial lines from these 34.5 kV loops including some radials that extend over 15 miles from the main 34.5 kV loop. In many of these loops, 34.5 kV voltage regulators and capacitors are present to maintain adequate voltages on the system when one end of the loop fails.

## Reliability and Transmission Age Issues

Transmission Lines on List of 50 Worst Composite Reliability Scores

| | | |
|---|---|---|
| Line 25 | Little Falls 526FM 34.5 kV (PL) | Rank: 11 |
| Line 224 | Blanchard 502F 34.5 kV | Rank: 17 |
| Line 244 | Verndale 510FM 34.5 kV | Rank: 20 |
| Line 289 | Long Lake 545F (OT, RT) 34.5 kV | Rank: 24 |
| Line 243 | Long Prairie 501FM (TW-HAT, TW-IOT) 34.5 kV | Rank: 38 |
| Line 29 | Dog Lake 1T 34.5 kV (TW-WAT) | Rank: 46 |

Transmission Lines Built before 1980

| | | |
|---|---|---|
| Line 25 | Little Falls 526FM 34.5 kV (PL) | 8 Mi.-1958 |
| Line 76 | Badoura 507FM-Birch Lake 516F 34.5 kV (HO) | 5 Mi.-1960 |
| Line 224 | Blanchard 508F 34.5 kV (ST-FN, ST-SU, ST-NTP) | 12 Mi.-1969-71 |
| Line 244 | Verndale 510FM 34.5 kV (TW-LRT) | 4 Mi.-1962 |
| Line 289 | Long Lake 545F 34.5 kV (OT, RT) | 15 Mi.-1976 |
| Line 29 | Dog Lake 1T 34.5 kV (TW-WAT) | 8 Mi.-1974 |
| Line 231 | Blanchard 524F 34.5 kV (ST-US, ST-SU) | 13 Mi.-1971-75 |
| Line 245 | Hubbard 515F 34.5 kV (TW-MET) | 6 Mi.-1971 |

The reliability of this region is generally a little worse than the GRE average. The line age information does not provide the full view of its reliability impact because it only covers part of the system. Much of the 34.5 kV system is owned and operated by Minnesota Power; GRE does not have line age and maintenance information for the MP facilities.

Line 25 from Little Falls is a 32 mile 34.5 kV line serving two substations. Its reliability performance is among the 50 worst lines for each of the six indices used. The majority of the line is owned by Minnesota Power, so most of the maintenance and age information is not available. Minnesota Power rebuilt nearly 10 miles of line from MP Little Falls to the Lastrup tap in 2006 with arresters. Also, the tap switch at Crow Wing's Little Falls substation has been replaced.

Line 224 from Blanchard is a 40 mile, 34.5 kV line serving two substations. This line is operated by Minnesota Power. Its reliability performance is among the 50 worst lines for each of the six indices used, with its worst performance from high numbers of momentary and sustained

outages. The majority of the line is owned by Minnesota Power, so most of the maintenance and age information is not available. MP rebuilt about six miles of this line and GRE added arresters on the GRE owned portions of the line in 2006. Also, a grounding survey is planned to determine grounding additions if indicated.

Line 244 from Verndale is a 19 mile, 34.5 kV line serving two substations. Its reliability performance is worse than the GRE average on all six indices. The majority of the line is owned by Minnesota Power, so most of the maintenance and age information is not available. Remote control has been added at the Sebeka tap switches to aid in outage restoration.

Line 289 from Long Lake is a 33 mile, mostly radial 34.5 kV line serving three substations. Its reliability performance is worse than the GRE average on all six indices; with it worst performance due to long term outages. The maintenance reports do not show much maintenance on this line. The recent addition of the Long Lake 115-34.5kV substation should improve overall reliability, but not for issues related to the radial supply. The RDO substation has been converted to 115kV supply and the planned Long Lake-Badoura 115kV line will provide it with two-way 115kV supply.

Line 243 from Long Prairie is a 28 mile, 34.5 kV line serving two substations. Its reliability performance was worse than the GRE average on five of the six indices. The majority of the line is owned by Minnesota Power, so most of the maintenance and age information is not available. The 2005 addition of the Eagle Valley 115-34.5kV substation has allowed the line to be reconfigured to reduce exposure. Also, remote control is being added to the Hartford tap switches to aid in outage restoration.

Line 29 from Dog Lake is a 20 mile, 34.5 kV line serving two substations. Its reliability performance was worse than the GRE average on four of the six indices. Part of this line is owned by Minnesota Power, so most of the maintenance and age information is not available. There are no recent or planned projects to improve reliability of this line.

## Future Development

### Load Forecast

The following forecast is the load served by the transmission system in the region. This load includes GRE, MP, and municipal load.

| GRE-MP 34.5 kV Region Load (in MW) | | | |
|---|---|---|---|
| Season | 2011 | 2021 | 2031 |
| Summer | 338.8 | 430.8 | 560.2 |
| Winter | 363.0 | 473.4 | 613.6 |

### Planned Additions

The following are projects that are expected over the LRP time period that are not significant in defining alternatives for future load serving capability. This list may also include generation or transmission projects that are already budgeted for construction, but have yet to be energized.

- GRE and MP are planning a new 115 kV transmission line and substation that will connect CWP's Southdale substation to MP's 24 Line (Baxter-Dog Lake Tap) via a breaker station at Scearcyville. The scheduled ISD for this project is 2009.

- IM is planning a new Shingobee distribution substation with an ISD of 2009. GRE is building approximately 2.8 miles of 115 kV line from the Akeley-Badoura 115 kV line to connect the new substation to the system.
- GRE and MP are constructing the Badoura project consisting of 63 miles of new 115 kV transmission connecting the Pequot Lakes, Badoura, Birch Lake, and Long Lake substations. New transformations will be placed at Birch Lake (115/69 kV) and at a new substation at Pine River (115/34.5 kV). As a result of this project, CWP is upgrading their Pine River substation and IM is converting its Tripp Lake substation from 34.5 kV to 115 kV. The scheduled ISD for the project is 2010.
- GRE and MP are planning a new 115 kV transmission connecting the GRE Menahga 34.5 kV substation with MP's Hubbard-MN Pipeline 34.5 kV line. The scheduled ISD for the project is 2010.
- IM is planning a new Potato Lake substation in 2010. GRE is planning to connect the substation with approximately 6 miles of transmission line that taps the Mantrap Tap-Mantrap 34.5 kV line.
- CWP is proposing to add a new 115 kV distribution substation at Hardy Lake in 2012. This substation will directly tap the Southdale-Scearcyville 115 kV line.
- CWP is planning a new Shamineau Lake substation in 2014. GRE will connect this substation via a new 5 mile line that taps the MP Motley-GRE Motley 34.5 kV line.
- CWP is has identified a need for a new Barrows substation that will tap the Nokay-Southdale 115 kV line. The projected ISD for this addition is 2014.
- IM has identified the need for a new Shell Lake substation to be energized in 2015. In order to connect this substation to the bulk system, GRE plans to construct approximately 4.5 miles of transmission line from the Osage-Pine Point 34.5 kV line to the new substation.
- CWP is planning to add a new 115 kV distribution substation at Portage Lake in 2019. This substation will connect to the Tripp Lake-Birch Lake 115 kV line via a 4.0 mile 115 kV line.
- CWP is proposing to add a Gilbert Lake substation that taps the Riverton-Baxter 115 kV line. The expected ISD is 2024.
- CWP has identified a need for a new Ripley distribution substation that will directly tap the Dewing-Little Falls 115 kV line. The expected ISD for this project is 2029.
- CWP has indicated that a new Royalton substation is needed in 2029. This substation will directly tap the Little Falls-Langola Tap 115 kV line.

***230-115 kV Bulk Delivery***

Analysis of the 34.5 kV region has shown that the regional bulk system voltages are beginning to depress as system loading is increasing. Of concern are the 230 kV system voltages in and around the Riverton area. While not violating criteria, the high voltage system voltage issues directly lead to voltage issues on the lower voltage systems. A more detailed analysis of bulk system issues will have to be done as this is outside the scope of this study. Some of the System Intact voltages are listed in the below table.

| Facility | 2011 SUPK % | 2021 SUPK % |
|---|---|---|
| Riverton 230 kV | 102.2 | 97.2 |
| Mud Lake 230 kV | 101.8 | 96.8 |
| Wing River 230 kV | 101.5 | 95.7 |
| Badoura 230 kV | 102.9 | 97.3 |

| Facility | 2011 SUPK % | 2021 SUPK % |
|---|---|---|
| Hubbard 230 kV | 103.1 | 97.2 |
| Little Falls 115 kV | 102.5 | 96.7 |
| Blanchard 115 kV | 102.5 | 97.0 |
| Platte River 115 kV | 101.8 | 96.1 |
| Swanville 115 kV | 103.0 | 97.3 |

A new bulk source into the Little Falls area would help to boost the 115 kV voltages and improve regional 34.5 kV load serving capability. This source could come from the proposed Pierz 230/115 kV source in the ***Central Minnesota Region-Mille Lacs Area***. Other potential sources would involve 230 or 115 kV transmission from the St. Cloud and/or the Brainerd areas. Additions of 230 kV capacitor could help with the 230 kV system voltages. It is expected that the CAPX Fargo-Monticello 345 kV line would greatly help out with voltages in the area as through-flow to the St. Cloud and Twin Cities metro areas would be reduced.

A few bulk system thermal overloads were also observed. The Riverton-Brainerd and Mud Lake-Brainerd 115 kV lines overload for loss of the Mud Lake and Riverton 230/115 kV transformers, respectively.

**Thermal Overloads**

| Facility | Rating MVA | Estimated Year | 2011 MVA | 2021 MVA |
|---|---|---|---|---|
| Riverton-Brainerd 115 kV line | 90 | 2018 | 76.1 | 110.8 |
| Mud Lake-Brainerd 115 kV line | 120 | 2020 | 102.5 | 134.8 |

It is assumed that the cheapest option would be to rebuild these facilities to a higher capacity conductor. A new 230/115 kV transformation at Scearcyville may also provide loading relief to these facilities. However, further study is required to validate this option. Assuming a rebuild to 636 ACSR, the following are the recommended bulk facility installations. The lines will likely be rebuilt by MP as they are the owners of these facilities.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2018 | Riverton-Brainerd, 13.13 Mile, 636 ACSR, 115 kV line rebuild | $4,267,250 |
| 2020 | Mud Lake-Brainerd, 4.41 Mile, 636 ACSR, 115 kV line rebuild | $1,433,290 |

## ***Verndale-Dog Lake-Baxter-Brainerd Area***

The Verndale-Dog Lake-Baxter-Brainerd system consists of the 34.5 kV system that ties these 115/34.5 kV sources together. The following are the 34.5 kV outlets for this area:

- 503 Line from Verndale
- 503 Line from Dog Lake
- 534 Line from Baxter
- 504 Line from Brainerd

This area also has two hydroelectric stations at Pillager and Sylvan. From Sylvan, the normally open 502 Line goes to the ***Little Falls-Platte River-Blanchard Area***.

Other lines exist in the Verndale and Brainerd area that tie to the system, but are not of concern to the capability of serving GRE substations of Staples, Ward, and Motley. The GRE 115 kV loads in the area include Aldrich (Verndale), Thomastown, Southdale, Baxter, Nokay, and Dewing. The following forecast is the load served in this area. This load includes GRE, MP, and Staples Municipal load.

| Season | 2011 | 2021 | 2031 |
|---|---|---|---|
| Summer | 124.5 | 166.7 | 226.6 |
| Winter | 117.3 | 151.5 | 195.9 |

The distribution substation interconnections that are scheduled over the LRP time period are depicted in the following table. In total, four distribution substation interconnections are planned for the Shamineau Lake, Hardy Lake, Gilbert Lake, and Barrows substation projects.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2012 | Hardy Lake 115 kV 3-way switch | $205,000 |
| 2014 | Shamineau Lake- MP 524 Line, 5.0 Mile, 477 ACSR, 115 kV line and 3-way switch (operated at 34.5 kV) | $2,700,000 |
| 2014 | Nokay-Southdale Line Tap to Barrows 1.0 mile, 336 ACSR 115 kV line and 3-way switch | $894,000 |
| 2024 | Gilbert Lake 115 kV 3-way switch | $205,000 |

## Area Deficiencies

Deficiencies seen in this area reside in the western portion of this system around Dog Lake and Verndale. The completion of the Scearcyville-Southdale 115 kV line in the eastern portion of the region will loop in the Southdale substation and create a 115 kV ring around the Brainerd/Baxter area, thus securing the transmission system through the LRP time frame. The overload of the Brainerd and Verndale 115/34.5 kV transformers can be alleviated by switching loads to the other transformers in the system if necessary. Most of the 34.5 kV voltage deficiencies seen are caused by loss of the Dog Lake 115/34.5 kV transformer.

### Overloads

| Facility | Rating MVA | Estimated Year | 2011 MVA | 2021 MVA | Contingency |
|---|---|---|---|---|---|
| Brainerd 115/34.5 kV transformer #1 | 30 | 2010 | 38.2 | 42.9 | Brainerd 115/34.5 kV transformer #2 |
| Brainerd 115/34.5 kV transformer #2 | 30 | 2010 | 38.3 | 43.0 | Brainerd 115/34.5 kV transformer #1 |
| Verndale 115/34.5 kV transformer #1 | 20 | <2011 | 34.0 | 41.8 | Verndale 115/34.5 kV transformer #2 |
| Verndale 115/34.5 kV transformer #2 | 20 | <2011 | 36.9 | 45.3 | Verndale 115/34.5 kV transformer #1 |

### Voltage Deficiencies

| Substation | Estimated Year | 2011 % | 2021 % | Contingency |
|---|---|---|---|---|
| Shamineau Lake 34.5 kV | 2017 | 95.6 | 89.3 | Dog Lake 115/34.5 kV transformer |
| Ward 34.5 kV | 2018 | 99.4 | 88.0 | Dog Lake 115/34.5 kV transformer |
| GRE Motley 34.5 kV | 2019 | 96.9 | 90.3 | Dog Lake 115/34.5 kV transformer |
| GRE Staples 34.5 kV | 2019 | 97.3 | 90.0 | Verndale-Wing River 115 kV |
| MP Staples 34.5 kV | 2020 | 96.7 | 89.3 | Verndale-Wing River 115 kV |

## Alternatives

Alternatives look at providing a new source into the 34.5 kV system and converting more load from 34.5 kV to 115 kV.

## Option 1: Motley 115 kV conversion and Shamineau Lake-Ward development

The conversion of the GRE Motley load to 115 kV would offload the 34.5 kV system to provide better voltage regulation upon outage of the Dog Lake 115/34.5 kV transformer. Adding a line between Shamineau Lake and Ward would allow for Ward to be served from the Dog Lake source upon loss of the Dog Lake Tap-Ward Tap 34.5 kV line or the Verndale-Aldrich 34.5 kV line. This line would be constructed to 115 kV standards and operated at 34.5 kV.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2017 | Motley- MP 24 Line, 4.3 Mile, 477 ACSR 115 kV line | $1,747,400 |
| 2017 | GRE Motley conversion to 115 kV operation | $350,000 |
| 2018 | Shamineau Lake-Ward, 6.75 Mile, 477 ACSR 115 kV line (operated at 34.5 kV) | $2,814,000 |

## Option 2: Shamineau Lake 115/34.5 kV source

This option would establish a 115/34.5 kV source at Shamineau Lake and provide 34.5 kV outlets to the MP 534 Line, Ward, and North Parker substations. This would provide another source into the middle of the area plus provide support to the Blanchard area.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2016 | Shamineau Lake-North Parker, 13.6 Mile, 477 ACSR 115 kV line (operated at 34.5 kV) | $5,384,800 |
| 2019 | Shamineau Lake 115/34.5 kV source | $6,201,400 |
| 2022 | Shamineau Lake-Ward, 6.75 Mile, 477 ACSR 115 kV line (operated at 34.5 kV) | $3,149,000 |

## Generation Options

Generation would be attractive on the low-side of the Verndale to unload the transformers. However, to offset transmission projects it would be more feasible away from the main delivery points to delay future lines or voltage support improvements. The capacity and radial nature of the 34.5 kV lines make it very difficult to justify generation placement in this area.

## Present Worth

A cost analysis was performed on each option with loss savings assumed to be benchmarked against Option 1. The loss savings in MW for each option are as follows:

| Option | 2011 Summer | 2021 Summer | 2031 Summer |
|---|---|---|---|
| 2 | 0.0 | -0.5 | -0.9 |

With the loss allocations, the present worth is summarized as follows (in 1000's):

| Option | Cumulative Investment | Present Worth | Present Worth w/ Loss Savings |
|---|---|---|---|
| 1 | $9,644 | $9,903 | - |
| 2 | $30,417 | $29,822 | $27,927 |

Option 1 offers the least amount of investment. However, Option 1 provides marginal voltage support throughout the LRP time period. The Ward and Shamineau Lake substations will need additional transmission facilities that will allow for adequate voltage support for System Intact conditions in 2032. The Option 2 facilities offer much improved system performance over the Option 1 facilities and provide benefits not only to this area but the ***Long Prairie-Swanville-Blanchard Area*** as well via the Shamineau Lake-North Parker 115 kV line. Therefore, Option 2 is being preferred as the recommended plan.

### Viability with Growth

GRE will have to watch the load growth closely in this region. The Shamineau Lake 115/34.5 kV source will provide for additional flexibility in serving the area loads as they grow as they could be potential candidates for 115 kV conversion. A 115 kV line to Shamineau Lake would also lend itself to be a potential start to a 115 kV loop to Long Prairie and/or Blanchard. However, if load growth does not occur at the expected rates, GRE will have to revisit the transmission plan for the area to see if an alternate option makes better sense to pursue.

## ***Verndale-Hubbard Area***

The Verndale-Hubbard area consists of the 34.5 kV system that ties the 115/34.5 kV sources between Verndale and Hubbard. The 34.5 kV MP 515 Line ties the Verndale and Hubbard substations together and serves the GRE substations of Twin Lakes, Menahga, Orton, Sebeka, and Leaf River. Other lines exist in the Verndale and Hubbard area that tie to the system, but are not of concern to the capability of serving these GRE substations. This load includes GRE and MP load.

| Season | 2011 | 2021 | 2031 |
|---|---|---|---|
| Summer | 16.9 | 21.0 | 26.4 |
| Winter | 21.9 | 27.5 | 35.1 |

GRE's Pipeline-Menahga 34.5 kV project will help to serve this system upon loss of either end of the loop. This project is currently budgeted with an expected ISD of 2010, will be constructed to 115 kV specifications, and is assumed as being in-service for the simulations.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2010 | Pipeline-Menahga, 8.5 Mile, 477 ACSR 115 kV line (operated at 34.5 kV) | $1,644,563 |

### Area Deficiencies

Area deficiencies are voltage-related in nature and stem from the loss of ties to either the Hubbard or Verndale sources.

**Voltage Deficiencies**

| Substation | Estimated Year | 2011 % | 2021 % |
|---|---|---|---|
| Leaf River 34.5 kV | 2014 | 93.1 | 86.2 |
| GRE Sebeka 34.5 kV | 2017 | 95.8 | 88.9 |
| Blue Grass 34.5 kV | 2018 | 94.6 | 88.0 |
| Sebeka Regulator 34.5 kV | 2020 | 95.4 | 89.2 |
| Orton 34.5 kV | 2020 | 97.3 | 91.0 |
| Twin Lakes 34.5 kV | 2020 | 97.1 | 91.0 |
| MP Sebeka 34.5 kV | 2021 | 95.7 | 89.8 |

## Alternatives

Alternatives look to providing additional sources and ties to the 34.5 kV system.

## Option 1: Leaf River-Compton 115 kV line

Addition of a Leaf River-Compton 115 kV line operated at 34.5 kV would tie the Leaf River substation back to the Verndale substation upon loss of the Leaf River-Verndale 34.5 kV line.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2021 | Leaf River-Compton, 9.0 Mile, 477 ACSR 115 kV line (operated at 34.5 kV) | $3,642,000 |

## Option 2: Hubbard-Wing River 115 kV development

This option looks at establishing a 115 kV path between the Hubbard and Wing River 115 kV substations and placing a new 115/34.5 kV substation at Orton Tap. Distribution substation conversions at Menahga, Leaf River, Compton, and Hewitt are required with this option.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2021 | Hubbard-Wing River 115 kV development | $26,316,010 |

## Generation Options

As discussed in the ***Verndale-Dog Lake-Baxter-Brainerd Area***, generation would be attractive on the low-side of the Verndale substation to unload the transformers. However, to offset transmission projects it would be more feasible away from the main delivery points to delay future lines or voltage support improvements. Depending on load growth, distributed generation may offer a great opportunity in this area as small generation units may have long-term impacts on the transmission grid.

## Present Worth

A cost analysis was performed on each option with line losses evaluated with Option 1 being the benchmark for loss savings. The loss savings in MW for each option are as follows:

| Option | 2011 Winter | 2021 Winter | 2031 Winter |
|---|---|---|---|
| 2 | 0.0 | -0.6 | -2.6 |

With the loss allocations, the present worth is summarized as follows (in 1000's):

| Option | Cumulative Investment | Present Worth | Present Worth w/ Loss Savings |
|---|---|---|---|
| 1 | $8,728 | $7,093 | - |
| 2 | $63,068 | $51,315 | $47,150 |

Based on the present worth values, it is evident that Option #1 is the preferred plan.

## Viability with Growth

Option 1 provides adequate support to the system based on the present LRP load projections and would provide a base for deploying the Option 2 plan if needed. GRE will have to monitor load growth to see if Option 2 might become necessary. It may feasible to simply build the Orton Tap 115/34.5 kV source and Hubbard-Menahga-Orton Tap 115 kV line and convert Menahga to

115 kV operation. Wind projects may also push the development of the Option 2 facilities as the area around Verndale has the potential to see many wind interconnections.

### *Verndale-Eagle Valley-Long Prairie Area*

The Verndale-Eagle Valley-Long Prairie system consists of the 34.5 kV system that ties the 115/34.5 kV sources between Verndale, Eagle Valley, and Long Prairie. Two 34.5 kV outlets, the 519 and 533 Lines, exist at Verndale, one outlet exists at Long Prairie (501 Line), and two outlets emanate from Eagle Valley (513 and 517 Lines). Other lines exist in the Long Prairie and Verndale area that tie to the system, but are not of concern to the capability of serving GRE substations at Hartford, Iona, Eagle Bend, Hewitt, and Compton. The following forecast is the load served in this area. This load includes GRE, MP, and Wadena Municipal load.

| Season | 2011 | 2021 | 2031 |
|---|---|---|---|
| Summer | 37.4 | 43.6 | 49.4 |
| Winter | 39.9 | 46.7 | 53.0 |

### Area Deficiencies

The Eagle Valley 115/34.5 kV source greatly aids in holding the voltage at the Hewitt, Compton, and Wadena 34.5 kV substations upon loss of the Verndale source. However, the Compton voltage falls below criteria in 2022 and the Wadena voltage in 2023. Also of interest is the loading on the Verndale 115/34.5 kV transformers. The third 20 MVA, 115/34.5 kV transformer failed in 2006 and is has put additional strain on the remaining transformers. The most severe loading is seen when one Verndale 115/34.5 kV transformer is lost. Switching the system to have load sourced from other transformers will likely alleviate these overloads. The addition of the Shamineau Lake 115/34.5 kV source as identified in the ***Brainerd-Baxter-Dog Lake-Verndale Area*** would also offer transformer loading relief.

**Overloads**

| Facility | Rating MVA | 2011 MVA | 2021 MVA | Contingency |
|---|---|---|---|---|
| Verndale 115/34.5 kV transformer #1 | 20 | 34.0 | 41.7 | Verndale 115/34.5 kV transformer #2 |
| | | 22.2 | 28.2 | Dog Lake 115/34.5 kV transformer |
| Verndale 115/34.5 kV transformer #2 | 20 | 36.9 | 45.3 | Verndale 115/34.5 kV transformer #1 |
| | | 21.8 | 27.7 | Dog Lake 115/34.5 kV transformer |

**Voltage Deficiencies**

| Substation | Estimated Year | 2011 % | 2021 % |
|---|---|---|---|
| Compton 34.5 kV | 2022 | 97.2 | 92.3 |
| Wadena 34.5 kV | 2023 | 96.0 | 91.0 |

The GRE criterion is to have a 92% voltage at GRE buses, whereas MP buses have a criterion of 90% during contingency conditions.

### Alternatives

The deficiencies in the area stem from the loss of the Verndale-Wadena 34.5 kV line as this puts the largest load in the area on a long radial line far from any source. Therefore, alternatives focus on 115 kV load conversion and providing additional ties into the Wadena area.

The following are options that were considered:

### Option 1: Compton-Leaf River 115 kV line and Hewitt 115 kV conversion

This option examines adding a Compton-Leaf River 115 kV line that is initially operated at 34.5 kV. This would provide another tie to the Compton/Wadena area from the Verndale sub and help mitigate the Verndale-Wadena 34.5 kV outage. Conversion of the Hewitt substation to 115 kV via a Wing River-Hewitt 115 kV line would further offload the 34.5 kV system to maintain the Wadena voltage during contingency situations. Finally, a 21.6 MVAR cap bank would be placed at the Verndale 115 kV bus to provide voltage support upon loss of the tie to Wing River.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2022 | Hewitt 115 kV conversion | $350,000 |
| 2022 | Wing River-Hewitt, 4.5 Mile, 477 ACSR, 115 kV line | $2,156,000 |
| 2022 | Compton-Leaf River, 9.0 Mile, 477 ACSR, 115 kV line (operated at 34.5 kV) | $3,642,000 |
| 2026 | Verndale 115 kV 21.6 MVAR capacitor bank | $281,200 |

### Option 2: Wing River-Hubbard 115 kV development

This option looks at establishing a 115 kV path between the Hubbard and Wing River 115 kV substations and establishes a new 115/34.5 kV substation at Orton Tap in the ***Hubbard-Verndale Area***. Distribution substation conversions at Menahga, Leaf River, Compton, and Hewitt are required with this option.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2022 | Wing River-Hubbard 115 kV development | $26,316,010 |

### Present Worth

A cost analysis was performed on each option with Option 1 being the benchmark for loss savings. The loss savings in MW for each option are as follows:

| Option | 2011 Winter | 2021 Winter | 2031 Winter |
|---|---|---|---|
| 2 | 0.0 | 0.0 | -2.6 |

With the loss allocations, the present worth is summarized as follows (in 1000's):

| Option | Cumulative Investment | Present Worth | Present Worth w/ Loss Savings |
|---|---|---|---|
| 1 | $16,520 | $12,605 | - |
| 2 | $66,852 | $50,835 | $46,822 |

Option 1 offers the least cost plan and requires the least investment.

### Viability with Growth

Load growth will have to be carefully monitored in this area. The Leaf River-Compton 115 kV line offers only limited support to the Wadena substation. Conversion of the Wadena load to 115 kV operations or establishing a 115/34.5 kV source at Wadena would provide more reliable service to this substation and would help with the Verndale transformer loading issues. Also, the area surrounding Wadena has the potential to have many larger wind farm interconnections that

could not be handled by the 34.5 kV system. In the event that that these wind projects develop, GRE would likely have to revert to the Option 2 facilities to handle the interconnections.

### *Long Prairie-Swanville-Blanchard Area*

The Long Prairie-Swanville-Blanchard system consists of the 34.5 kV system that ties the 115/34.5 kV sources between Long Prairie, Swanville, and Blanchard. Three 34.5 kV outlets, 521, 524 and 508 Line, exist at Blanchard and one 34.5 kV outlet, the 527 Line, sources from Long Prairie. The Swanville source connects the 508 and 524 Lines. The 521 Line serves the MN Pipeline load individually as its start up causes voltage dips on the system. MP has isolated this load to its own 115/34.5 kV transformer at Blanchard. Other lines exist in the Long Prairie and Blanchard area that tie to the system, but are not of concern to the capability of serving GRE substations at Sobieski, Pine Lake, Pillsbury, Flensburg, and North Parker. The following forecast is the load served in this area and includes both GRE and MP load.

| Season | 2011 | 2021 | 2031 |
|---|---|---|---|
| Summer | 39.7 | 47.3 | 57.1 |
| Winter | 34.6 | 40.7 | 48.7 |

### Area Deficiencies

No line overloads were identified within this area. Voltage deficiencies stem from loss of the Swanville source which requires significant reconfiguration of the system.

**Voltage Deficiencies**

| Substation | Estimated Year | 2011 % | 2021 % |
|---|---|---|---|
| North Parker 34.5 kV | 2016 | 97.0 | 86.1 |
| GRE Flensburg 34.5 kV | 2019 | 99.1 | 89.2 |
| North Parker Jct. 34.5 kV | 2019 | 97.9 | 87.3 |
| Flensburg Switch 34.5 kV | 2021 | 99.1 | 89.4 |

### Alternatives

The immediate issue in this area is the voltage performance of the 34.5 kV system. The North Parker substation is on a radial line distant from all three area sources. Alternatives look to provide voltage support via new sources closer to the North Parker area.

### Option 1: Pike Creek 115/34.5 kV source

This option provides a new source at the junction of the 34.5 kV 508 and 521 Lines by rebuilding the Blanchard to 508-521 Tie 34.5 kV line to 115 kV. This also places a stronger source closer to the MN Pipeline load which would likely help in reducing voltage dips upon starting of the compressor station.

The following is the estimated timeline for Option 1 installations:

| Estimated Year | Facility | Cost |
|---|---|---|
| 2016 | Blanchard-Pike Creek, 9.15 Mile, 477 ACSR 115 kV rebuild | $2,516,250 |
| 2016 | Pike Creek 30 MVA, 115/34.5 kV source | $3,814,400 |

### Option 2: Shamineau Lake-North Parker development

This option establishes a 34.5 kV connection between Shamineau Lake and North Parker to provide support to the North Parker substation (constructed to 115 kV standards). Eventually, a Shamineau Lake 115/34.5 kV source is required for support of both the Shamineau Lake and North Parker areas.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2016 | Shamineau Lake-North Parker, 13.6 Mile, 477 ACSR, 115 kV line (operated at 34.5 kV) | $5,219,800 |
| 2019 | Shamineau Lake 30 MVA, 115/34.5 kV source | $6,201,400 |

### Generation Options

Generation would be attractive at North Parker to provide voltage support and defer transmission investment. However, the Shamineau Lake-North Parker transmission development would be beneficial to both the Dog Lake and the Swanville-Blanchard areas, thus making generation investment difficult to justify.

### Present Worth

A cost analysis was performed on each option with line losses evaluated with Option 1 being the benchmark for loss savings. The loss savings in MW for each option are as follows:

| Option | 2011 Summer | 2021 Summer | 2031 Summer |
|---|---|---|---|
| 2 | 0.0 | -0.6 | -0.8 |

With the loss allocations, the present worth is summarized as follows (in 1000's):

| Option | Cumulative Investment | Present Worth | Present Worth w/ Loss Savings |
|---|---|---|---|
| 1 | $11,337 | $12,969 | - |
| 2 | $22,870 | $23,484 | $21,365 |

Option 1 is the least cost plan. However, as discussed in the ***Brainerd-Baxter-Dog Lake-Verndale Area***, the Shamineau Lake 115/34.5 kV source provides benefits to both areas. Therefore, Option 2 will be the recommended plan for the area.

### Viability with Growth

Option 2 allows for future conversion of the North Parker and other area substations to 115 kV operation. The Blanchard and Little Falls 115 kV voltages are fairly weak as the sources into the 115 kV system are distant from these substations, thus the voltage support provided by the Pike Creek source to the 34.5 kV system is dictated by the 115 kV system voltage levels. Also, the Shamineau Lake 115 kV line also would provide the basis for a 115 kV loop to Blanchard or Long Prairie.

## ***Blanchard-Platte River-Little Falls Area***

The Blanchard-Platte River-Little Falls system consists of the 34.5 kV system that ties the 115/34.5 kV sources between Blanchard, Platte River, and Little Falls. One 34.5 kV outlet, the 511 Line, exists at Blanchard and another outlet, the 526 Line, emanates from Little Falls. The two outlets meet with the 5261 FDR line, which ties the system together as a looped system. The Platte River substation is in the middle of the radial line that serves Rice and provides

emergency support upon loss of the Blanchard source. Other lines exist in the Little Falls and Blanchard area that tie to the system, but are not of concern to the capability of serving GRE substations of Little Falls and Lastrup. The following forecast is the load served in this area. This load includes GRE and MP substations.

| Season | 2011 | 2021 | 2031 |
|---|---|---|---|
| Summer | 28.7 | 35.3 | 35.7 |
| Winter | 24.6 | 31.1 | 32.5 |

Two distribution interconnection projects are planned for the area for the Ripley and Royalton substations. GRE interconnection costs are listed in the following table.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2029 | Royalton 115 kV 3-way switch | $205,000 |
| 2029 | Ripley 115 kV 3-way switch | $205,000 |

## Long-term Deficiencies

The transmission system in this area is already deficient for both line overloads and voltage violations. They are as follows:

### Overloads

| Facility | Rating MVA | Outage | 2011 MVA |
|---|---|---|---|
| Royalton 34.5 kV regulator | 10 | Little Falls Bulk-GRE Little Falls 34.5 kV | 19.2 |
| Royalton Regulator-Rice Tap 34.5 kV | 18 | Little Falls Bulk-GRE Little Falls 34.5 kV | 19.2 |
| Rice Tap-Little Rock 34.5 kV | 18 | Little Falls Bulk-GRE Little Falls 34.5 kV | 18.8 |
| Little Rock-526-511 Tie Sw. 34.5 kV | 18 | Little Falls Bulk-GRE Little Falls 34.5 kV | 17 |

### Voltage Deficiencies

| Substation | 2011 % | 2021 % | Outage | Estimated Year |
|---|---|---|---|---|
| Pierz Regulator 34.5 kV | 92.1 | 75.8 | Little Falls Bulk-GRE Little Falls 34.5 kV | 2013 |
| Rich Prairie 34.5 kV | 92.6 | 77.3 | Little Falls Bulk-GRE Little Falls 34.5 kV | 2013 |
| Buckman 34.5 kV | 93.7 | 79.5 | Little Falls Bulk-GRE Little Falls 34.5 kV | 2014 |
| Lastrup 34.5 kV | 97.6 | 88.7 | System Intact | 2014 |
| Lastrup 34.5 kV | 101.2 | 101.5 | Little Falls Bulk-GRE Little Falls 34.5 kV | 2016 |
| Pierz Regulator 34.5 kV | 99.0 | 91.2 | System Intact | 2016 |
| Pierz 34.5 kV | 99.0 | 91.1 | System Intact | 2016 |
| GRE Little Falls 34.5 kV | 102.8 | 83.5 | Little Falls Bulk-GRE Little Falls 34.5 kV | 2017 |
| Lastrup 34.5 kV | 97.2 | 88.2 | Rice Tap-61k Distribution 34.5 kV | 2017 |
| Little Rock 34.5 kV | 97.2 | 86.0 | Little Falls Bulk-GRE Little Falls 34.5 kV | 2018 |
| Pierz 34.5 kV | 102.4 | 83.7 | Little Falls Bulk-GRE Little Falls 34.5 kV | 2018 |
| GRE Little Falls 34.5 kV | 100.4 | 93.1 | System Intact | 2019 |
| Little Falls 34.5 kV | 101.1 | 94.6 | System Intact | 2021 |

The GRE criteria are to have a 95% System Intact voltage and a 92% contingent voltage at GRE buses, whereas MP buses have a criterion of 90% during contingency conditions. Also of note are the bulk system voltages at Little Falls and Blanchard in the out-year scenarios. While not below the 95% criterion for system intact violations, the 115 kV voltage is becoming

depressed which is leading to depressed voltages on the 34.5 kV system and causing the Royalton and Pierz regulator stations to saturate their LTC's.

### Alternatives

The immediate issue in this area is relieving the flow on the 34.5 kV system upon loss of the Little Falls source. Also, it already takes two regulators to maintain voltage when the tie out of the Little Falls is lost. Taking these items into consideration, only one alternative was tested:

### Option 1: 115 kV conversion

This option examines converting the GRE Little Falls and Lastrup substations to 115 kV operation by connecting them to the Little Falls 115 kV bulk substation. This would remove the two largest loads on this loop and greatly extend the life of the 34.5 kV system.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2012 | Little Falls-GRE Little Falls, 3.0 Mile, 795 ACSS 115 kV line | $2,099,000 |
| 2012 | GRE Little Falls 115 kV conversion | $350,000 |
| 2018 | GRE Little Falls-Lastrup, 12.0 Mile, 795 ACSS, 115 kV line | $6,646,000 |
| 2018 | Lastrup conversion to 115 kV operation | $350,000 |

The 2012 timeline for the Little Falls conversion is based on the voltage. Conversion should take place as soon as funding can be procured for the project.

### Generation Options

Generation would be attractive in the Buckman area, thus, providing a voltage source in the middle of the system. This generation however may not be able to resolve the voltage drop on the transmission lines, leading to continued voltage problems on the large loads located near the transmission sources.

### Present Worth

Present worth analysis was not performed as there are no counter options provided for proposed plan.

### Viability with Growth

Conversion of the GRE loads to 115 kV will greatly extend the life of the 34.5 kV system and provide 34.5 kV loading relief to the regulating stations. Establishing a 115 kV path to Little Falls from Lastrup will also provide a future tie to the Pierz 230/115 kV source (as discussed in the ***Central Minnesota Region-Mille Lacs Area***) to help with bulk system voltage support around the Little Falls area. GRE and MP will have to monitor the load growth in the Little Falls region to see if the Pierz source is needed sooner than the 2022 time frame as estimated by the Mille Lacs area needs. Depending on the timing, establishing a 115/34.5 kV source from this substation would place a source in the middle of the loop thus potentially delaying the conversion of the Lastrup substation until the Mille Lacs development is needed.

## ***Akeley-Pequot Lakes Area***

The Akeley-Pequot Lakes system consists of the 34.5 kV system that ties the 115/34.5 kV sources between Akeley and Pequot Lakes. A 69/34.5 kV transformation exists at the Birch Lake substation that provides additional support to the area. A future 115/34.5 kV transformation will be placed at Pine River upon completion of the Badoura project along with a Badoura-Pine River-Pequot Lakes 115 kV line and a Badoura-Birch Lake 115 kV line. These

facilities are scheduled for completion in 2010 and are assumed as part of the base models. The 34.5 kV system consists of:

- The 507 Line which ties the Birch Lake and Pequot Lakes 34.5 kV substations together and serves the GRE substations of Pine River and Tripp Lake. Both of these substations will be converted to 115 kV operation as part of the Badoura project.
- The 543 and 509 Lines which serve GRE load of Onigum.

The GRE Merrifield load is served from the Riverton-Pequot Lakes 115 kV line. This line not only serves the MP Pequot Lakes 115,34.5 kV substation, but also GRE's 115/69 kV substation. The load served in this region includes GRE and MP load with the following forecast:

| Season | 2011 | 2021 | 2031 |
|---|---|---|---|
| Summer | 30.4 | 38.1 | 45.4 |
| Winter | 38.9 | 52 | 63.7 |

Crow Wing Power is also planning to add a new Portage Lake substation in 2019. GRE will have to install approximately 4 miles of 115 kV line and a 3-way switch on the Tripp Lake-Birch Lake 115 kV line for the interconnection.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2019 | Portage Lake 4.0 Mile, 336 ACSR, 115 kV line and 3-way switch | $2,197,000 |

### Area Deficiencies

Deficiencies stem from the loss of the Birch Lake 34.5 kV tie to Hackensack or the 69/34.5 kV source at Birch Lake. This requires that the large loads of Onigum and Walker be fully supplied from Akeley. The system between Badoura and Pequot Lakes is secure throughout the LRP timeframe upon completion of the Badoura project.

**Overloads**

| Line Segment | Rating MVA | Estimated Year | 2011 MVA | 2021 MVA |
|---|---|---|---|---|
| Badoura Tap-Akeley 34.5 kV | 22 | 2013 | 20.8 | 26.9 |
| Akeley-Walker 34.5 kV | 22 | 2016 | 25.3 | 19.5 |
| Badoura Tap-Akeley Bulk 34.5 kV | 17 | 2021 | 14.6 | 17.2 |

**Voltage Deficiencies**

| Substation | Estimated Year | 2011 % | 2021 % |
|---|---|---|---|
| Onigum 34.5 kV | 2009 | 89.9 | 79.7 |
| Hackensack 34.5 kV | 2015 | 93.1 | 84.8 |
| Ten Mile Lake 34.5 kV | 2015 | 93.2 | 84.9 |
| Walker 34.5 kV | 2019 | 95.5 | 88.4 |

## Alternatives

Alternatives will focus on converting the Onigum load to 115 kV as this is the largest load on the 34.5 kV system between Akeley and Birch Lake. Onigum is the only Lake Country Power substation on the 34.5 kV system so conversion of this load would allow it to be backfed from LCP's other substations.

## Option 1: Birch Lake-Onigum 115 kV line

This option establishes a Birch Lake-Onigum 115 kV line and Onigum 115 kV voltage conversion.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2009 | Birch Lake-Onigum, 9.85 Mile, 477 ACSR, 115 kV line | $4,861,550 |
| 2009 | Onigum conversion to 115 kV | $350,000 |

## Option 2: Shingobee-Onigum 115 kV line

This option establishes a Shingobee-Onigum 115 kV line and Onigum 115 kV voltage conversion. It is assumed that the Akeley-Shingobee Tap 115 kV line would be rebuilt to double circuit back to the Akeley substation so that the radial line could be on a dedicated breaker.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2009 | Shingobee-Onigum, 12.2 Mile, 477 ACSR, 115 kV line | $6,176,100 |
| 2009 | Shingobee Tap-Akeley, 0.75 Mile, 477 ACSR, 115 kV double circuit line | $796,250 |
| 2009 | Onigum conversion to 115 kV | $350,000 |

## Generation Options

Generation would be attractive at the Onigum substation as this is the largest load on the Akeley-Birch Lake system and could provide voltage support to the area. However, due to its proximity to many lakes, distributed generation may be environmentally difficult to site.

## Present Worth

A cost analysis was performed on each option with line losses evaluated for MP and GRE control areas with Option 1 being the benchmark for loss savings. The loss savings in MW for Option 2 are as follows:

| Option | 2011 Winter | 2021 Winter | 2031 Winter |
|---|---|---|---|
| 2 | 0.1 | 0.1 | -0.2 |

With the loss allocations, the present worth is summarized as follows (in 1000's):

| Option | Cumulative Investment | Present Worth | Present Worth w/ Loss Savings |
|---|---|---|---|
| 1 | $6,207 | $11,372 | -- |
| 2 | $8,721 | $15,973 | $16,188 |

Option 1 is the least cost plan and requires the least amount of investment.

**Viability with Growth**

Option 1 is shorter in distance and would utilize existing right of way along its entire route. As load grows in the Walker area, the Option 2 line could be constructed to loop in the Onigum and Birch Lake substations and provide another 115 kV connection to the Akeley area. The MP Walker load could then be easily converted to 115 kV to extend the life of the area 34.5 kV system.

***Hubbard-Long Lake-Akeley Area***

The Hubbard-Long Lake-Akeley system consists of the 34.5 kV system that ties the 115/34.5 kV sources of Akeley and Hubbard. The 115/34.5 kV Long Lake substation provides a source in the middle of the system. Two 115 kV lines tie the Badoura substation to the region; one terminating at Hubbard and one terminating at Long Lake as part of the Badoura project. Furthermore, a 115 kV line ties the Hubbard and Long Lake substations together. Three GRE distribution substations take service at 115 kV: RDO, Palmer Lake, and Long Lake. The 34.5 kV system consists of the following outlets:

- Akeley 544 Line which serves GRE load of Nevis.
- Long Lake 540 Line which serves the GRE load of Mantrap.
- Long Lake 540 and 541 Lines which serve the Park Rapids area.
- Long Lake 545 Line which serves GRE loads of Osage and Pine Point.
- Hubbard 523 Line which serves the MP Hubbard substation.

The load in the area has been increasing at a rate much greater than was anticipated during the previous long range plan. Based on current load projections, the 2011 loads will exceed the 2003 LRP 2026 load forecast. Additionally, the projected 2031 winter peak load will more than double the 2026 WIPK load forecast from the previous LRP. The load served in this region includes GRE and MP load with the following forecast:

| Season | 2011 | 2021 | 2031 |
|---|---|---|---|
| Summer | 61.2 | 78.8 | 119.6 |
| Winter | 85.8 | 123.9 | 184.7 |

There are two new substation interconnections planned for the area over the LRP time frame for the Potato Lake and Shell Lake substations. The Potato Lake substation is proposed to be interconnected to the Mantrap-Mantrap Tap 34.5 kV line via a 7.0 Mile, 477 ACSR, 115 kV line while the Shell Lake substation is proposed to be connected to the Osage-Pine Point 34.5 kV line via a 5.0 Mile, 336 ACSR, 115 kV line. GRE interconnection costs are as follows:

| Estimated Year | Facility | Cost |
|---|---|---|
| 2010 | Potato Lake 7.0 Mile, 477 ACSR, 115 kV line (connected at 34.5 kV) | $2,224,000 |

### Voltage Deficiencies

| Substation | Estimated Year | 2011 % | 2021 % | Contingency |
|---|---|---|---|---|
| Potato Lake 34.5 kV | 2013 | 96.1 | 66.8 | Park Rapids Tap-Mantrap Tap 34.5 kV |
| Mantrap 34.5 kV | 2013 | 96.8 | 68.6 | Park Rapids Tap-Mantrap Tap 34.5 kV |
| GRE Osage 34.5 kV | 2014 | 98.4 | 85.4 | System Intact |
| Pine Point 34.5 kV | 2014 | 98.5 | 83.8 | System Intact |
| Dorset 34.5 kV | 2015 | 98.7 | 76.8 | Park Rapids Tap-Mantrap Tap 34.5 kV |
| GRE Nevis 34.5 kV | 2016 | 100.1 | 83.9 | Park Rapids Tap-Mantrap Tap 34.5 kV |
| MP Nevis 34.5 kV | 2017 | 100.1 | 83.4 | Park Rapids Tap-Mantrap Tap 34.5 kV |

## Alternatives

Options look at converting the majority of the area GRE load to higher voltage levels due to the large loads being located far from the 34.5 kV sources. All options include a new termination at the Hubbard substation. Due to lack of space at the Hubbard substation, the 115/34.5 kV Hubbard transformers would have to be relocated to other locations. A likely location for a new 115/34.5 kV source would be at the GRE Menahga substation. This would place a 115/34.5 kV source about midway between the Long Lake and Verndale sources. The TWEC Menahga distribution substation would be converted to 115 kV operation.

## Option 1: Long Lake-Mantrap Tap 115 kV line and 115 kV conversion.

This option explores rebuilding the Long Lake-Mantrap Tap 34.5 kV line to 115 kV specs with 34.5 kV underbuild. This will place the Mantrap and Potato Lake loads on a dedicated breaker out of Long Lake and separate these loads from the Long Lake-Akeley loop. Eventually, these loads would have to be converted to 115 kV operation. To resolve the voltage issues seen at Pine Point and Osage, a voltage regulator would be placed approximately half way between the Osage 34.5 kV Tap Switches and the Osage 34.5 kV substation. Furthermore, a 115 kV loop would be constructed out of Hubbard to pick up the MN Pipeline, Osage, Shell Lake, and Pine Point substations once the voltage regulator can no longer hold the 34.5 kV voltage to an acceptable level. A 17 Mile, 115 kV line and a breaker station at Carsonville would connect the Osage/Pine Point area with the Potato Lake substation.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2013 | Long Lake-Mantrap Tap, 1.75 Mile, 477 ACSR, 115 kV line (operate at 34.5 kV) | $1,233,890 |
| 2014 | Osage 25 MVA, 34.5 kV Voltage Regulator Station | $100,000 |
| 2017 | Potato Lake and Mantrap 115 kV conversions | $1,000,000 |
| 2017 | Mantrap Tap-Potato Lake Tap-Mantrap, 4.75 Mile, 477 ACSR 115 kV line | $1,444,640 |
| 2019 | Hubbard-Carsonville-Potato Lake, 47.33 Mile, 477 ACSR, 115 kV loop | $20,839,950 |

## Option 2: Potato Lake Tap 115/34.5 kV source

This option places a new 115/34.5 kV source at the Potato Lake Tap switches and would be initially fed via a new 4.25 Mile, 477 ACSR, Long Lake-Potato Lake Tap 115 kV line with 34.5 kV underbuild. Similarly to Option 1, the Potato Lake and Mantrap substations would be converted to 115 kV operation and the Hubbard-Carsonville-Potato Lake loop would be constructed after the installation of the Osage 34.5 kV regulator.

## GRE Long-Range Transmission Plan

| Estimated Year | Facility | Cost |
|---|---|---|
| 2013 | Potato Lake Tap 50 MVA, 115/34.5 kV source | $5,519,909 |
| 2014 | Osage 25 MVA, 34.5 kV Voltage Regulator Station | $100,000 |
| 2019 | Hubbard-Carsonville-Pine Point, 30.33 Mile, 477 ACSR, 115 kV loop | $12,147,950 |
| 2021 | Potato Lake-Carsonville, 17 Mile, 477 ACSR, 115 kV line | $9,397,000 |
| 2021 | Potato Lake Tap-Mantrap, 2.25 Mile, 477 ACSR, 115 kV line | $618,750 |
| 2021 | Potato Lake and Mantrap 115 kV conversions | $1,000,000 |

### Option 3: Itasca-Mantrap 115 kV development

This option initially converts the Mantrap and Potato Lake loads to 115 kV, adds the Osage 34.5 kV regulator station, and eventually constructs the Hubbard-Carsonville-Potato Lake 115 kV loop.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2013 | Potato Lake and Mantrap 115 kV conversions | $3,427,500 |
| 2014 | Osage 25 MVA, 34.5 kV Voltage Regulator Station | $100,000 |
| 2019 | Hubbard-Carsonville-Potato Lake, 47.33 Mile, 477 ACSR, 115 kV loop | $20,839,950 |

### Option 4: Itasca-Mantrap 69 kV development

This option examines placing 115/69 kV sources at Long Lake and Hubbard and converting the majority of the Itasca-Mantrap loads to 69 kV operation. Potato Lake and Mantrap would be converted initially while the Hubbard-Carsonville-Potato Lake portions would be added when the Osage 34.5 kV regulator station fails to support Osage, Pine Point, and Shell Lake.

| Estimated Year | Facility | Cost |
|---|---|---|
| 2013 | Long Lake 70 MVA, 115/69 kV source | $2,174,028 |
| 2013 | Potato Lake and Mantrap 69 kV conversions | $2,760,000 |
| 2014 | Osage 25 MVA, 34.5 kV Voltage Regulator Station | $100,000 |
| 2019 | Hubbard 70 MVA, 115/69 kV source | $2,174,028 |
| 2019 | Hubbard-Carsonville-Potato Lake, 47.33 Mile, 477 ACSR, 69 kV loop | $17,326,850 |

### Generation Options

Generation would be attractive at the Osage or Pine Point substations. The amount of load served on the radial OT Line is requiring the majority of the transmission alternatives proposed above. Due to the cost of the proposed additions, any generation addition that causes delay may be cost justified.

With the loss allocations, the present worth is summarized as follows (in 1000's):

| Option | Cumulative Investment | Present Worth | Present Worth w/ Loss Savings |
|---|---|---|---|
| 1 | $51,105 | $49,288 | - |
| 2 | $60,770 | $58,070 | $58,874 |
| 3 | $49,017 | $48,323 | $47,638 |
| 4 | $49,172 | $49,635 | $58,560 |

Option 3 is the least cost plan and requires the least amount of investment.

### Viability with Growth

Option 3 will provide the best flexibility to serve the load in the area. It will also offer most of the Itasca-Mantrap loads with 115 kV service and extend the life of the 34.5 kV system without major 34.5 kV system additions.

### Recommended Plan

The following are suggested projects for the GRE-MP 34.5 kV region.

| Estimated Year | Responsible Company | Facility | Cost |
|---|---|---|---|
| 2009 | GRE | Birch Lake-Onigum, 9.85 Mile, 477 ACSR, 115 kV line | $4,861,550 |
| 2009 | GRE | Onigum conversion to 115 kV | $350,000 |
| 2010 | CWP | Pine River 115 kV distribution substation upgrade | $350,000 |
| 2010 | IM | Tripp Lake 115 kV distribution substation upgrade | $350,000 |
| 2010 | GRE | Pipeline-Menahga, 8.5 Mile, 477 ACSR, 115 kV line (operated at 34.5 kV) | $1,644,563 |
| 2010 | GRE | Potato Lake 7.0 Mile, 477 ACSR, 115 kV line (operated at 34.5 kV) | $2,901,000 |
| 2010 | IM | Potato Lake 34.5 kV distribution substation | $940,000 |
| 2012 | GRE | Little Falls-GRE Little Falls, 3.0 Mile, 795 ACSS, 115 kV line | $2,099,000 |
| 2012 | CWP | GRE Little Falls 115 kV conversion | $350,000 |
| 2012 | GRE | Hardy Lake 115 kV 3-way switch | $205,000 |
| 2012 | CWP | Hardy Lake 115 kV distribution substation | $1,090,000 |
| 2013 | GRE | Potato Lake and Mantrap 115 kV conversions | $3,427,500 |
| 2014 | GRE | Osage 25 MVA, 34.5 kV Voltage Regulator Station | $100,000 |
| 2014 | GRE | Shamineau Lake - MP 524 Line, 5.0 Mile, 477 ACSR, 115 kV line and 3-way switch (operated at 34.5 kV) | $2,700,000 |
| 2014 | CWP | Shamineau Lake 34.5 kV distribution substation | $940,000 |
| 2014 | GRE | Nokay-Southdale Line Tap to Barrows 1.0 Mile, 336 ACSR, 115 kV line and 3-way switch | $563,000 |
| 2014 | CWP | Barrows 115 kV distribution substation | $1,090,000 |
| 2015 | GRE | Shell Lake 5.0 Mile, 336 ACSR, 115 kV line (operated at 34.5 kV) | $2,380,000 |
| 2015 | IM | Shell Lake 34.5 kV distribution substation | $940,000 |
| 2016 | GRE | Shamineau Lake-North Parker, 13.6 Mile, 477 ACSR, 115 kV line (operated at 34.5 kV) | $5,384,000 |
| 2018 | GRE | GRE Little Falls-Lastrup, 12.0 Mile, 795 ACSS, 115 kV line | $6,646,000 |
| 2018 | CWP | Lastrup conversion to 115 kV operation | $350,000 |
| 2018 | MP | Riverton-Brainerd, 13.13 Mile, 636 ACSR, 115 kV line rebuild | $4,267,250 |
| 2019 | GRE | Shamineau Lake 115/34.5 kV source | $6,201,400 |

## GRE Long-Range Transmission Plan

| Estimated Year | Responsible Company | Facility | Cost |
|---|---|---|---|
| 2019 | GRE | Hubbard-Carsonville-Potato Lake, 47.33 Mile, 477 ACSR, 115 kV loop | $20,839,950 |
| 2019 | GRE | Portage Lake 4.0 Mile, 336 ACSR, 115 kV line and 3-way switch | $2,197,000 |
| 2019 | CWP | Portage Lake 115 kV distribution substation | $1,090,000 |
| 2020 | MP | Mud Lake-Brainerd, 4.41 Mile, 636 ACSR, 115 kV line rebuild | $1,433,290 |
| 2021 | GRE | Leaf River-Compton, 9.0 Mile, 477 ACSR, 115 kV line (operated at 34.5 kV) | $3,642,000 |
| 2022 | GRE | Shamineau Lake-Ward, 6.75 Mile, 477 ACSR, 115 kV line (operated at 34.5 kV) | $3,149,000 |
| 2022 | TWEC | Hewitt 115 kV conversion | $350,000 |
| 2022 | GRE | Wing River-Hewitt, 4.5 Mile, 477 ACSR, 115 kV line | $2,156,000 |
| 2024 | GRE | Gilbert Lake 115 kV 3-way switch | $205,000 |
| 2024 | CWP | Gilbert Lake 115 kV distribution substation | $1,090,000 |
| 2026 | MP | Verndale 115 kV 21.6 MVAR capacitor bank | $281,200 |
| 2029 | GRE | Royalton 115 kV 3-way switch | $205,000 |
| 2029 | GRE | Ripley 115 kV 3-way switch | $205,000 |
| 2029 | CWP | Royalton 115 kV distribution substation | $1,090,000 |
| 2029 | CWP | Ripley 115 kV distribution substation | $1,090,000 |

# Public Hearing Ex. 59

Map showing large available corridors for routing

**Figure 1. Project Overview Map**