



Integrated Transmission System Assessment

Eastern South Dakota
Area 5
(2012-2021)

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Developed For:

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0.0 EXECUTIVE SUMMARY

The purpose of this study is to evaluate and identify system additions needed in the Western, Basin, and Heartland Integrated System (IS). This is accomplished by analyzing near term and out-year summer and winter peak scenarios with best available load estimates and presently known transmission system planned facility additions. This effort will identify limiting transmission element(s) and potential problem areas where load serving capability is limited by voltage or thermal limitations. The goal is to maintain system reliability and customer load serving capability by identifying possible problems and resolving them before they appear. This study examines the high voltage (69 kV and above) transmission system in WAPA's control area located within the Mid-continent Area Power Pool (MAPP) footprint.

Two 250 MVA normal (312 MVA emergency) transformers are recommended to replace the existing 100 MVA Sioux Falls transformers. Due to the large growth in the Sioux Falls area and uncertainty about future construction projects, a third transformer may be required in the Sioux Falls area (Sioux Falls, Lincoln County, VFO) in the future based on development and distribution substation locations. The Sioux Falls transformers were sized adequately to serve the IS load in the Sioux Falls area when disconnected from the XEL system. Limiting bus and terminal equipment at the Sioux Falls substation should also be upgraded to prevent limiting substation ratings.

Western also recommends closing of the Sioux Falls-Lawrence 115 kV line as soon as possible. Closing of this line provides benefit to both the Western and XEL systems. Under current system conditions, closure also offloads the existing Sioux Falls transformers as power is transferred between Western and XEL on both the 230 and 115 kV ties. The closure of the Sioux Falls-Lawrence 115kV interconnection also would fulfill Western's obligations under the terms of the FERC Settlement Agreement. This coupled with Western obligation to service XEL's load at Sioux Falls under the Tariff agreement was the basis for Western proposing to close this additional interconnection with XEL.

Low voltage violations can occur at Ordway for the loss of the Ordway – Groton line. This issue is masked in off-the-shelf MRO models as waste heat generation on the 69 kV system at Ordway and a wind farm at Edgeley provide additional voltage support during contingencies. Therefore, Western recommends the addition of 15-20 MVARs of capacitance at Ordway 115 kV and the possible future construction of a Ordway-Aberdeen Siebrecht 115 kV line.

The Eagle 230 kV Substation is a 5 breaker ring with 2 lines and 3 transformers. There is a common breaker for the two 230 kV lines. This substation is very critical to the networked 69 kV NIPCO/MEC system and outages involving loss of 230 can result in voltage collapse on the 69 kV system. There are no Bulk Electric System (BES) violations on the 230 kV system for contingencies at Eagle. This deficiency was identified in previous 890 studies and a UVLS scheme was implemented to protect against voltage collapse on the 69 kV system. NIPCO/MEC plan on performing additional studies to provide an additional source to the 69 kV system.

The Spencer 161 kV substation has a 50 MVA and a 60 MVA 161/69 kV transformer that are critical to the networked 69 kV system. These transformers were identified for replacement and will be sized in a supplemental study using the future 890 cases. The Spencer substation will

also be reconfigured to remove the voltage regulating transformer, separate the two new 161/69 kV transformers, install series bus sectionalizing breakers, and install a capacitor on the 161 kV bus.

The Creston 161 kV substation has two 56 MVA 161/69 kV transformers that are critical to the networked 69 kV system. These transformers have been identified for replacement with two 150 MVA units but the replacement transformers will not be installed until 2013. Operating guides have been developed until the replacement can take place. Series 161 kV bus sectionalizing breakers will also be installed at Creston to prevent loss of the entire Creston 161 kV bus.

The substations on the Sioux Falls – Gavins Point 115 kV loop can experience low voltages for loss of either end of the loop. Therefore, Western recommends the addition of 2 x 7.5 MVAR capacitors at Beresford or Spirit Mound and the possible future construction of a Rasmussen to Manning 115 kV line.

Eastern South Dakota / Southwestern Minnesota / Northern Nebraska (Area 5)

- 2012: Close Sioux Falls – Lawrence 115 kV line
- 2012: Add a capacitor at Ordway 115 kV bus
- 2012: Add a capacitor at Spirit Mound or Beresford 115 kV bus
- 2012: Continue with planned reconductor of NWPS Huron Tap – Redfield – Aberdeen Siebrecht 115 kV line (final completion targeted for 2013)
- 2013: Continue with planned improvements at Creston Substation (final completion targeted for 2013)
 - Replacement of existing 56 MVA transformers with 150 MVA transformers with LTCs
 - Removal of existing voltage regulating transformer
 - Installation of series 161 kV bus sectionalizing breakers
 - Installation of dedicated transformer breakers
- 2013: Continue with study of the improvements at Spencer Substation (final completion targeted for 2015)
 - Replacement of existing transformers with larger transformers
 - Removal of existing voltage regulating transformer
 - Installation of dedicated transformer breakers
 - Installation of series 161 kV bus sectionalizing breakers
 - Installation of a capacitor on the 161 kV bus
- 2013: Study of the Construct Ordway – Aberdeen Siebrecht 115 kV line
- 2013: Study of the Construct Rasmussen – EJ Manning/Vermillion 115 kV line
 - Requires creation of a 115 kV yard at Rasmussen
 - Requires 230/115 kV transformer at Rasmussen
- 2013: Replace two existing 100 MVA 230/115 kV transformers at Sioux Falls with two 250 MVA transformers