



**INTERCONNECTION
FACILITIES STUDY
REPORT**

GEN-2017-048

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
9/17/2021	SPP	Initial draft report issued.
7/11/2022	SPP	Updated to include group 16 restudy results.
7/28/2022	SPP	Updated to include revised group 16 restudy and affected systems results.
08/16/2022	SPP	Updated to include group 16 restudy results.
02/02/2023	SPP	Updated for MISO's Affected Systems costs listed in the AFS report.
02/28/2023	SPP	Updated to include MISO's Facility Study for GI

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-048 is for a 300 MW generating facility located in Williams County, ND. The Interconnection Request was studied in the DISIS-2017-001 Impact Study for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is September 30th, 2024.

The interconnecting Transmission Owner, Basin Electric Power Cooperative (BEPC), performed a detailed IFS at the request of SPP. The full report is included in Appendix A. SPP has determined that full Interconnection Service will be available after the assigned Transmission Owner Interconnection Facilities (TOIF), Non-Shared Network Upgrades, Shared Network Upgrades, Contingent Network Upgrades, and Affected System Upgrades that are required for full interconnection service are completed.

The primary objective of the IFS is to identify necessary Transmission Owner Interconnection Facilities, Network Upgrades, other direct assigned upgrades, cost estimates, and associated upgrade lead times needed to grant the requested Interconnection Service.

PHASE(S) OF INTERCONNECTION SERVICE

It is not expected that Interconnection Service will occur in phases. However, full Interconnection Service will not be available until all Interconnection Facilities and Network Upgrade(s) can be placed in service.

COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)

FERC Order ER20-1687-000 eliminated the use of Attachment Z2 revenue crediting as an option for compensation. The Incremental Long Term Congestion Right (ILTCR) process will be the sole process to compensate upgrade sponsors as of July 1st, 2020.

INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES

The Generating Facility is proposed to consist of sixty-two (62) 4.8 MW Nordex - Acciona N149 Wind Turbine Generation Systems for a total generating nameplate capacity of 300 MW.

The Interconnection Customer's Interconnection Facilities to be designed, procured, constructed, installed, maintained, and owned by the Interconnection Customer at its sole expense include:

- 34.5 kV underground cable collection circuits;
- 34.5 kV to 230 kV transformation substation with associated 34.5 kV and 230 kV switchgear;
- Two 230/34.5 kV 120/160/200 MVA and 107/133/167 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An approximately 7.42 mile overhead 230 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 230 kV bus at existing Transmission Owner substation ("Neset 230 kV Substation") that is owned and maintained by Transmission Owner;
- All transmission facilities required to connect the Interconnection Customer's substation to the POI;
- Equipment at the Interconnection Customer's substation necessary to maintain a composite power delivery at continuous rated power output at the high-side of the generator substation at a power factor within the range of 95% lagging and 95% leading in accordance with Federal Energy Regulatory Commission (FERC) Order 827. The Interconnection Customer may use inverter manufacturing options for providing reactive power under no/reduced generation conditions. The Interconnection Customer will be required to provide documentation and design specifications demonstrating how the requirements are met; and,
- All necessary relay, protection, control and communication systems required to protect Interconnection Customer's Interconnection Facilities and Generating Facilities and coordinate with Transmission Owner's relay, protection, control and communication systems.

TRANSMISSION OWNER INTERCONNECTION FACILITIES AND NON-SHARED NETWORK UPGRADE(S)

To facilitate interconnection, the interconnecting Transmission Owner will perform work as shown below necessary for the acceptance of the Interconnection Customer’s Interconnection Facilities.

Table 1 and Error! Reference source not found. lists the Interconnection Customer’s estimated cost responsibility for Transmission Owner Interconnection Facilities (TOIF) and Non-Shared Network Upgrade(s) and provides an estimated lead time for completion of construction. The estimated lead time begins when the Generator Interconnection Agreement has been fully executed.

Table 1: Transmission Owner Interconnection Facilities (TOIF)

Transmission Owner Interconnection Facilities (TOIF)	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>Netset 230 kV Substation GEN-2017-048 Interconnection (TOIF) (BEPC) (132998):</u> Construct one (1) 230 kV line terminal, line switches, dead end structure, line relaying, communications, revenue metering, line arrester, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer’s Generating Facility.	\$1,683,828	100%	\$1,683,828	15 Months
Total	\$1,683,828		\$1,683,828	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>Netset 230 kV Substation GEN-2017-048 Interconnection (Non-Shared NU) (BEPC) (132999):</u> Construct one (1) 230kV breaker, one (1) 230kV breaker disconnect switch, one (1) set of line PT, one (1) set of CTs, one (1) set of line surge arrestors and all other associated work and materials.	Eligible	\$1,296,018	100%	\$1,296,018	15 Months

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<u>Transmission Owner Neseet to Tioga 230 kV Rebuild (143236):</u> Rebuild the existing Neseet to Tioga 230kV 1 mile line and switch 1289 at the Neseet Substation to achieve a minimum summer/emergency rating of 615 MVA.	Eligible	\$306,498	100%	\$306,498	12 Months
Total		\$1,602,516		\$1,602,516	

SHARED NETWORK UPGRADE(S)

The Interconnection Customer’s share of costs for Shared Network Upgrades is estimated in **Table 3** below.

Table 3: Interconnection Customer Shared Network Upgrade(s)

Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
Broadland 345/230kV Transformer Replacement (DISIS-2017-001) (143226): Replace the existing Broadland 345/230kV Transformer to achieve a minimum Summer/Normal rating of 471 MVA	Eligible	\$10,061,320	65.41%	\$6,581,109	33 Months
Total		\$10,061,320		\$6,581,109	

All studies have been conducted assuming that higher-queued Interconnection Request(s) and the associated Network Upgrade(s) will be placed into service. If higher-queued Interconnection Request(s) withdraw from the queue, suspend or terminate service, the Interconnection Customer’s share of costs may be revised. Restudies, conducted at the customer’s expense, will determine the Interconnection Customer’s revised allocation of Shared Network Upgrades.

CONTINGENT NETWORK UPGRADE(S)

Certain Contingent Network Upgrades are **currently not the cost responsibility** of the Interconnection Customer but will be required for full Interconnection Service.

Table 4: Interconnection Customer Contingent Network Upgrade(s)

Contingent Network Upgrade(s) Description	Current Cost Assignment	Estimated In-Service Date
Transmission Owner Neset - Northshore 230 kV Ckt 1 (NTC 210560): Build a new 28 mile 230kV line from Neset to Northshore.	\$0	12/31/2022

Depending upon the status of higher- or equally-queued customers, the Interconnection Request’s in-service date is at risk of being delayed or Interconnection Service is at risk of being reduced until the in-service date of these Contingent Network Upgrades.

AFFECTED SYSTEM UPGRADE(S)

To facilitate interconnection, the Affected System Transmission Owner will be required to perform the facilities study work as shown below necessary for the acceptance of the Interconnection Customer’s Interconnection Facilities. **Table 5** displays the current impact study costs provided by MISO as part of the Affected System Impact review. The Affected System facilities study could provide revised costs and will provide each Interconnection Customer’s allocation responsibilities for the upgrades.

Table 5: Interconnection Customer Affected System Upgrade(s)

Affected System Upgrades Description	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)
<u>MISO AFS for DISIS-2017-001:</u> Montezuma 345 kV + 100 MVAR capacitor bank	\$6,000,000	19.4%	\$1,440,860
<u>MISO AFS for DISIS-2017-001:</u> Blackhawk 345 kV + 100 MVAR SVC/Statcom	\$50,000,000	22.6%	\$11,300,000
Montana-Dakota Utilities “MDU” Tioga 230kV Terminal Upgrades (143237): Upgrade terminal equipment at Tioga 230kV to achieve a minimum Summer/Emergency rating of 701 MVA.	\$800,000	100%	\$800,000
Total	\$56,800,000		\$13,540,860

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 300 MW can be granted. Full Interconnection Service will be delayed until the TOIF, Non-Shared NU, Shared NU, Contingent NU, Affected System Upgrades that are required for full interconnection service are completed. The Interconnection Customer’s estimated cost responsibility for full interconnection service is summarized in the table below.

Table 6: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities Upgrade(s)	\$1,683,828
Non-Shared Network Upgrade(s)	\$1,602,516
Shared Network Upgrade(s)	\$6,581,109
Affected System Upgrade(s)	\$13,540,860
Total	\$23,408,313

Use the following link for Quarterly Updates on upgrades from this report: <https://spp.org/spp-documents-filings/?id=18641>

A draft Generator Interconnection Agreement will be provided to the Interconnection Customer consistent with the final results of this IFS report. The Transmission Owner and Interconnection Customer will have 60 days to negotiate the terms of the GIA consistent with the SPP Open Access Transmission Tariff (OATT).

APPENDICES

**A: TRANSMISSION OWNER'S INTERCONNECTION FACILITIES STUDY
REPORT AND NETWORK UPGRADES REPORT(S)**

See next page for the Transmission Owner's Interconnection Facilities Study Report and Network Upgrades Report(s).

CRITICAL ENERGY INFRASTRUCTURE INFORMATION NOTICE

The materials contained in this document and attachments include Critical Energy Infrastructure Information (“CEII”). All materials designated as CEII must be handled and protected per the requirements in FERC CEII Policy. There may be additional requirements for CEII materials in the future.

Facilities Study for Black Hawk Substation Add One 345 kV, 100 MVAR STATCOM

**Related to ERIS Results
for
MISO Affected System Study for SPP DISIS 2017-001**

Submitted by
MidAmerican Energy Company

January 2023

1.1 Project Summary

MidAmerican Energy Company (“MidAmerican” or “Transmission Owner”) was retained by MISO (“Transmission Provider”) to perform a facilities study for the upgrades necessary to add one 345 kV, 100 MVAR static synchronous compensator (“STATCOM”) at Black Hawk Substation for the Energy Resource Interconnection Service (“ERIS”) impacts by the Interconnection Customers in MISO’s Affected System Study for SPP DISIS 2017-001. MidAmerican owns the Black Hawk Substation affected by this work.

Updates to this facilities study may be necessary to reflect 1) effects of the required upgrades identified in restudies of the MISO Affected System Study for SPP DISIS 2017-001 steady state and stability studies, 2) changes in information from the Interconnection Customers, 3) updates or restudies made to previously completed DPP studies and/or 4) results of any Optional Studies being performed for the Interconnection Customers. The following table summarizes the estimated costs of the Network Upgrades.

Table 1-1. Cost Estimate of Network Upgrades

Upgrade Classification	Description of Upgrade	Cost Estimate (\$)*
Non-Stand Alone Network Upgrade	Black Hawk Substation Add One 345 kV, 100 MVAR STATCOM and associated transmission line additions/relocations	\$50,000,000
	Total	\$50,000,000

* Estimated cost includes AFUDC and is in 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years. Tax gross-up does not apply based on present IRS rules. Transmission Owner plans to elect self-funding.

1.2 Election to Transmission Owner self-fund of Network Upgrades

Transmission Owner plans to self-fund these Network Upgrades in this facilities study. As a result, the Interconnection Customers would provide suitable financial security such as a parent guaranty, letter of credit or surety bond as part of the Multi-Party Facilities Construction Agreement (“MPFCA”). Later, the Interconnection Customers and Transmission Owner would enter into a Facilities Service Agreement (“FSA”) or Multi-Party FSA (“MPFSA”) covering the payments for the Network Upgrades.

2 Transmission Owner Interconnection Facilities

Not Applicable

3 Stand Alone Network Upgrades

None

4 Non-Stand Alone Network Upgrades

Network Upgrades to be installed by Transmission Owner

4.1 Black Hawk Substation Add One 345 kV, 100 MVAR STATCOM

4.1.1 Overview

The MISO Affected System Study for SPP DISIS 2017-001 study showed the need for additional capacitive VAR support at Black Hawk Substation to increase voltages in the area to mitigate the impacts of the Interconnection Customers on the system. The Black Hawk Substation is a 345 kV ring bus with only three networked transmission elements (line or transformer). The substation will already have a large 345 kV, 150 MVAR switched capacitor bank installed as a network upgrade for DPP 2016 February West. A NERC TPL-001 Category P2 or P4 breaker failure contingency within the 345 kV ring bus or Category P6 N-1-1 contingency can result in the loss of two of the three networked transmission elements leaving the substation on a radial from the remaining transmission element. As a result, adding additional shunt reactive power devices can result in high post-contingent voltages unless the incremental devices are dynamic such as a STATCOM so the device can automatically reduce output following contingencies.

The Black Hawk Substation was reviewed to determine the potential placement of one 345 kV, 100 MVAR STATCOM including the additional bus expansion needed to accommodate the STATCOM. If a MISO Affected System restudy for SPP DISIS 2017-001 required a different amount of STATCOM at Black Hawk Substation, then a revised or new facilities study would be required. The review did not include a STATCOM switching analysis or a harmonic frequency scan analysis. Such analyses will be completed as part of the design process should this project proceed.

The scope of the substation and transmission line work assumed in the estimated cost and schedule for the 345 kV STATCOM installation at Black Hawk Substation includes one 345 kV, 100 MVAR STATCOM, 345 kV line terminal with breaker and disconnects in a standalone fenced in area, a short new line to Black Hawk Substation and expansion of Black Hawk Substation including moving an existing line to accommodate a new 345 kV line to the STATCOM facility. The expansion work at Black Hawk Substation includes bus and breaker additions to expand the ring bus to provide terminals for the new 345 kV line to the STATCOM and the relocated Black Hawk-Hazleton 345 kV line, 345 kV breaker for the line to the STATCOM, breaker disconnect switches, control and relaying, steel support structures, yard expansion and high security fence expansion. No land costs are included in the estimate because the STATCOM site and line is assumed to be on land that Transmission Owner already owns.

The substation and transmission line upgrades are estimated to cost \$50,000,000 in year 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years. The upgrades are described below and shown in preliminary drawing in Exhibits A2 and A3.

4.1.2 Assumptions

- It is assumed outages to complete the Network Upgrades will be granted when requested to meet project schedule
- It is assumed based on the present tax laws in effect at the time of this study that tax gross-up would not apply and is not included in the cost estimates
- It is assumed labor resources and equipment will be available at reasonable costs. For example, low unemployment rates and significant amounts of transmission and substation project work related to new wind and solar farm interconnections requesting to be eligible for the Federal Production Tax Credit (“PTC”), the Infrastructure Investment and Jobs Act (“IIJA”) and other initiatives may drive costs significantly higher and affect schedule
- It is assumed that timely receipt of financial security will be provided by all Interconnection Customers
- It is assumed the STATCOM switching analysis and harmonic frequency scan analysis that will be completed as part of the design process will not result in significant changes to the project scope and cost
- The results of recent DPP studies or affected system studies have required numerous capacitor banks and/or STATCOMs in eastern Iowa to improve system voltage; it is assumed these installations will not have negative interactions with each other
- The STATCOM addition requires construction of a separate substation yard for the STATCOM. For the purposes of the cost estimate, it is assumed the Transmission Owner owns the land the new substation yard will be constructed. If additional land is also needed to meet governmental setback or other requirements, it is assumed additional land can be purchased. No land costs are included in the estimate, but it is assumed land can be obtained at a reasonable cost, if necessary. This is a preliminary design that is subject to change during detailed design stage should the Interconnection Customers proceed further

4.1.3 Structure and Foundation

Yard Development

For existing Black Hawk Substation

- Grading and expansion of existing yard
- Installation of additional station ground grid system
- Installation of additional substation yard rock surfacing
- Installation of additional below grade control conduit and manhole system
- Modification, removal and installation of high security fence

For STATCOM yard

- Grading of yard
- Installation of a station ground grid system
- Installation of the substation yard rock surfacing
- Installation of the below grade control conduit and manhole system
- Installation of a 12 feet high security mesh fence with 1 foot of barbed and razor wire

- Installation of substation yard lighting
- Installation of a lightning shielding system

Steel Structures

- Support structures for two (2) 345 kV dead-end structures
- Support structures for three (3) 345 kV breakers
- Support structures for five (5) three phase 345 kV switches; four (4) manual breaker disconnects and one (1) motor operated line disconnect
- Support structures for three (3) single phase 209 kV MCOV surge arresters
- Bus support structures, ten (10) 345 kV supports
- Drilled pier foundations will be used for all equipment support structures as design permits

4.1.4 Major Items

345 kV STATCOM

- One (1) 345 kV, nominal 100 MVAR STATCOM and associated equipment from manufacturer
- Includes installing foundations, support structures, arresters

345 kV Gas Circuit Breakers

- One (1) 345 kV, SF6 gas circuit breaker rated 3000 A, 50 kA interrupting capability in ring bus
- Two (2) 345 kV, SF6 gas circuit breakers rated 3000 A, 50 kA interrupting capability for transmission line to STATCOM
- Includes installing foundations, control conduit to the circuit breakers, jumpers to the associated disconnect switches and control cable to the control building

345 kV Disconnect Switches

- Five (5) disconnect switches rated 345 kV, 3000 A continuous, 100 kA momentary, 1300 kV BIL are required to allow isolation of the added circuit breakers and bus
- Includes installing foundations and support structures

345 kV Rigid Aluminum Bus

- The main bus additions will be aluminum rigid tubular bus

4.1.5 SCADA and Communications

- Updates to RTU and SCADA for STATCOM and breaker additions

4.1.6 Protection and Control

345 kV Relay/Control/Metering Panels

- One (1) protection panel for line to STATCOM, SEL-411L or equivalent
- One (1) protection panel for the relocated line, SEL-411L or equivalent
- One (1) breaker control panel

- Includes installing the panels in the control building, connection of control cable wiring, checkout and commissioning of the associated systems
- Includes modification to other protection panels

4.1.7 Transmission Line Work

- One (1) new 345 kV line to be constructed from existing Black Hawk 345 kV bus to the separate STATCOM yard
- Existing Hazleton 345 kV line to be relocated to a new 345 kV line terminal on Black Hawk 345 kV bus
- Includes conductor, structures and foundations for the new and relocated lines

4.1.8 Price

The cost estimate for Network Upgrades is \$50,000,000 in year 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years.

5 System Protection Facilities constructed by Transmission Owner

None

6 Distribution Upgrades

None

7 Exhibits

7.1 A1 - Interconnection Customer One Line and Site Map

A1-1 One-line Diagram for IC Project

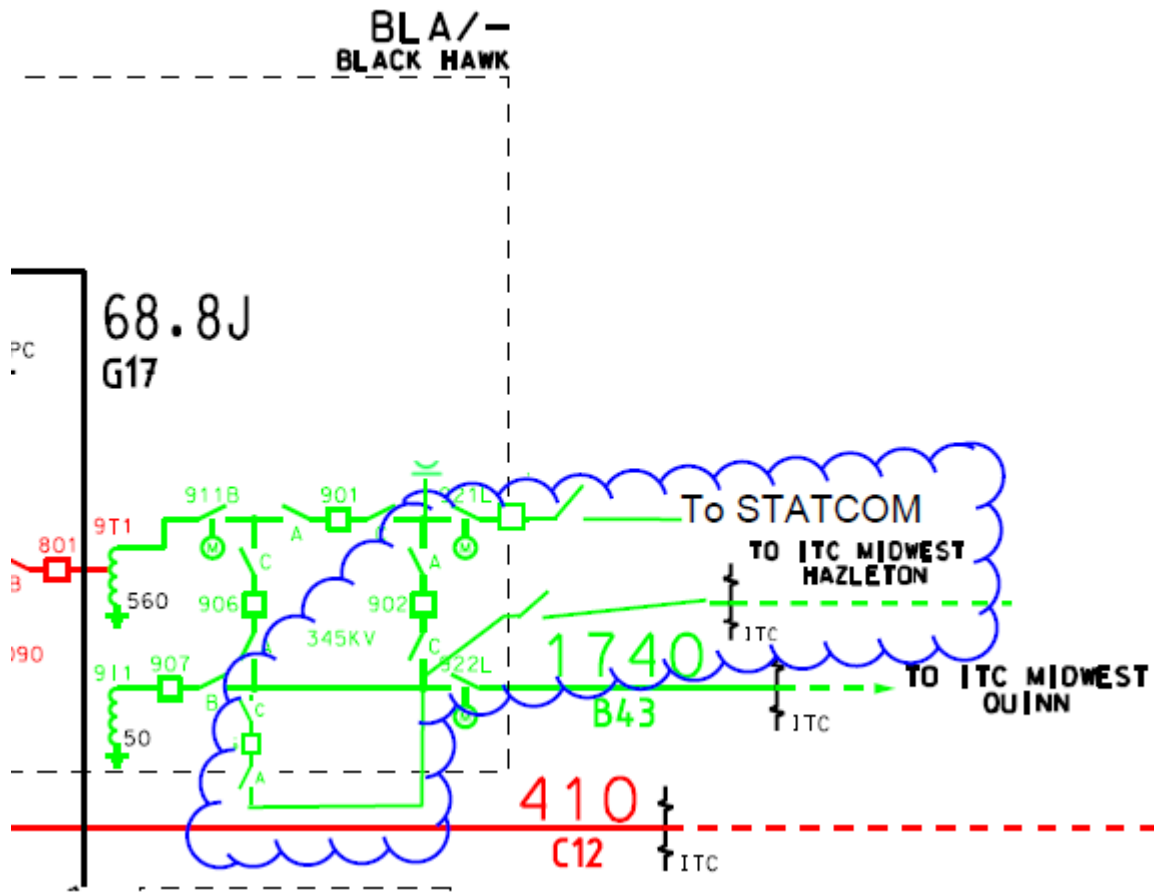
Not Applicable

A1-2 Site Map for IC Project

Not Applicable

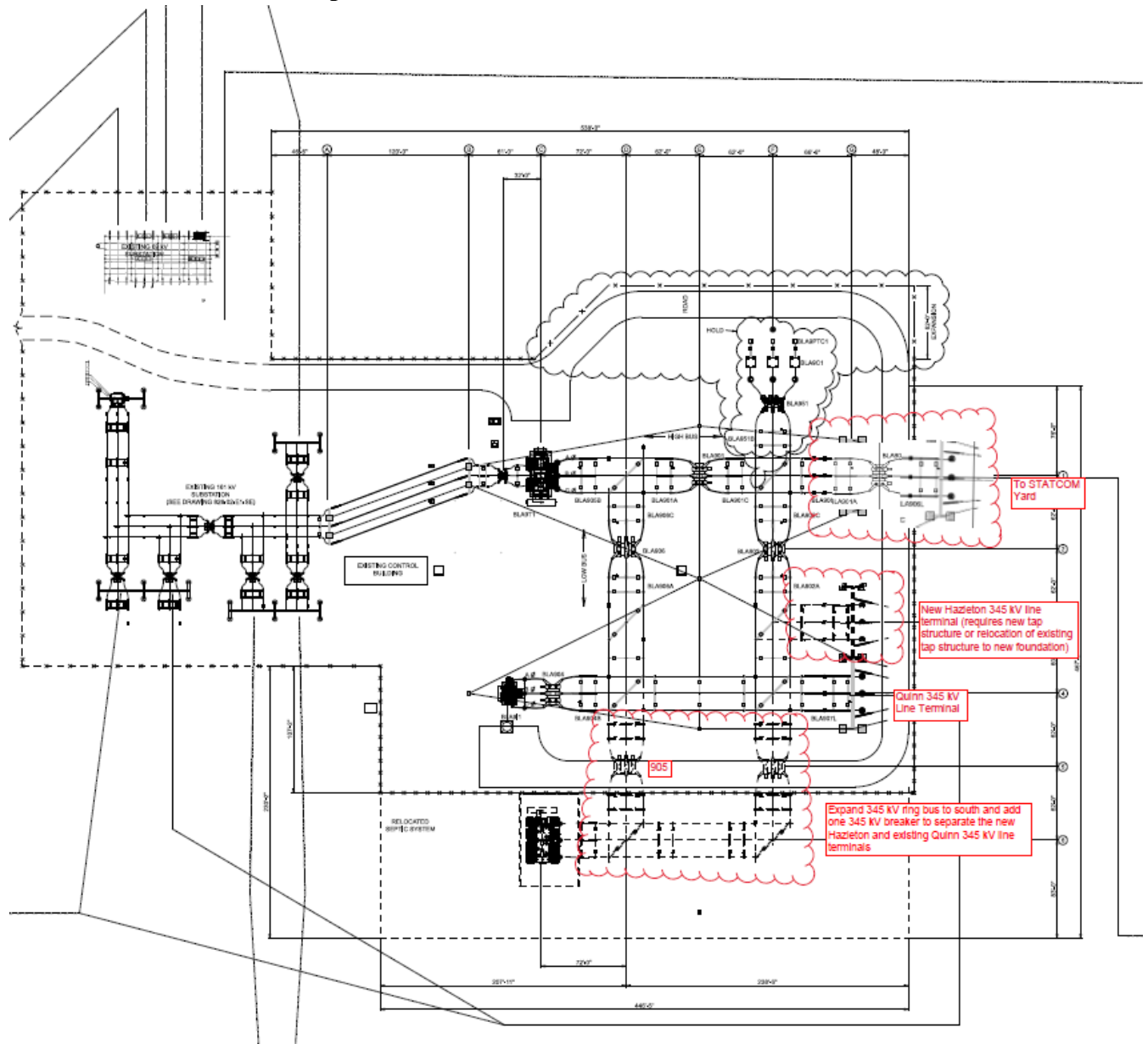
7.2 A2 - Transmission Owner One Line

Black Hawk Substation: Expansion to Add One 345 kV, 100 MVAR STATCOM



7.3 A3 - Site Plans or General Arrangement Drawing

Black Hawk Substation: Expansion to Add One 345 kV, 100 MVAR STATCOM



7.4 A4 – Network Upgrade Plan and Profile

7.5 A5 - Facilities to be Constructed by Transmission Owner

Upgrade Classification	Description of Upgrade	Cost Estimate (\$)*
Non-Stand Alone Network Upgrade	Black Hawk Substation Add One 345 kV, 100 MVAR STATCOM and associated transmission line additions/relocations	\$50,000,000
	Total	\$50,000,000

7.6 A6 - Detailed Cost of Facilities to be Constructed by Transmission Owner

Table A6-1 Construct Transmission Owner Interconnection Facilities

Not Applicable

Table A6-2 Construct Stand Alone Network Upgrade

Not Applicable

Table A6-3 Construct Non-Stand Alone Network Upgrade

**Black Hawk Substation Add One 345 kV, 100 MVAR STATCOM
Network Upgrade Estimate**

Description	Cost Estimate (\$)*
Stores (arresters, insulators, conductor, etc.)	\$250,000
Substation Steel, Bus, Connectors	\$500,000
STATCOM	\$27,000,000
Disconnect Switches	\$120,000
Circuit Breakers	\$1,100,000
Instrument Transformers	\$200,000
Control, Metering and Communications	\$500,000
Civil (foundations, raceways, grounding, yard)	\$4,000,000
Consultant Design Labor & Project Management	\$1,000,000
Contractor Labor & Commissioning	\$5,650,000
Company Labor	\$250,000
Transportation	\$5,000
Transmission Line Costs	\$2,500,000
Miscellaneous	\$500,000
General & Administrative	\$3,925,000
AFUDC	\$2,500,000
Total Substation Network Upgrades w/ AFUDC	\$50,000,000

* Estimated cost includes AFUDC and is in 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years. Tax gross-up does not apply based on present IRS rules. Transmission Owner plans to elect self-funding.

Schedule is dependent on outage availability, labor availability, equipment lead times and milestones in the Multi-Party Facilities Construction Agreement (“MPFCA”) including receipt of acceptable financial security and what time of year the MPFCA is signed because of the effect on the available construction seasons.

See Section 4.1.2 Assumptions for more information.

7.7 A7 - Facilities to be Constructed by Interconnection Customer

None

7.8 A8 - Detailed Cost of Transmission Owner Facilities to be Constructed by Interconnection Customer

Not applicable

7.9 A9 - Facilities Subject to MISO Attachment FF

Upgrade Classification	Description of Upgrade	Cost Estimate (\$)*
Non-Stand Alone Network Upgrade	Black Hawk Substation Add One 345 kV, 100 MVAR STATCOM and associated transmission line additions/relocations	\$50,000,000
	Total	\$50,000,000

* Estimated cost includes AFUDC and is in 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years. Tax gross-up does not apply based on present IRS rules. Transmission Owner plans to elect self-funding.

For Network Upgrades at 345 kV, ten percent (10%) of the total costs identified as Network Upgrades are eligible for reimbursement according to the existing provisions in Attachment FF of the MISO Open Access Transmission, Energy and Operating Reserve Markets Tariff. The cost estimate is the 100% cost estimate.

Since the Transmission Owner plans to elect self-funding, the Network Upgrade costs included in the FSA or MPFSA would reflect the ten percent (10%) reimbursement being effectively paid to the Interconnection Customer, subject to the terms of the FSA or MPFSA.

7.10 A10 - Contingent Facilities

MISO will provide this exhibit.

7.11 A11 - Interconnection Customer Milestones

Not Applicable

7.12 A12 - Construction and Coordination Schedules

Transmission Owner estimates that construction of the Network Upgrades described in this report can be completed approximately 36-42 months after the Interconnection Customers meet financial security requirements in the executed MPFCA. The proposed schedule is dependent on the time of year the MPFCA is executed as it affects the construction seasons available, timely receipt of all approvals associated with constructing the Transmission Owner Network Upgrades, higher queued projects, outage availability, equipment lead-time and labor resource availability. As previously mentioned, the availability of labor resources at reasonable costs is a concern as well as outage availability given the amount of work expected in Iowa and MISO West footprint. It is anticipated that outages will be restricted during the mid-May to mid-September period. No additional right-of-way is expected for this project. Long lead-time items include substation steel structures, circuit breakers, conductor and STATCOM.

1. Prepare preliminary engineering, procurement and construction (“EPC”) documents
2. Order or reserve certain long lead equipment
3. Finalize EPC bid documents and issue project for bids
4. Review proposals and award bid
5. Commence STATCOM and capacitor switching study
6. Complete engineering
7. Review and submit all necessary permits for the project
8. Coordinate outages, material and resource availability
9. Begin construction
10. Complete project work

7.13 A13 - Permits, Licenses, Regulatory Approvals and Authorization

It is not expected that any required approvals will delay completion of this upgrade. Typical permits, licenses and approvals required to construct the Transmission Owner facilities may include, but are not limited to:

- Landowner easements – No additional easements assumed
- Local Building/Construction permit for substation
- County Engineer Approval – 1 to 2 months
- Local City Government Approval
- Iowa Department of Transportation
- Iowa Department of Natural Resources – 3 to 6 months
- Iowa Historical Society Review and Application – 1 to 2 months
- US Corps of Engineers Approval
- US Fish and Wildlife Approval
- Foreign Utility Conflicts Approval
- FAA Approval
- Iowa Utilities Board (Assumed not to be required.)

7.14 A14 - Interconnection and Operating Guidelines

Not Applicable

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Facilities Study for Montezuma Substation Add One 345 kV, 100 MVAR Capacitor

Related to MISO Affected System Study Results
for
SPP DISIS 2017-001 Study

Submitted by
MidAmerican Energy Company

December 2022

1.1 Project Summary

MidAmerican Energy Company (“MidAmerican” or “Transmission Owner”) was retained by MISO (“Transmission Provider”) to perform a facilities study for the upgrades necessary to add one 345 kV, 100 MVAR capacitor at Montezuma Substation as a result of the MISO Affected System Study for SPP DISIS 2017-001. Montezuma Substation is operated by Transmission Owner and jointly owned with ITC Midwest with undivided ownership interests as tenants in common. Transmission Owner would complete the upgrades as operator of the substation. The following table summarizes the estimated cost and estimated project duration for Transmission Owner’s upgrade. These Transmission Owner facilities were identified as Network Upgrades.

Updates to this facilities study may be necessary to reflect 1) effects of the required upgrades identified in restudies of the MISO Affected System Study for SPP DISIS 2017-001 steady state and stability studies, 2) changes in information from the Interconnection Customers, 3) updates or restudies made to previously completed DPP studies or DISIS studies and/or 4) results of any Optional Studies being performed for the Interconnection Customers. The following table summarizes the estimated costs of the Network Upgrade.

Table 1-1. Cost Estimate of Network Upgrades

Upgrade Classification	Description of Upgrade	Cost Estimate (\$)*
Non-Stand Alone Network Upgrade	Montezuma Substation Add One 345 kV, 100 MVAR Capacitor	\$6,000,000
	Total	\$6,000,000

* Estimated cost includes AFUDC and is in 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years. Tax gross-up does not apply based on present IRS rules. Transmission Owner plans to elect self-funding.

1.2 Election to Transmission Owner self-fund of Network Upgrades

Transmission Owner plans to self-fund these Network Upgrades described in this facilities study. As a result, the Interconnection Customers would provide suitable financial security such as a parent guaranty, letter of credit or surety bond as part of the MPFCA. Later, the Interconnection Customers and Transmission Owner would enter into a Facilities Services Agreement (“FSA”) or a Multi-Party FSA (“MPFSA”) covering the payments for the Transmission Owner’s share of the Network Upgrades. Interconnection Customers would also enter similar agreements with ITC Midwest for their share of the Network Upgrades.

2 Transmission Owner Interconnection Facilities

Not Applicable

3 Stand Alone Network Upgrades

None

4 Non-Stand Alone Network Upgrades

Network Upgrades to be installed by Transmission Owner

4.1 Montezuma Substation Add One 345 kV, 100 MVAR Capacitor

4.1.1 Overview

The MISO Affected System Study for SPP DISIS 2017-001 study showed the need for capacitive VAR support at Montezuma Substation to increase voltages in the area to mitigate the impacts of the Interconnection Customers on the system. The Montezuma Substation was reviewed to determine the potential placement of one 345 kV, 100 MVAR capacitor including the expansion needed to accommodate the capacitor. If a MISO Affected System Study for SPP DISIS 2017-001 restudy required a different amount of capacitance at Montezuma Substation, then a revised or new facilities study would be required.

The review did not include a capacitor bank switching analysis or a harmonic frequency scan analysis. Such analyses will be completed as part of the design process should this project proceed.

The substation is operated by Transmission Owner and jointly owned with ITC Midwest with undivided ownership interests as tenants in common. Transmission Owner owns 52% and ITC Midwest owns 48%. The upgrades would be jointly owned by the existing owners, as tenants in common, consistent with the existing agreements that govern the Montezuma Substation and be operated by Transmission Owner. Transmission Owner would work as agent for ITC Midwest in constructing the new facilities. Prior to the Transmission Owner substation project being closed to charges, ITC Midwest will likely pay Transmission Owner for 48% of the Network Upgrade charges related to ITC Midwest's ownership share.

The scope of the substation work assumed in the estimated cost and schedule for the 345 kV capacitor installation at Montezuma Substation includes one 345 kV, 100 MVAR capacitor, switching breaker, disconnect switches, control and relaying, steel support structures and expanding the yard.

The substation upgrades are estimated to cost \$6,000,000 in year 2022 U.S. dollars +/- 20% and does not include the effects of inflation or escalation to future years and are described below and shown in preliminary drawing in Exhibits A4.

4.1.2 Assumptions

- It is assumed outages to complete the Network Upgrades will be granted when requested to meet project schedule.
- It is assumed based on the present tax laws in effect at the time of this study that tax gross-up would not apply and is not included in the cost estimates.
- It is assumed labor resources and equipment will be available at reasonable costs. For example, low unemployment rates and significant amounts of transmission and

substation project work related to new wind and solar farm interconnections requesting to be eligible for the Federal Production Tax Credit (“PTC”), the Infrastructure Investment and Jobs Act (“IIJA”) and other initiatives may drive costs significantly higher and affect schedule.

- It is assumed that timely receipt of financial security will be provided by all the Interconnection Customers.
- It is assumed that the capacitor bank switching analysis and harmonic frequency scan analysis that will be completed as part of the design process will not result in significant changes to the project scope.
- The results of recent DPP studies and Affected System Studies have required numerous capacitor banks in eastern Iowa to improve system voltage, it is assumed that these installations will not have negative interactions with each other.
- The capacitor addition requires an expansion of the substation yard and acquisition of additional land to the west or to the south of the substation. For the purposes of the cost estimate, it is assumed this land can be obtained. If additional land is also needed to meet governmental setback or other requirements, it is assumed additional land can be purchased. No land costs are included in the estimate, but it is assumed it can be obtained at a reasonable cost. This is a preliminary design that is subject to change during detailed design stage should the Interconnection Customers proceed further.

4.1.3 Structure and Foundation

Yard Development

- Grading and expansion of yard
- Installation of additional station ground grid system
- Installation of additional substation yard rock surfacing
- Installation of additional below grade control conduit and manhole system
- Modification and installation of high security fence

Steel Structures

- Support structures for 345 kV switching breaker, manual breaker 345 kV disconnect switch, CCVT, shield masts, 345 kV bus work
- Drilled pier foundations will be used for all equipment support structures as design permits

4.1.4 Major Items

345 kV Capacitor Bank

- One (1) 345 kV, nominal 100 MVAR capacitor
- Capacitor will have an inrush/outrush reactor sized as per IEEE Standard C37.06
- Includes installing foundations, support structures, arresters

345 kV Gas Circuit Breakers

- One (1) 345 kV, SF6 gas circuit breakers rated 3000 A, 50 kA interrupting capability, with synchronous closing
- Includes installing foundations, control conduit to the circuit breaker, jumpers to the associated disconnect switch and control cable to the control building

345 kV Disconnect Switches

- One (1) disconnect switch rated 345 kV, 3000 A continuous, 100 kA momentary, 1300 kV BIL is required to allow isolation of the capacitor
- Includes installing foundations and support structures

345 kV Rigid Aluminum Bus

- The main bus additions will be aluminum rigid tubular bus

4.1.5 SCADA and Communications

- Updates to RTU and SCADA for capacitor and breaker addition

4.1.6 Protection and Control

345 kV Relay/Control/Metering Panels

- One (1) protection panel for capacitor bank, SEL-487V or equivalent
- Includes installing the panels in the control building, connection of control cable wiring, checkout and commissioning of the associated systems
- Includes modification to other protection panels

4.1.7 Price

The cost estimate for Network Upgrades is \$6,000,000 in year 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years.

5 System Protection Facilities constructed by Transmission Owner

None

6 Distribution Upgrades

None

7 Exhibits

7.1 A1 - Interconnection Customer One Line and Site Map

A1-1 One-line Diagram for IC Project

A1-2 Site Map for IC Project

Not Applicable

7.2 A2 - Transmission Owner One Line

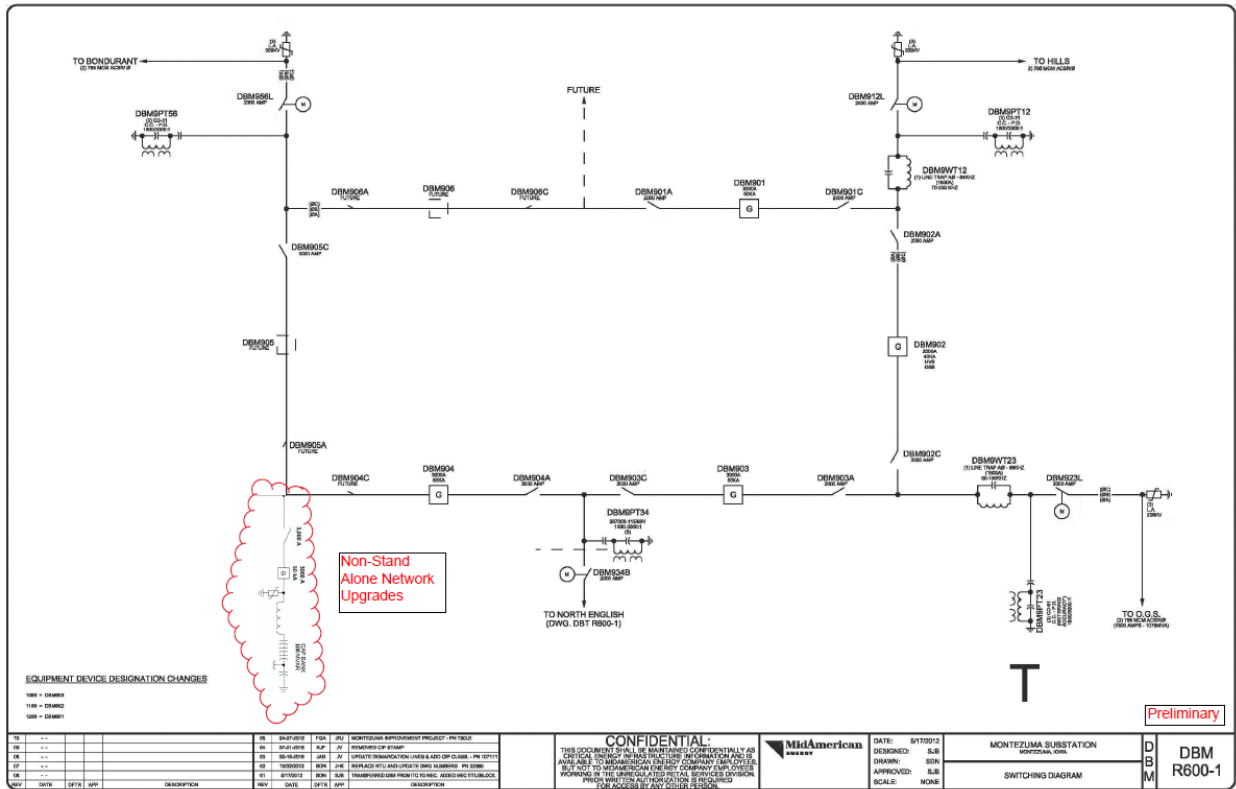
Not Applicable

7.3 A3 - Site Plans or General Arrangement Drawing

Not Applicable

7.4 A4 – Network Upgrade Plan and Profile

Montezuma Substation: Expansion to Add One 345 kV, 100 MVAR Capacitor



7.5 A5 - Facilities to be Constructed by Transmission Owner

Upgrade Classification	Description of Upgrade	Cost Estimate (\$)*
Non-Stand Alone Network Upgrade	Montezuma Substation Add One 345 kV, 100 MVAR Capacitor	\$6,000,000
	Total	\$6,000,000

* Estimated cost includes AFUDC and is in 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years. Tax gross-up does not apply based on present IRS rules. Transmission Owner plans to elect self-funding.

7.6 A6 - Detailed Cost of Facilities to be Constructed by Transmission Owner

Table A6-1 Construct Transmission Owner Interconnection Facilities
 Not Applicable

Table A6-2 Construct Stand Alone Network Upgrade

Not Applicable

Table A6-3 Construct Non-Stand Alone Network Upgrade

**Montezuma Substation Add One 345 kV, 100 MVAR Capacitor
Network Upgrade Estimate**

Description	Cost Estimate (\$)*
Stores (arresters, insulators, conductor, etc)	\$125,000
Substation Steel, Bus, Connectors	\$175,000
Capacitors	\$500,000
Disconnect Switches	\$30,000
Circuit Breakers	\$350,000
Instrument Transformers	\$50,000
Control & Metering	\$125,000
Civil (foundations, raceways, grounding, yard)	\$1,200,000
Consultant Design Labor & Project Management	\$250,000
Contractor Labor & Commissioning	\$1,800,000
Company Labor	\$130,000
Transportation	\$5,000
Miscellaneous	\$500,000
General & Administrative	\$530,000
AFUDC	\$230,000
Total Substation Network Upgrades w/ AFUDC	\$6,000,000

* Estimated cost includes AFUDC and is in 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years. Tax gross-up does not apply based on present IRS rules. Transmission Owner plans to elect self-funding.

Schedule is dependent on outage availability, labor availability, equipment lead times and milestones in the Multi-Party Facilities Construction Agreement (“MPFCA”) including receipt of acceptable financial security and what time of year the MPFCA is signed because of the effect on the available construction seasons.

See Section 4.1.2 Assumptions for more information.

7.7 A7 - Facilities to be Constructed by Interconnection Customer

None

7.8 A8 - Detailed Cost of Transmission Owner Facilities to be Constructed by Interconnection Customer

Not applicable

7.9 A9 - Facilities Subject to MISO Attachment FF

Upgrade Classification	Description of Upgrade	Cost Estimate (\$)*
Non-Stand Alone Network Upgrade	Montezuma Substation Add One 345 kV, 100 MVAR Capacitor	\$6,000,000
	Total	\$6,000,000

* Estimated cost includes AFUDC and is in 2022 U.S. dollars +/-20% and does not include the effects of inflation or escalation to future years. Tax gross-up does not apply based on present IRS rules. Transmission Owner plans to elect self-funding.

For Network Upgrades at 345 kV, ten percent (10%) of the total costs identified as Network Upgrades are eligible for reimbursement according to the existing provisions in Attachment FF of the MISO Open Access Transmission, Energy and Operating Reserve Markets Tariff. The cost estimate is the 100% cost estimate.

Since the Transmission Owner and ITC Midwest plan to elect self-funding, the Network Upgrade costs included in the FSAs or MPFSAs would reflect the ten percent (10%) reimbursement being effectively paid to the Interconnection Customer, subject to the terms of the FSAs or MPFSAs. Interconnection Customers would enter into separate FSAs or MPFSAs with Transmission Owner and ITC Midwest for their share of the Network Upgrades.

7.10 A10 - Contingent Facilities

MISO will provide this exhibit.

7.11 A11 - Interconnection Customer Milestones

Not Applicable

7.12 A12 - Construction and Coordination Schedules

Transmission Owner estimates that construction of the Network Upgrades described in this report can be completed approximately 30-36 months after the Interconnection Customers meet financial security requirements in the executed MPFCA. The proposed schedule is dependent on the time of year the MPFCA is executed as it affects the construction seasons available, timely receipt of all approvals associated with constructing the Transmission Owner Network Upgrades, higher queued projects, outage availability, equipment lead-time and labor resource availability. As previously mentioned, the availability of labor resources at reasonable costs is a concern as well as outage availability given the amount of work expected in Iowa and MISO West footprint. It is anticipated that outages will be restricted during the mid-May to mid-September period. No additional right-of-way is expected for this project. However, the project requires an expansion of the substation yard and acquisition of additional land to the west or to the south of the substation. It is assumed this land can be obtained timely and at a reasonable cost. Long lead-time items include substation steel structures, circuit breaker/capacitor switching device.

1. Begin preparing preliminary engineering, procurement and construction (“EPC”) documents
2. Order or reserve certain long lead equipment
3. Finalize EPC bid documents and issue project for bids
4. Review proposals and award bid
5. Commence capacitor switching study
6. Review and submit all necessary permits for the project
7. Coordinate outages, material and resource availability
8. Begin construction
9. Complete project work

7.13 A13 - Permits, Licenses, Regulatory Approvals and Authorization

It is not expected that any required approvals will delay completion of this upgrade. However, the project requires an expansion of the substation yard and acquisition of additional land to the west or to the south of the substation. It is assumed this land can be obtained timely.

Typical permits, licenses and approvals required to construct the Transmission Owner facilities may include, but are not limited to:

- Landowner easements – No additional easements assumed
- Local Building/Construction permit for substation
- County Engineer Approval – 1 to 2 months
- Local City Government Approval
- Iowa Department of Transportation
- Iowa Department of Natural Resources – 3 to 6 months
- Iowa Historical Society Review and Application – 1 to 2 months
- US Corps of Engineers Approval
- US Fish and Wildlife Approval
- Foreign Utility Conflicts Approval
- FAA Approval
- Iowa Utilities Board (Assumed not to be required.)

7.14 A14 - Interconnection and Operating Guidelines

Not Applicable

Basin Electric Power Cooperative Facility Study Report GEN-2017-048

1. Background:

- 1.1 Per the Generator Interconnection Procedures (GIP), Attachment V, Section 8.11, SPP requests that Basin Electric Power Cooperative (BEPC) perform a facilities study in for the following Interconnection and/or Network Upgrade(s):

Interconnection	132999	Neset 230 kV Substation GEN-2017-048 Interconnection (Non-Shared NU) (BEPC)	\$1,362,742	12 Months
Interconnection	132998	Neset 230 kV Substation GEN-2017-048 Interconnection (TOIF) (BEPC)	\$1,617,104	12 Months

2. Study Requirements:

BEPC has performed this Facility Study report in accordance with the Generator Interconnection Procedures (GIP), Attachment V, Section 8.11 for the Interconnection and/or Network Upgrade(s) as described in Section 1.

2.1. The Facility Study report includes an evaluation of the following:

- 2.1.1. Perform/develop a substation layout, perform a preliminary bus design, determine all electrical equipment requirements, and if required determine a suitable site location to accommodate the Request. Develop/compile cost estimates for all BEPC labor, overheads, equipment additions, modifications, etc. to accommodate the generator interconnection.
- 2.1.2. Develop an overall construction schedule for completion of the necessary additions and/or modifications.
- 2.1.3. Point Of Change of Ownership. For the purposes of this Facility Study report, the Point of Change of Ownership location is defined as the take-off structure(s) at the BEPC Substation/Switching Station where the Interconnection Customer's transmission line(s) connects to the take-off structure(s). Interconnection Customer will furnish and install the conductor jumper and insulator assembly to the take-off structure(s).
- 2.1.4. Other Interconnection/Metering Requirements. Basic indication, metering, monitoring, control, and relaying requirements due to a generator interconnection are included in the cost estimate. BEPC's generation metering requirements, as an SPP Transmission Owner, must be met. A list of specific needs will be provided by BEPC once design has progressed.

3. Study Results for GEN-2017-048:

- 3.1. The following results document the analysis of the required facilities for this Interconnection Request as outlined in Section 1 for a new 230kV line terminal at the Neset 230kV Substation. BEPC has determined that the following additions and improvements are required to maintain a safe and reliable interconnection to BEPC's transmission system.

3.2 Substation/Switchyard

A 230kV terminal addition will be built to accommodate the new generation resource interconnection. This terminal will be added to the existing breaker and a half substation. Reference Figures A1 and A2. All equipment will follow BEPC's internal design standards for minimum BIL, ampacity, and fault capabilities.

The associated work for the new 230kV line terminal includes the following major additions:

- (1) 230kV Line Take-Off Structure
- (1) 230kV Breaker
- (2) 230kV Breaker Disconnect Switches
- (1) Set of Line Potential Transformers
- (1) Set of Current Transformers
- (1) Set of Line Surge Arrestors

Additional associated work will include a review and update to relay/protection schemes and SCADA RTU configurations at the current facility.

3.3 Environmental Requirements

Compliance with all applicable federal, state and local regulations will be strictly adhered to. Additionally, all applicable and required permits and approvals will be obtained prior to construction. For the purposes of this Facility Study report, it is anticipated that this new 230kV line terminal will require incidental minor local permitting.

3.4 Cost Estimate

GEN-2017-048 Estimated Costs Non Shared Network Upgrades	Current Year \$
Line Costs	
Engineering Labor	\$0
Construction Labor	\$0
Reactive Compensation (Labor & Materials)	\$0
Material	\$0
Right of Way	\$0
Line Sub Total	\$0
Station Costs	
Engineering Labor	\$231,000
Construction Labor	\$514,669
Site Property Rights	\$0
Reactive Compensation	\$0
Material	\$225,307
Right of Way	\$0
Station Sub Total	\$970,976
AFUDC	\$0
Contingency	\$325,042
Non - Shared Network Upgrades total	\$1,296,018

GEN-2017-048 Transmission Owner Interconnect Facilities	Current Year \$
Line Costs	
Engineering Labor	\$0
Construction Labor	\$0
Reactive Compensation (Labor & Materials)	\$0
Material	\$0
Right of Way	\$0
Line Sub Total	\$0
Station Costs	
Engineering Labor	\$200,000
Construction Labor	\$536,700
Site Property Rights	\$0
Reactive Compensation	\$0
Material	\$524,823
Right of Way	\$0
Station Sub Total	\$1,261,523
AFUDC	\$0
Contingency	\$422,305
TOIF Subtotal	\$1,683,828

Total Interconnection Cost	\$2,979,846
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3.5 Construction Schedule

The preliminary project schedule provided is for planning level purposes only and will be adjusted with additional project definition. If it is determined that NEPA and/or ROW condemnation is required, 12-18 months will be added to the In-Service date.

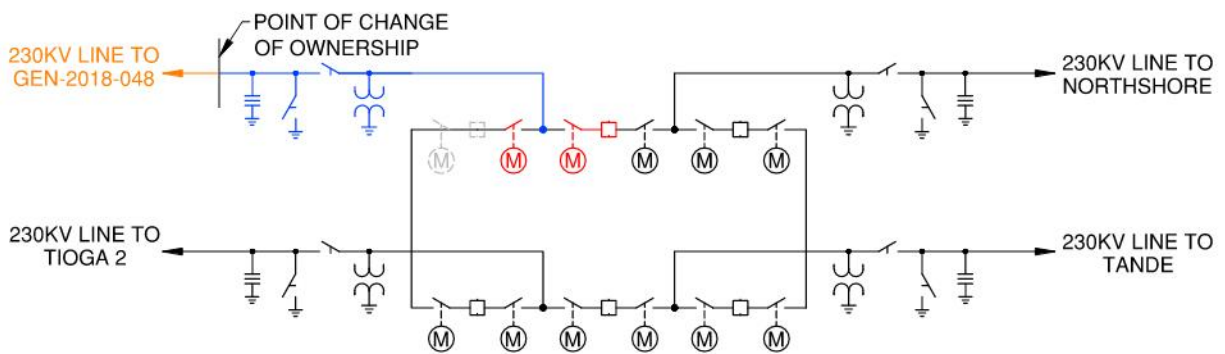
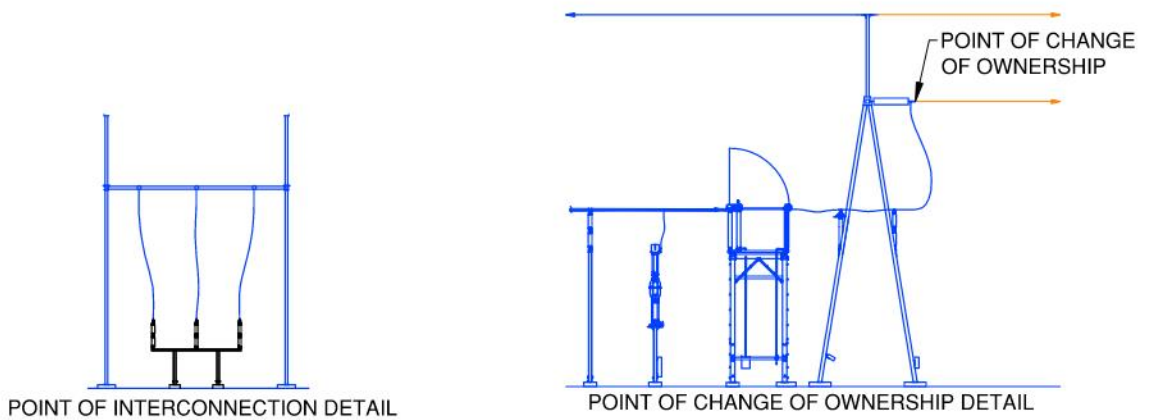
Activity	Duration	Estimated Start	Estimated Finish
Executed GIA-Notice To Proceed Letter	--	Month 0	--
Project Planning	1 Month	Month 0	Month 1
Engineering Design	4-6 Months	Month 1	Month 7
Equipment Procurement	8-10 Months	Month 2	Month 12
Advertise and Award Construction Contracts	2-3 Months	Month 7	Month 10
Construction	4 Months	Month 10	Month 14
Energize and In-Service Date	1 Month	Month 14	Month 15

Figure A1: Proposed Switching Diagram

**FIGURE A1
GEN-2017-048**

LEGEND:

- EXISTING EQUIPMENT
- NON SHARED NETWORK UPGRADES
- SHARED NETWORK UPGRADES
- TRANSMISSION OWNERS INTERCONNECTION FACILITIES
- INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES
- FUTURE



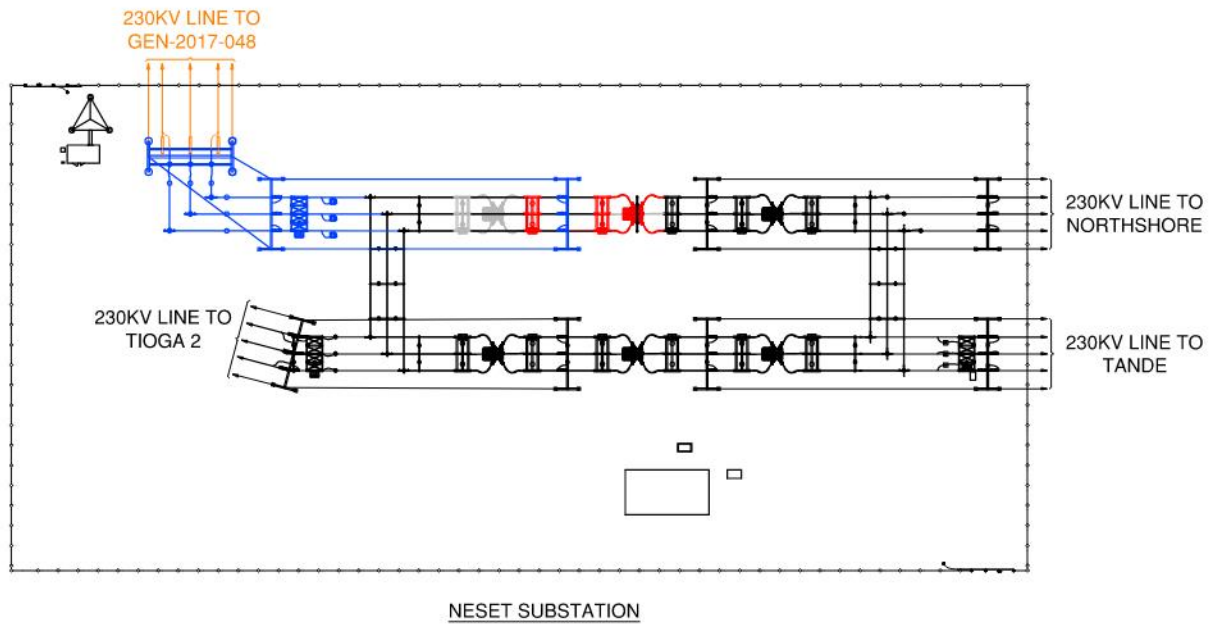
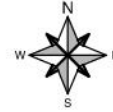
NESET SUBSTATION

Figure A2: Proposed General Arrangement

FIGURE A2
GEN-2017-048

LEGEND:

- EXISTING EQUIPMENT
- NON SHARED NETWORK UPGRADES
- SHARED NETWORK UPGRADES
- TRANSMISSION OWNERS INTERCONNECTION FACILITIES
- INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES
- FUTURE



ATTACHMENT A
SPP INTERCONNECTION FACILITIES STUDY REQUEST LETTER

June 15, 2021

Subject: Facilities Study Request for DISIS-2017-001

Dear Mr. Severson:

Per the Generator Interconnection Procedures (GIP), SPP requests that Basin Electric Power Cooperative (BEPC) perform facilities study in accordance with Section 8.11 for the following Interconnection and/or Network Upgrade(s):

Upgrade Type	UID	Upgrade Name	DISIS Cost Estimate	DISIS Lead Time
Network Upgrade	143226	Broadland 345/230kV Transformer Replacement (DISIS-2017-001)	\$5,906,325	36 Months
Interconnection	132999	Neset 230 kV Substation GEN-2017-048 Interconnection (Non-Shared NU) (BEPC)	\$1,362,742	12 Months
Interconnection	132998	Neset 230 kV Substation GEN-2017-048 Interconnection (TOIF) (BEPC)	\$1,617,104	12 Months
Interconnection	132949	Rhame 230 kV Substation GEN-2017-010 Interconnection (Non-Shared NU) (BEPC)	\$1,189,064	12 Months
Interconnection	132948	Rhame 230 kV Substation GEN-2017-010 Interconnection (TOIF) (BEPC)	\$1,608,232	12 Months

** If the upgrade cost studied is higher than 20% of DISIS estimates, please provide justification in the facility report.*

The scope of the Facilities Study is to determine the cost estimates of equipment, engineering, procurement, and construction as well as the associated lead times.

For the completion of this Facilities Study request, please provide a Facilities Study report to SPP within ninety (90) calendar days to include all of the Interconnection and Network Upgrade(s) listed in the table above. Additionally, please provide an updated and completed Standardized Cost Estimate Report (SCERT) via the Transmission Reporting and Communication (TRAC) tool.

Sincerely,
SPP Generator Interconnection Department
201 Worthen Drive
Little Rock, AR 72223-4936

Basin Electric Power Cooperative Facility Study Report UID-143226

1. Background:

- 1.1 Per the Generator Interconnection Procedures (GIP), Attachment V, Section 8.11, SPP requests that Basin Electric Power Cooperative (BEPC) perform a facilities study in for the following Interconnection and/or Network Upgrade(s):

Network Upgrade	143226	Broadland 345/230kV Transformer Replacement (DISIS-2017-001)	\$5,906,325	36 Months
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2. Study Requirements:

BEPC has performed this Facility Study report in accordance with the Generator Interconnection Procedures (GIP), Attachment V, Section 8.11 for the Interconnection and/or Network Upgrade(s) as described in Section 1.

2.1. The Facility Study report includes an evaluation of the following:

- 2.1.1. Perform/develop a substation layout, perform a preliminary design, determine all electrical equipment requirements, and if required determine a suitable site location to accommodate the Interconnection and/or Network Upgrade(s). Develop/compile cost estimates for all BEPC labor, overheads, equipment additions, modifications, etc. to accommodate the Interconnection and/or Network Upgrade(s).
- 2.1.2. Develop an overall construction schedule for completion of the necessary additions and/or modifications.

3. Study Results for UID-143226:

3.1. The following results document the analysis of the required facilities for this Upgrade Request as outlined in Section 1 for a replacement 345/230 kV 600 MVA transformer at the Broadland 345kV Substation.

3.2 Substation/Switchyard

A new 345/230 kV transformer will be purchased to replace the existing transformer. The foundation will be analyzed for compatibility with the new transformer and if required will be modified to accommodate the new transformer. Reference Figures A1 and A2. All equipment will follow BEPC's internal design standards for minimum BIL, MVA rating, and fault capabilities.

The associated work for the new 345kV line terminal includes the following major additions:

- (1) 345/230 kV 600 MVA Transformer
- (1) Transformer Foundation

Additional associated work will include a review and update to relay/protection schemes and SCADA RTU configurations at the current facility.

3.3 Environmental Requirements

Compliance with all applicable federal, state and local regulations will be strictly adhered to. Additionally, all applicable and required permits and approvals will be obtained prior to construction. For the purposes of this Facility Study report, it is anticipated that this Interconnection and/or Network Upgrade(s) will require incidental minor local permitting.

3.4 Cost Estimate

UID-143226 Estimated Costs Non Shared Network Upgrades	Current Year \$
Line Costs	
Engineering Labor	\$0
Construction Labor	\$0
Reactive Compensation (Labor & Materials)	\$0
Material	\$0
Right of Way	\$0
Line Sub Total	\$0
Station Costs	
Engineering Labor	\$270,300
Construction Labor	\$273,000
Site Property Rights	\$0
Reactive Compensation	\$0
Material	\$4,552,500
Right of Way	\$0
Station Sub Total	\$5,095,800
AFUDC	\$0
Contingency	\$810,525
Network Upgrades total	\$5,906,325

3.5 Construction Schedule

The preliminary project schedule provided is for planning level purposes only and will be adjusted with additional project definition. If it is determined that NEPA and/or ROW condemnation is required, 12-18 months will be added to the In-Service date.

Activity	Duration	Estimated Start	Estimated Finish
Executed GIA-Notice To Proceed Letter	--	Month 0	--
Project Planning	1 Month	Month 0	Month 1
Engineering Design	2-6 Months	Month 2	Month 7
Equipment Procurement	24-28 Months	Month 4	Month 32
Advertise and Award Construction Contracts	2-3 Months	Month 12	Month 15
Construction	3 Months	Month 29	Month 32
Energize and In-Service Date	1 Month	Month 32	Month 33

Figure A1: Proposed Switching Diagram

FIGURE A1
UID-143226

LEGEND:

- EXISTING EQUIPMENT
- NON SHARED NETWORK UPGRADES
- SHARED NETWORK UPGRADES
- TRANSMISSION OWNERS
- INTERCONNECTION FACILITIES
- INTERCONNECTION CUSTOMER
- FUTURE

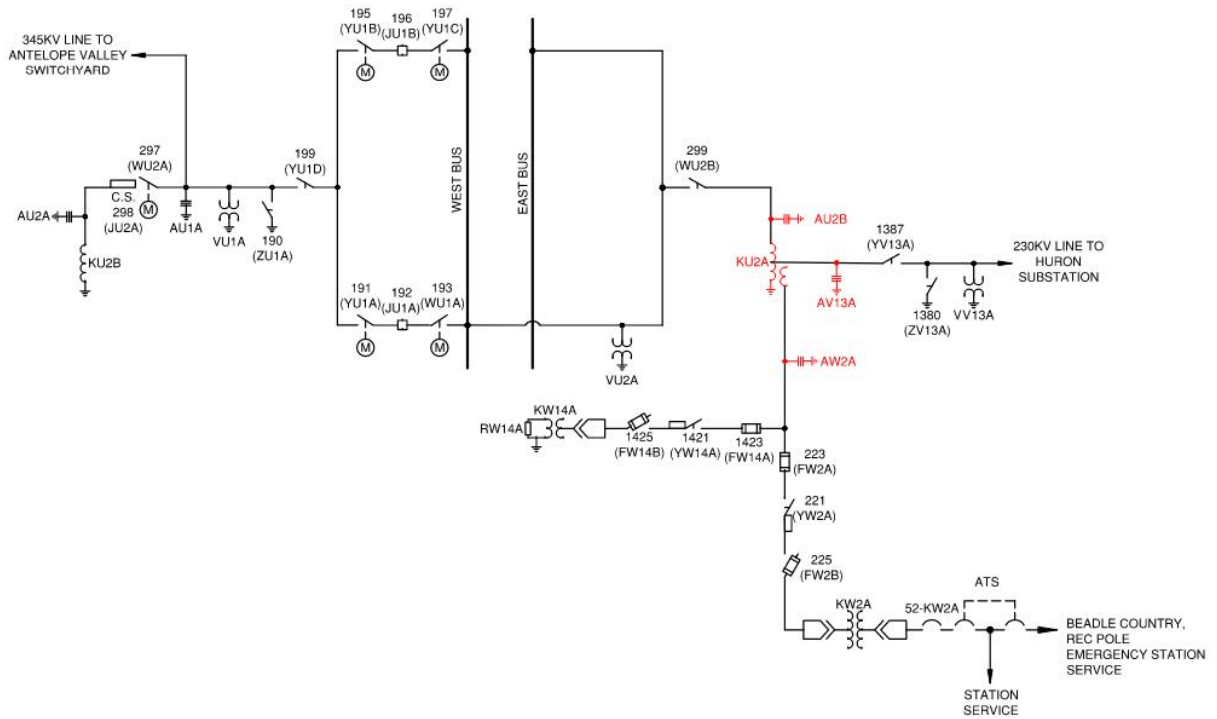
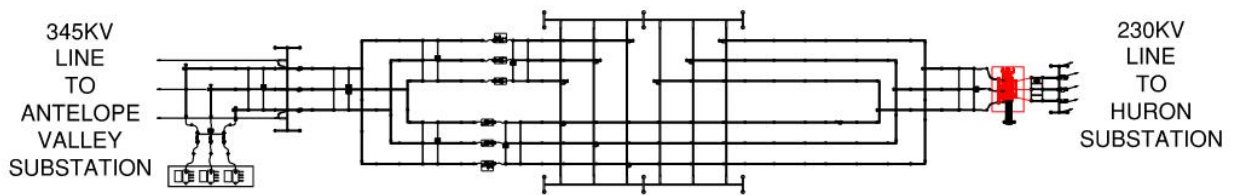


Figure A2: Proposed General Arrangement

FIGURE A2
UID-143226

LEGEND:

- EXISTING EQUIPMENT
- NON SHARED NETWORK UPGRADES
- SHARED NETWORK UPGRADES
- TRANSMISSION OWNERS INTERCONNECTION FACILITIES
- INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES
- FUTURE



CONTROL BUILDING →

ATTACHMENT A
SPP INTERCONNECTION FACILITIES STUDY REQUEST LETTER

June 15, 2021

Subject: Facilities Study Request for DISIS-2017-001

Dear Mr. Severson:

Per the Generator Interconnection Procedures (GIP), SPP requests that Basin Electric Power Cooperative (BEPC) perform facilities study in accordance with Section 8.11 for the following Interconnection and/or Network Upgrade(s):

Upgrade Type	UID	Upgrade Name	DISIS Cost Estimate	DISIS Lead Time
Network Upgrade	143226	Broadland 345/230kV Transformer Replacement (DISIS-2017-001)	\$5,906,325	36 Months
Interconnection	132999	Neset 230 kV Substation GEN-2017-048 Interconnection (Non-Shared NU) (BEPC)	\$1,362,742	12 Months
Interconnection	132998	Neset 230 kV Substation GEN-2017-048 Interconnection (TOIF) (BEPC)	\$1,617,104	12 Months
Interconnection	132949	Rhame 230 kV Substation GEN-2017-010 Interconnection (Non-Shared NU) (BEPC)	\$1,189,064	12 Months
Interconnection	132948	Rhame 230 kV Substation GEN-2017-010 Interconnection (TOIF) (BEPC)	\$1,608,232	12 Months

** If the upgrade cost studied is higher than 20% of DISIS estimates, please provide justification in the facility report.*

The scope of the Facilities Study is to determine the cost estimates of equipment, engineering, procurement, and construction as well as the associated lead times.

For the completion of this Facilities Study request, please provide a Facilities Study report to SPP within ninety (90) calendar days to include all of the Interconnection and Network Upgrade(s) listed in the table above. Additionally, please provide an updated and completed Standardized Cost Estimate Report (SCERT) via the Transmission Reporting and Communication (TRAC) tool.

Sincerely,
SPP Generator Interconnection Department
201 Worthen Drive
Little Rock, AR 72223-4936

Hello Andy,
Per the emails below, confirming that BEPC has updated the cost estimate for UID 143226 - Broadland 345/230kV Transformer Replacement (DISIS-2017-001) in TRAC. The cost estimate has been adjusted as follows:

Item	Previous Estimate	Current Estimate
Station - Engineering Labor	\$270,300	\$180,300
Station - Construction Labor	\$273,000	\$273,000
Station - Material (1)	\$4,552,500	\$6,835,500
Contingency (2)	\$810,525	\$2,772,520
Totals	\$5,906,325	\$10,061,320

(1) Material cost increases primarily related to recent BEPC transformer bids for similar sized transformers

(2) Contingency cost increases primarily related to recent BEPC transformer contract Terms and Conditions citing potential cost increases due to market conditions

The following Estimate Provider Comments were also added in TRAC to provide justification:

7/19/2022: (Boyd Trester) - Per email with Andy Barton on 7/15/2022 12:55pm, informed Andy that the IFS and associated cost estimate for this Shared Network Upgrade were prepared in 2021 based on known historical cost data at that time. BEPC has recently received transformer bids for similar sized transformers and it is clear that costs have gone up significantly. Additionally, Terms and Conditions in the Transformer Contracts present financial uncertainties based on current market conditions. Andy suggested that the costs be updated in TRAC along with a note about the cost increase justification and he would update the facility study and GIA's when appropriate. Material cost increases primarily related to recent BEPC transformer bids for similar sized transformers. Contingency cost increases primarily related to recent BEPC transformer contract Terms and Conditions citing potential cost increases due to market conditions.

Please let me know if you have any questions, or if BEPC is required to submit any additional information.

Thanks!

Boyd S. Trester, P.E.

Manager, Electrical Engineering
Basin Electric Power Cooperative
1717 E Interstate Avenue | Bismarck, ND 58503
Direct: 701.557.5720 | btrester@becp.com | basinelectric.com



Basin Electric Power Cooperative Facility Study Report DISIS-2017-001 Restudy

1. Background:

1.1 Per the Generator Interconnection Procedures (GIP), Attachment V, Section 8.11, SPP requests that Basin Electric Power Cooperative (BEPC) perform a Facility Study Report for the following Interconnection and/or Network Upgrade(s):

TO	Type	Upgrade ID	Upgrade Name
BEPC	Host	143236	Neset to Tioga 230kV Rebuild (DISIS-2017-001)

2. Study Requirements:

BEPC has performed this Facility Study Report in accordance with the Generator Interconnection Procedures (GIP), Attachment V, Section 8.11 for the Interconnection and/or Network Upgrade(s) as described in Section 1.

2.1. The Report includes an evaluation of the following:

- 2.1.1. Develop/compile cost estimates for all BEPC labor, overheads, equipment additions, modifications, etc. to accommodate the reconstruction of the Neset - Tioga 230 kV transmission line and upgrade of line jumpers at the Neset 230/115 kV substation.
- 2.1.2. Develop an overall construction schedule for completion of the reconstruction of the Neset - Tioga 230 kV transmission line and upgrade of the line jumpers at the Neset 230/115 kV substation.

3. Study Results for DISIS-2017-001 Restudy UID 143236:

3.1. The following costs and schedule summarize the improvements required for reconstruction of the 230kV tie-line between Neset and Tioga to meet higher MVA requirements. BEPC will replace the circuit with new conductor meeting 615 MVA and replace line jumpers at Neset 230/115 kV substation with the appropriate ratings to meet or exceed 615 MVA. The estimate includes up to one new deadend structure to accommodate the crossing and larger conductor and potential changes to the general arrangement if necessary.

3.2 Environmental Requirements

Compliance with all applicable federal, state and local regulations will be strictly adhered to. Additionally, all applicable and required permits and approvals will be obtained prior to construction. For the purposes of this Facility Study Report, it is anticipated that the scope of the work described in Section 3.1 will require incidental minor local permitting.

3.3 Cost Estimate

DISIS-2017-001 Restudy UID 143236 Estimated Costs Non Shared Network Upgrades	Current Year \$
Line Costs	
Engineering Labor	\$28,000
Construction Labor	\$100,000
Reactive Compensation (Labor & Materials)	\$0
Material	\$75,000
Right of Way	\$0
Line Sub Total	\$203,000
Station Costs	
Engineering Labor	\$20,000
Construction Labor	\$7,500
Site Property Rights	\$0
Reactive Compensation	\$0
Material	\$7,875
Right of Way	\$0
Station Sub Total	\$35,375
AFUDC	\$17,123
Contingency	\$51,000
Non - Shared Network Upgrades total	\$306,498

Total Interconnection Cost	\$306,498
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3.4 Construction Schedule

The preliminary project schedule provided is for planning level purposes only and will be adjusted with additional project definition.

Activity	Duration	Estimated Start	Estimated Finish
Executed NTC-Notice To Construct	--	Month 0	--
Project Planning	1 Month	Month 0	Month 1
Engineering Design	1-2 Months	Month 1	Month 3
Equipment Procurement	6-8 Months	Month 2	Month 10
Advertise and Award Construction Contracts	2-3 Months	Month 7	Month 10
Construction	1 Months	Month 10	Month 11
Energize and In-Service Date	1 Month	Month 11	Month 12

Figure A1: Proposed Switching Diagram

FIGURE A1
DISIS-2017-001 RESTUDY

LEGEND:

- EXISTING EQUIPMENT
- NON SHARED NETWORK UPGRADES
- SHARED NETWORK UPGRADES
- TRANSMISSION OWNERS INTERCONNECTION FACILITIES
- INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES
- FUTURE

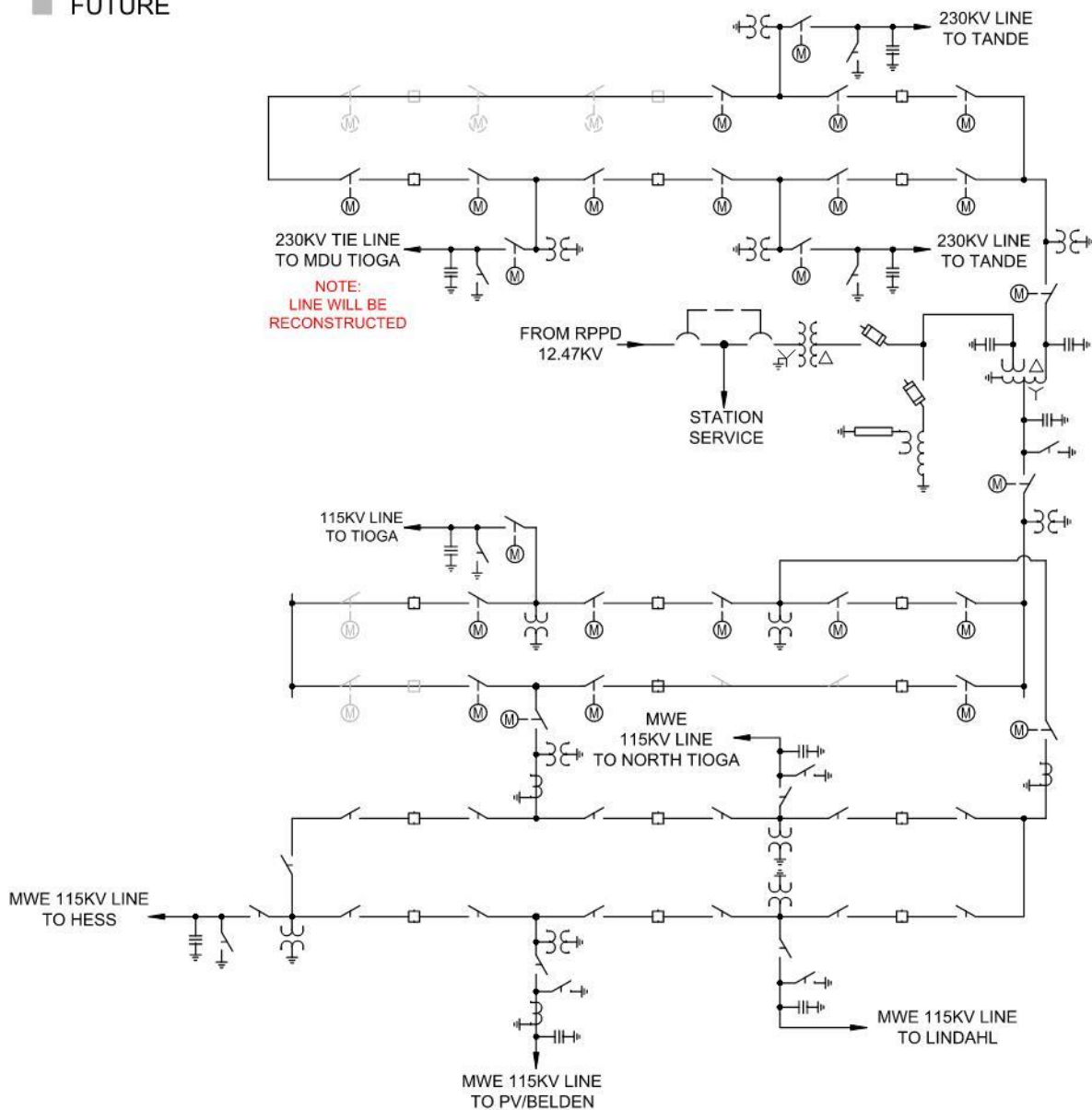
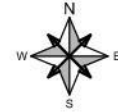
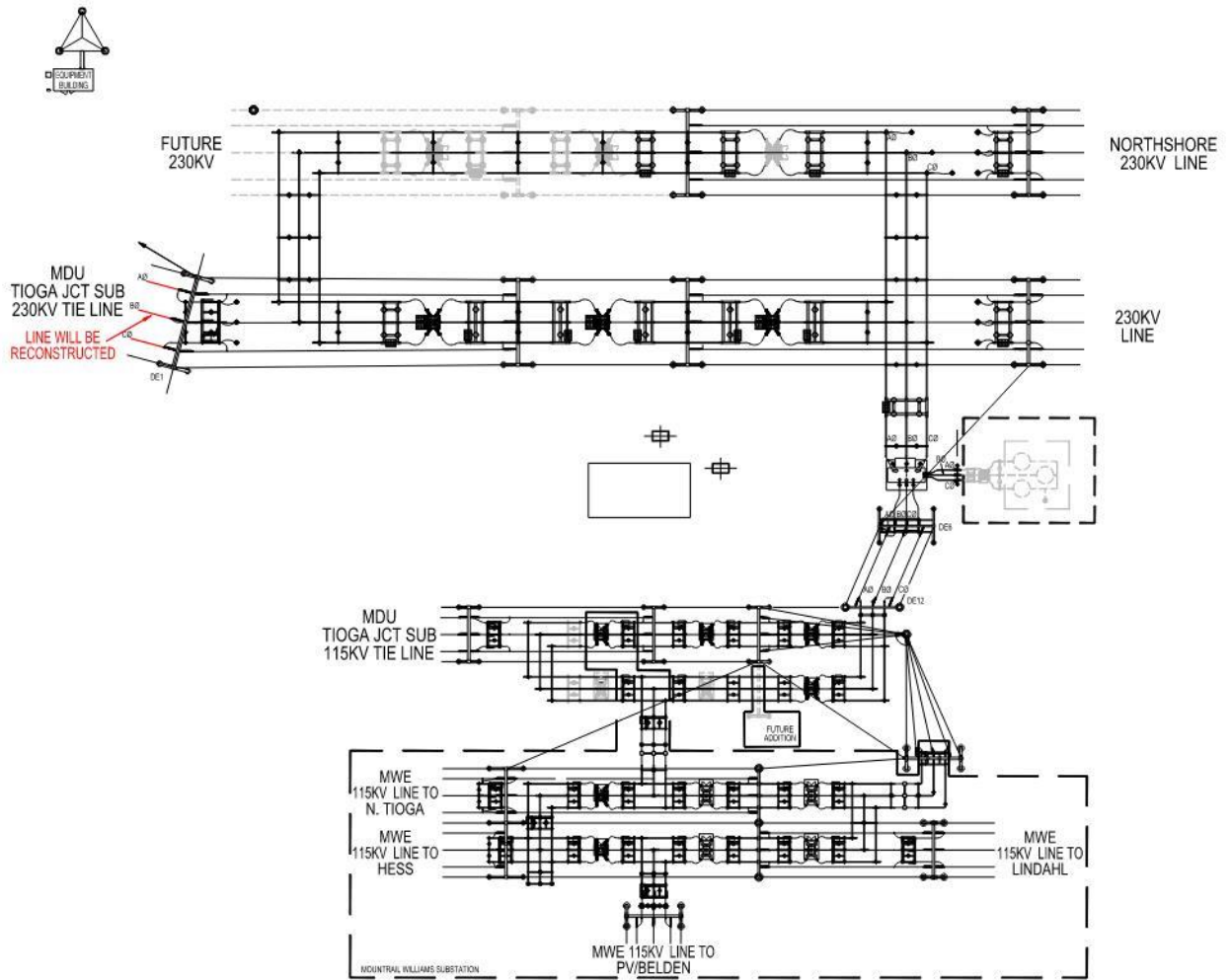


Figure A2: Proposed General Arrangement

FIGURE A2
DISIS-2017-001 RESTUDY



MISO Project SPP GEN-2017-048

Facility Study for Generator Interconnection

Prepared by Jon Wahlgren
Montana-Dakota Utilities Co.
For
The Midcontinent Independent System Operator

February 22, 2023

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Executive Summary

This report presents the results of a facility study performed to identify the necessary network upgrades on Montana-Dakota's Utilities Company's Transmission System required to interconnect the SPP GEN-2017-048 project to Southwest Power Pool's (SPP) Transmission System.

The Network Upgrades required for this interconnection are:

1. Upgrades to the Tioga 230kV Substation terminal equipment on the Tioga-Neset 230 kV line

Substation Estimated Cost - \$1,057,000

Each of the specific upgrades will be explained and identified as an Interconnection Facility, Network Upgrade, System Protection Upgrade, or Affected System Upgrade and include detailed cost estimates.

This report includes a Construction and Coordination Schedule of the Interconnection Facilities and Network Upgrades required. The expected completion date for the network upgrades is the commercial operation date of the Interconnection Customer.

The Interconnection Customer has proposed a generating facility in-service date of December 31st, 2025.

Introduction

This report fulfills the agreement for Study Services made between the Midcontinent Independent System Operator, Inc. (MISO) and Montana-Dakota Utilities Co. (MDU) to conduct a Network Upgrades Facilities Study for SPP's GEN-2017-048 project. This Facilities Study report provides a construction schedule and good faith detailed cost estimate (+/-20% accuracy) of the transmission facility additions and modifications necessary to physically and electrically connect the Interconnection Facilities to the transmission system. This Facilities Study report is being prepared for and submitted to MISO.

The Generating Facility is to be located in Williams County, North Dakota and will be interconnected to Basin Electric Power Cooperative's (Basin) Nenet Substation.

Study Scope

This study will only include the Network Upgrades specific to this interconnection. This facility study does not address any facilities necessary to interconnect the proposed generation to Transmission Owner's transmission system, or facility additions, upgrades, or other modifications that may be required to mitigate constraints identified in other system impact studies or long known pre-existing conditions that have adversely affected the transmission system. Interconnection Customer owned facilities are also beyond the scope of this study.

It should also be noted that the facility study results are based on the interconnection information provided by the Interconnection Customer, and on the transmission system configuration existing at the time of the study. If any significant change occurs to either the generation interconnection proposal or to the transmission system, additional studies may be needed to ensure that the interconnection does not degrade transmission system reliability. Study results may also change significantly. Transmission Owner reserves the right to re-evaluate the study prior to actual design and construction of the interconnection as circumstances dictate.

This facility study report will identify the Point of Interconnection, Point of Change of Ownership, Transmission Owner Interconnection Facilities, Interconnection Customer Interconnection Facilities, Network Upgrades, System Protection Upgrades, Generator Upgrades, Distribution Upgrades, and Affected System Upgrades.

Network Upgrades

Network Upgrades shall mean the additions, modifications, and upgrades to the Transmission System required at or beyond the point at which the Interconnection Facilities connect to the Transmission System or Distribution System, as applicable, to accommodate the interconnection of the Generating Facility to the Transmission System.

Stand Alone Network Upgrades shall mean Network Upgrades that may be constructed without affecting day-to-day operations of the Transmission System.

Non-Stand Alone Network Upgrades shall mean Network Upgrades that require interface with the Transmission Owner in order to proceed with construction.

This generator interconnection is proposing to tie into an existing substation. The proposed point of interconnection (POI) is Basin's Neset Transmission Substation located in Williams County North Dakota. This POI will require substation modifications, but those modifications are outside the scope of this report. This interconnection will require network upgrades on MDU's 230kV system, to include the terminal equipment at MDU's Tioga Substation on the Tioga-Neset 230 kV Line.

Stand Alone Network Upgrades

At this time no Stand-Alone Network Upgrades identified as needed or being proposed to be constructed by the Transmission Owner or the Interconnection Customer. All network upgrades are non-stand alone.

Non-Stand-Alone Network Upgrades

1. Upgrade the Tioga Substation 230 kV terminal equipment. Facility upgrades to increase the rating on the 230kV line between Tioga and Neset includes replacing circuit breakers, switches, jumpers and current transformer ratio changes at the Tioga Substation. Additional System Protection changes are described in the System Protection Facilities section below.

Please refer to the drawings attached as Exhibit A1.

Estimated cost - \$1,025,000

2. System Protection changes are described in the System Protection Facilities section below.

Please refer to the drawing attached as Exhibit A2 and A3.

Estimated cost - \$32,000

Transmission Owner's Interconnection Facilities

Transmission Owner's Interconnection Facilities shall mean all facilities and equipment owned by the Transmission Owner from the Point of Change of Ownership to the Point of Interconnection including any modifications, additions or upgrades to such facilities and equipment. Transmission Owner's Interconnection Facilities are sole use facilities and shall not include Distribution Upgrades, Generator Upgrades, Stand Alone Network Upgrades or Network Upgrades. Point of Change of Ownership shall mean the point where the Interconnection Customer's Interconnection Facilities connect to the Transmission Owner's Interconnection Facilities.

A Facility Study for Transmission Owner's Interconnection Facilities has been completed in August 2022 in Basin's Interconnection Facility Agreement. Those interconnection facilities are outside the scope of this report.

Interconnection Customer's Interconnection Facilities

Interconnection Customer's Interconnection Facilities shall mean all facilities and equipment that are located between the Generating Facility and the Point of Change of Ownership, including any modification, addition, or upgrades to such facilities and equipment necessary to physically and electrically interconnect the Generating Facility to the Transmission System or Distribution System, as applicable. Interconnection Customer's Interconnection Facilities are sole use facilities.

These facilities are beyond the scope of this report.

System Protection Facilities

System Protection Facilities shall mean the equipment, including necessary protection signal communications equipment, required to protect (1) the Transmission System or other delivery systems or other generating systems from faults or other electrical disturbances occurring at the Generating Facility and (2) the Generating Facility from faults or other electrical system disturbances occurring on the Transmission System or on other delivery systems or other generating systems to which the Transmission System is directly connected.

With the replacement of the terminal equipment and the line rating at the Tioga Substation, the current protective relaying at the MDU Tioga and Basin Neset substations will require modification. Microprocessor based protective relays are currently installed at Tioga, so the current transformer tap will need to be changed, and the relays will need to be reset. Basin Electric is responsible for the protective relay changes at the Neset Substation.

System Protection Upgrades include:

- Revise protection scheme and reset dual primary relay systems on the 230 kV Neset line at the Tioga 230 Substation.

Estimated cost - \$32,000

Affected System Upgrades

Affected System Upgrades shall mean an electric transmission or distribution system or the electric system associated with an existing generating facility or of a higher queued Generating Facility, which is an electric system other than the Transmission System that may be affected by the Interconnection Request. An Affected System may or may not be subject to FERC jurisdiction.

At this time there are no Affected System Upgrades identified as needed or being proposed to be constructed by the Transmission Owner or the Interconnection Customer.

Distribution Upgrades

Distribution Upgrades shall mean the additions, modifications, and upgrades to the Distribution System at or beyond the Point of Interconnection to facilitate interconnection of the Generating Facility and render the delivery service necessary to affect Interconnection Customer's wholesale sale of electricity in interstate commerce. Distribution Upgrades do not include Interconnection Facilities.

At this time there are no Distribution Upgrades identified as needed or being proposed to be constructed by the Transmission Owner or the Interconnection Customer.

Generator Upgrades

Generator Upgrades shall mean the additions, modifications, and upgrades to the electric system of an existing generating facility or of a higher queued Generating Facility at or beyond the Point of Interconnection to facilitate interconnection of the Generating Facility and render the transmission service necessary to affect Interconnection Customer's wholesale sale of electricity in interstate commerce.

At this time there are no Generator Upgrades identified as needed or being proposed to be constructed by the Transmission Owner or the Interconnection Customer.

Interconnection and Operating Guidelines

Interconnection and Operating Guidelines shall mean any “project specific” guidelines or requirements for the interconnection and/or operation of the Facility that go beyond the generic and universal requirement of “Good Utility Practice”.

Transmission Owner’s requirements for generation, transmission, and end-user facility interconnections are available at the following link.

<http://www.montana-dakota.com/rates-and-services/interconnection-requirements>

Exhibits

Exhibit A1 – Tioga Substation Plan View w/ Upgrades

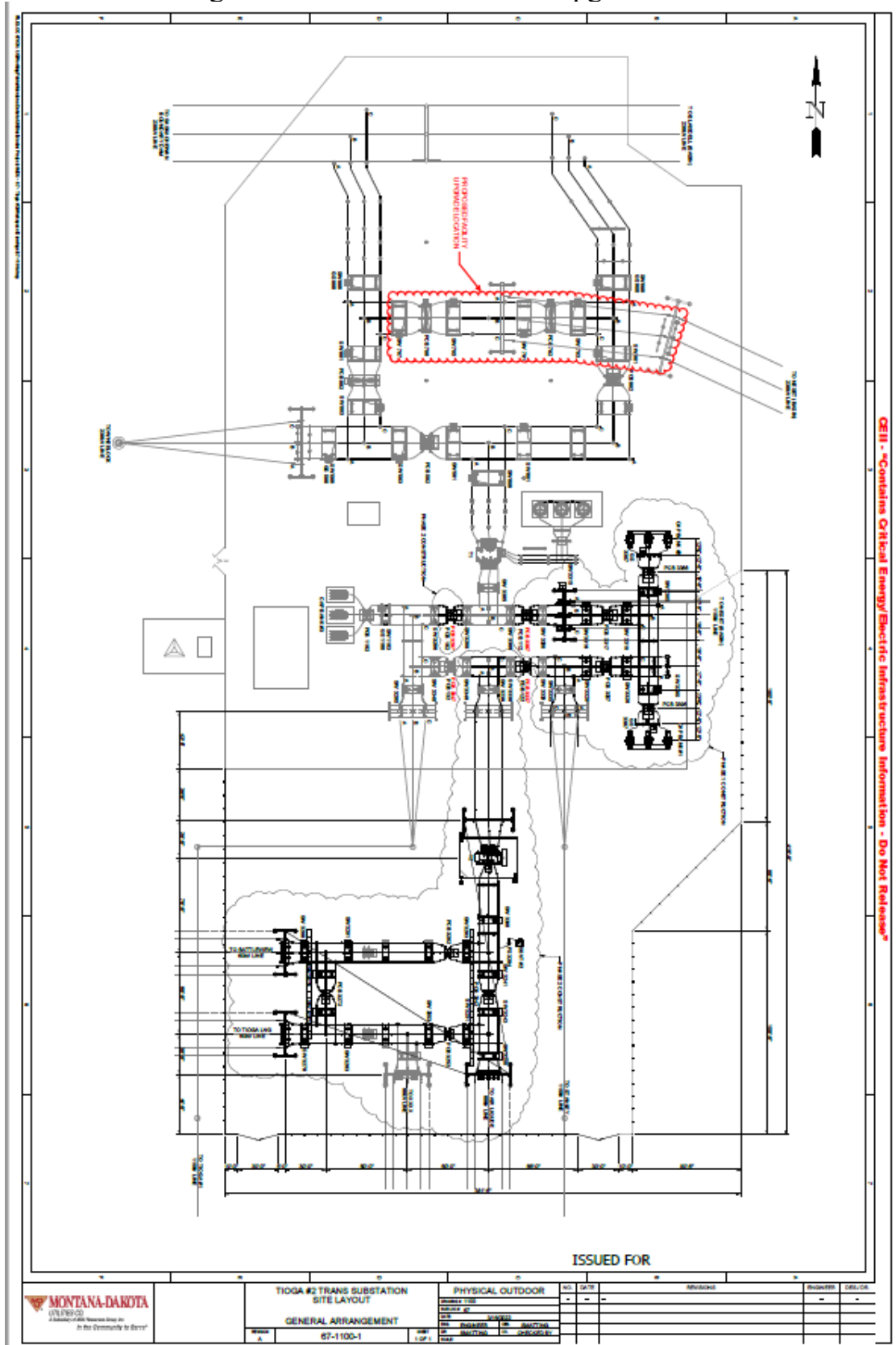


Exhibit A2 – Facilities to be constructed by Transmission Owner

<u>Upgrade Type</u>	<u>Facilities to be Constructed</u>	<u>Estimate (2022 Dollars)</u>
Non-Stand Alone Network Upgrade	Upgrade the Tioga Substation 230 kV terminal equipment	\$1,025,000
System Protection Upgrades	Tioga Substation Protective Relay Changes on Naset Line	\$32,000
	Total	\$1,057,000

Exhibit A3 – Detailed Cost of Facilities to be constructed by Transmission Owner

Exhibit A3-1 Non-Stand Alone Network Upgrades Tioga 230 kV Terminal Equipment		
Description	Quantity	Amount
242kV Power Circuit Breaker	2 Each	\$260,000
Group Operated Disconnect Switch	3 Each	\$70,000
Equipment Foundations	2 Each	\$30,000
Buswork (Includes Substation Jumpers)	Lot	\$95,000
Control Cable, Conduit, Grounding	Lot	\$85,000
Engineering Design & Checkout	Lot	\$65,000
Construction Labor	Lot	\$250,000
Transportation & Equipment	Lot	\$20,000
Overhead	Lot	\$150,000
Total		\$1,025,000

Exhibit A3-2 System Protection Upgrades SPP-2017-48 Protective Relay Changes		
Description	Quantity	Amount
Engineering Design & Checkout	Lot	\$10,000
Construction Labor	Lot	\$15,000
Overhead	Lot	\$7,000
Total		\$32,000

Exhibit A4 – Facilities Subject to Transmission Service Credits

<u>Upgrade Type</u>	<u>Facilities to be Constructed</u>	<u>Estimate (2022 Dollars)</u>
Non-Stand Alone Network Upgrade	Tioga Substation 230 kV Terminal Equipment Upgrade	\$1,025,000
System Protection Upgrades	Tioga Substation 230 kV Protective Relays	\$32,000

Exhibit A5 – Contingent Facilities

At the time of this proposal the final SPP DSIS-2017-001 System Impact Study report is still pending. Any additional facilities identified in the System Impact Study are not included in this proposal. MISO develops and maintains a list of contingent facilities.

Exhibit A6 – Customer Milestones

A list of key project and regulatory activities that must be met by the Interconnection Customer in a reasonable time period for the project to maintain its queue position of mutually agreeable in-service schedule.

The Interconnection Customer has proposed a generation facility commercial operation date of December 31, 2025. No other milestones have been identified at this time.

Exhibit A7 – Construction and Coordination Schedules

	Task Name	Duration	Start	Finish	Predecessors
1	▸ Project Initiation	17 days	Tue 8/1/23	Wed 8/23/23	
8	▸ Design	335 days	Mon 9/4/23	Fri 12/13/24	1
9	▸ Substation Physical Design	200 days	Fri 12/1/23	Thu 9/5/24	
22	▸ Substation Protection & Control	120 days	Mon 7/1/24	Fri 12/13/24	
36	▸ Procurement	400 days	Mon 10/2/23	Fri 4/11/25	8
37	▸ Substation Physical Procurement	400 days	Mon 10/2/23	Fri 4/11/25	
65	▸ Substation Protection & Control	90 days	Mon 9/2/24	Fri 1/3/25	
70	▸ Construction	180 days	Tue 4/1/25	Mon 12/8/25	36
71	▸ Substation Physical Construction	180 days	Tue 4/1/25	Mon 12/8/25	
98	▸ Substation Protection & Control	90 days	Tue 8/5/25	Mon 12/8/25	
113	▸ Project Close Out	90 days	Tue 12/9/25	Mon 4/13/26	70

Exhibit A8 – Permits, Licenses, Regulatory Approvals, and Authorization

Agency	Type of Approval	Need
<u>None identified at this time</u>		

Exhibit A9 – Interconnection and Operating Guidelines

Interconnection and Operating Guidelines shall mean any “project specific” guidelines or requirements for the interconnection and/or operation of the Facility that go beyond the generic and universal requirement of “Good Utility Practice”.

Transmission Owner’s requirements for generation, transmission, and end-user facility interconnections are available at the following link.

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