# INTERCONNECTION FACILITIES STUDY REPORT

GEN-2017-010

Published February 2023

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. |
| 02/02/2023 | SPP | Updated for MISO's Affected Systems costs listed in the AFS report. |

# CONTENTS

Revision History ..... i
Summary ..... 1
Introduction ..... 1
Phase(s) of Interconnection Service ..... 1
Compensation for Amounts Advanced for Network Upgrade(s) ..... 1
Interconnection Customer Interconnection Facilities ..... 2
Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s) ..... 3
Shared Network Upgrade(s) ..... 4
Contingent Network Upgrade(s) ..... 5
Affected System Upgrade(s) ..... 6
Conclusion ..... 7
Appendices ..... 8
A: Transmission Owner's Interconnection Facilities Study Report and Network Upgrades Report(s) ..... 9

# SUMMARY

## INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-010 is for a 200.1 MW generating facility located in Bowman 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 October 31st, 2022.

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 seventy-one (71) GE 2.82 MW Wind Turbine Generation Systems for a total generating nameplate capacity of 200.1 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;
- One 230/34.5 kV 135/180/224 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An approximately .8 mile overhead 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 ("Rhame 230kV 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 |
|---|---|---|---|---|
| **Rhame 230 kV Substation GEN-2017-010 Interconnection (TOIF) (BEPC) (132948):** Construct one (1) 230 kV line terminal, line switches, dead end structure, line relaying, communications, revenue metering, line arrestor, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility. | $1,674,744 | 100% | $1,674,744 | 15 Months |
| **Total** | **$1,674,744** | | **$1,674,744** | |

*Table 2: Non-Shared Network Upgrade(s)*

| Non-Shared Network Upgrades Description | ILTCR | Total Cost Estimate ($) | Allocated Percent (%) | Allocated Cost Estimate ($) | Estimated Lead Time |
|---|---|---|---|---|---|
| **Rhame 230 kV Substation GEN-2017-010 Interconnection (Non-Shared NU) (BEPC) (132949):** Construct one (1) 230kV breaker, one (1) 230kV breaker disconnect switch, one (1) set of line PTs, one (1) set of CTs, one (1) set of line surge arrestors and all other associated work and materials. | Not Eligible | $1,122,522 | 100% | $1,122,522 | 15 Months |
| **Total** | | **$1,122,522** | | **$1,122,522** | |

## 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 |
|---|---|---|---|---|---|
| **Transmission Owner 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 | 34.59% | $3,480,211 | 33 Months |
| **Total** | | **$10,061,320** | | **$3,480,211** | |

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 |
|---|---|---|
| **None** | $0 | N/A |

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 ($) | Allocated Percent (%) | Allocated Cost Estimate ($) |
|---|---|---|---|
| **MISO AFS for DISIS-2017-001:** Montezuma 345 kV + 100 MVAR capacitor bank | $6,000,000 | 15.4% | $924,731 |
| **MISO AFS for DISIS-2017-001:** Blackhawk 345 kV + 100 MVAR SVC/Statcom | $50,000,000 | 17.6% | $8,800,000 |
| **Total** | $56,000,000 | | $9,724,731 |

## CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 200.1 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) | $1,674,744 |
| Non-Shared Network Upgrade(s) | $1,122,522 |
| Shared Network Upgrade(s) | $3,480,211 |
| Affected System Upgrade(s) | $9,724,731 |
| **Total** | **$16,002,208** |

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

<u>Yard Development</u>

<u>For existing Black Hawk Substation</u>

- 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

<u>For STATCOM yard</u>

- 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

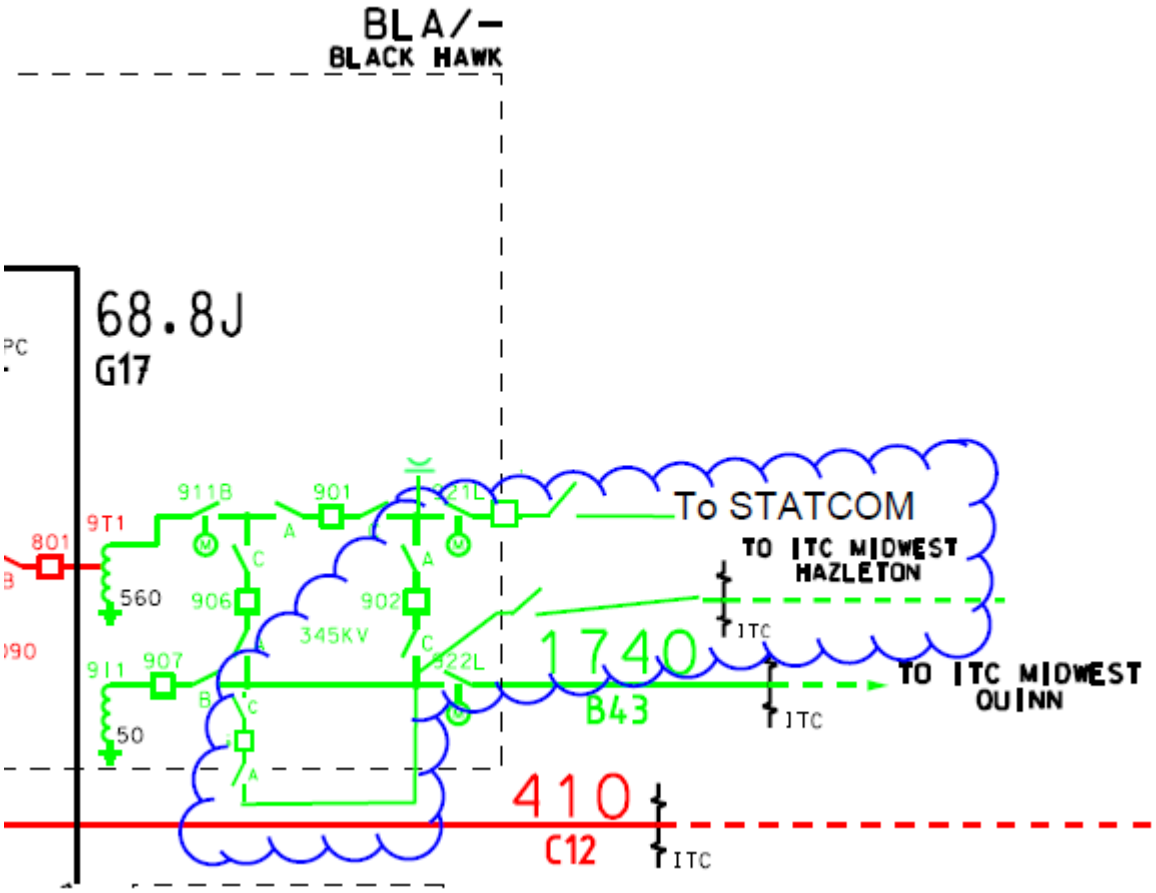
Not Applicable

### A1-2 Site Map for IC Project

Not Applicable

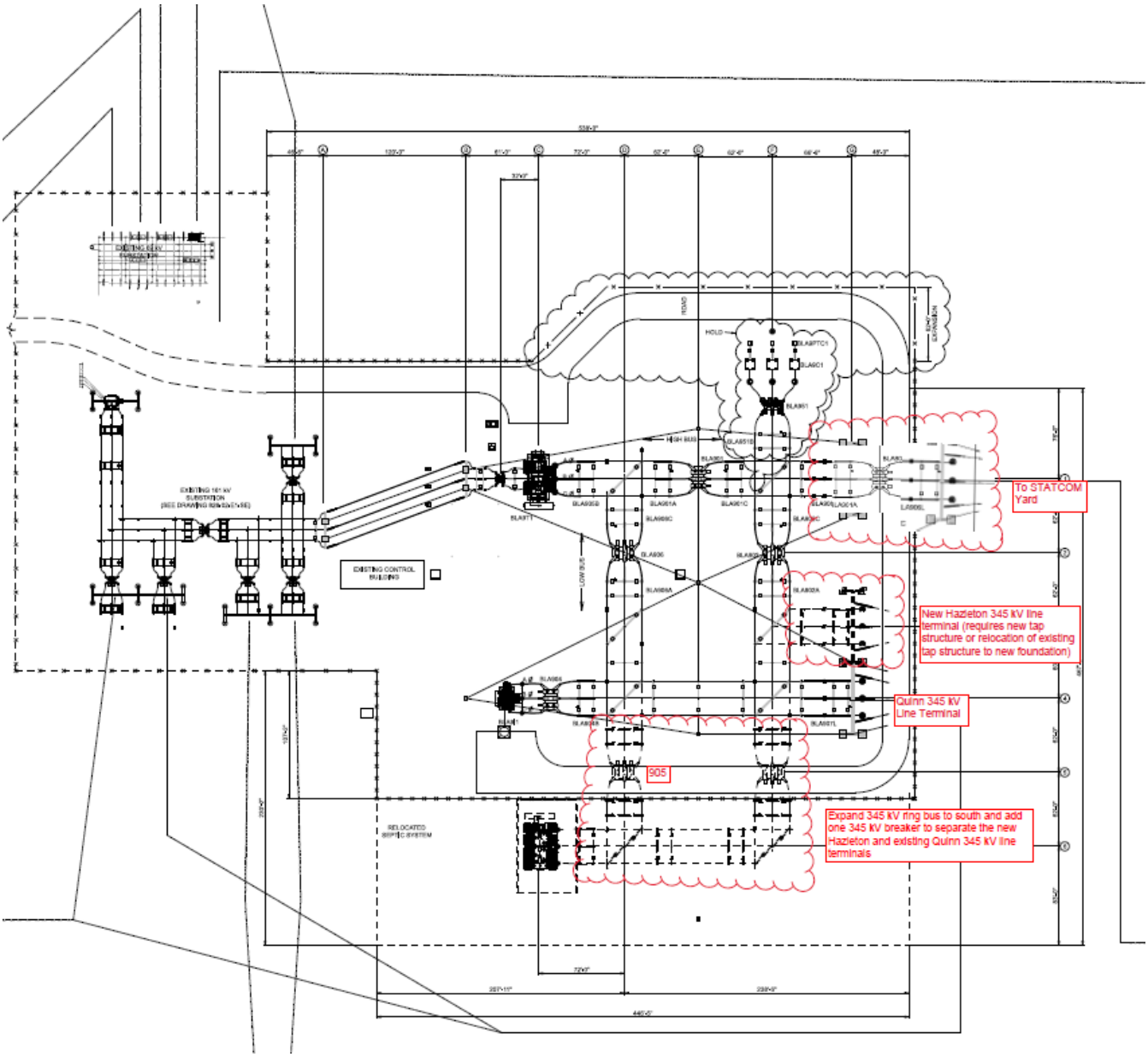
## 7.2 A2 - Transmission Owner One Line

**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

**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
# 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

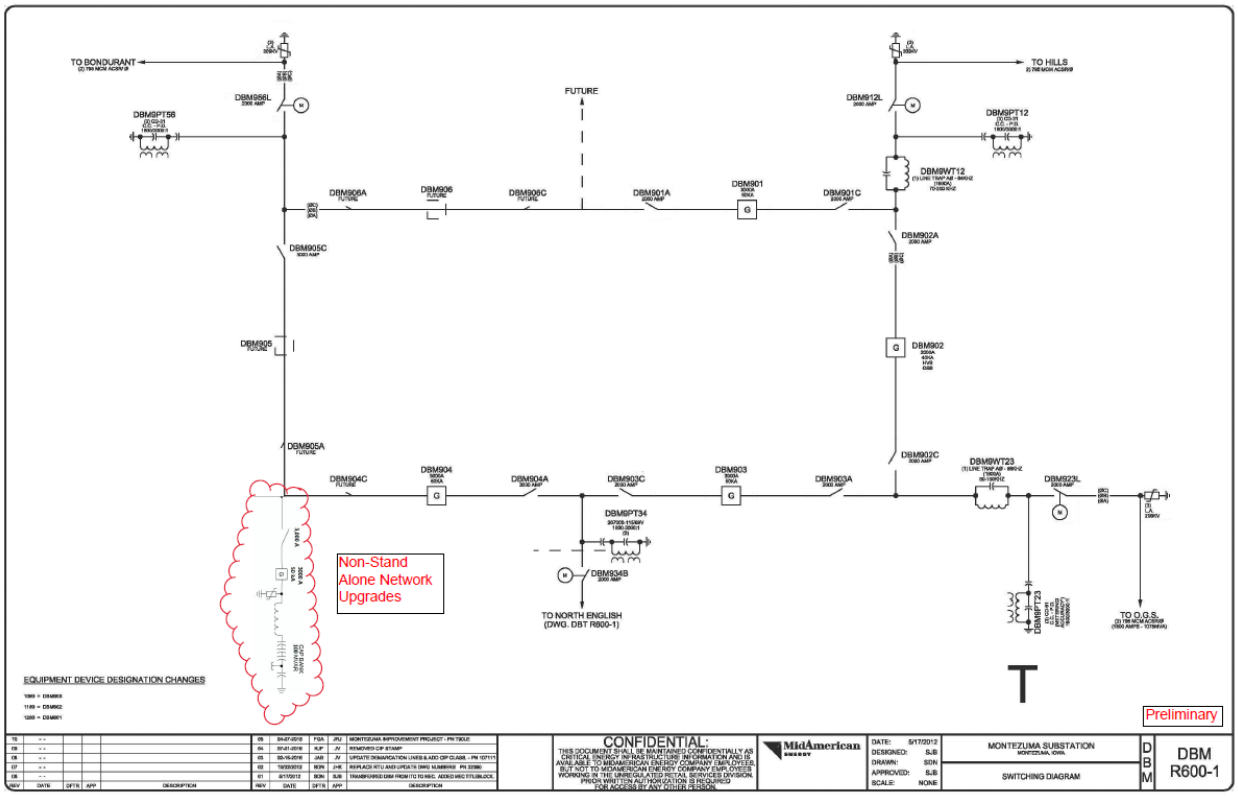
Not Applicable

## 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-2017-010

## 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 | 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 |

## 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-2017-010:

**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 Rhame 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 ring bus 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
- (1) 230kV Breaker Disconnect Switch
- (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 and the Leland Olds Unit 2 line terminal.

### 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-2017-010 Estimated Costs<br>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 | $438,311 |
| Site Property Rights | $0 |
| Reactive Compensation | $0 |
| Material | $174,565 |
| Right of Way | $0 |
| Station Sub Total | **$843,876** |
| AFUDC | $0 |
| Contingency | $278,676 |
| **Non - Shared Network Upgrades total** | **$1,122,552** |

| GEN-2017-010<br>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 | $522,285 |
| Right of Way | $0 |
| Station Sub Total | **$1,258,985** |
| AFUDC | $0 |
| Contingency | $415,759 |
| **TOIF Subtotal** | **$1,674,744** |

| **Total Interconnection Cost** | **$2,797,296** |
|---|---|

### 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**

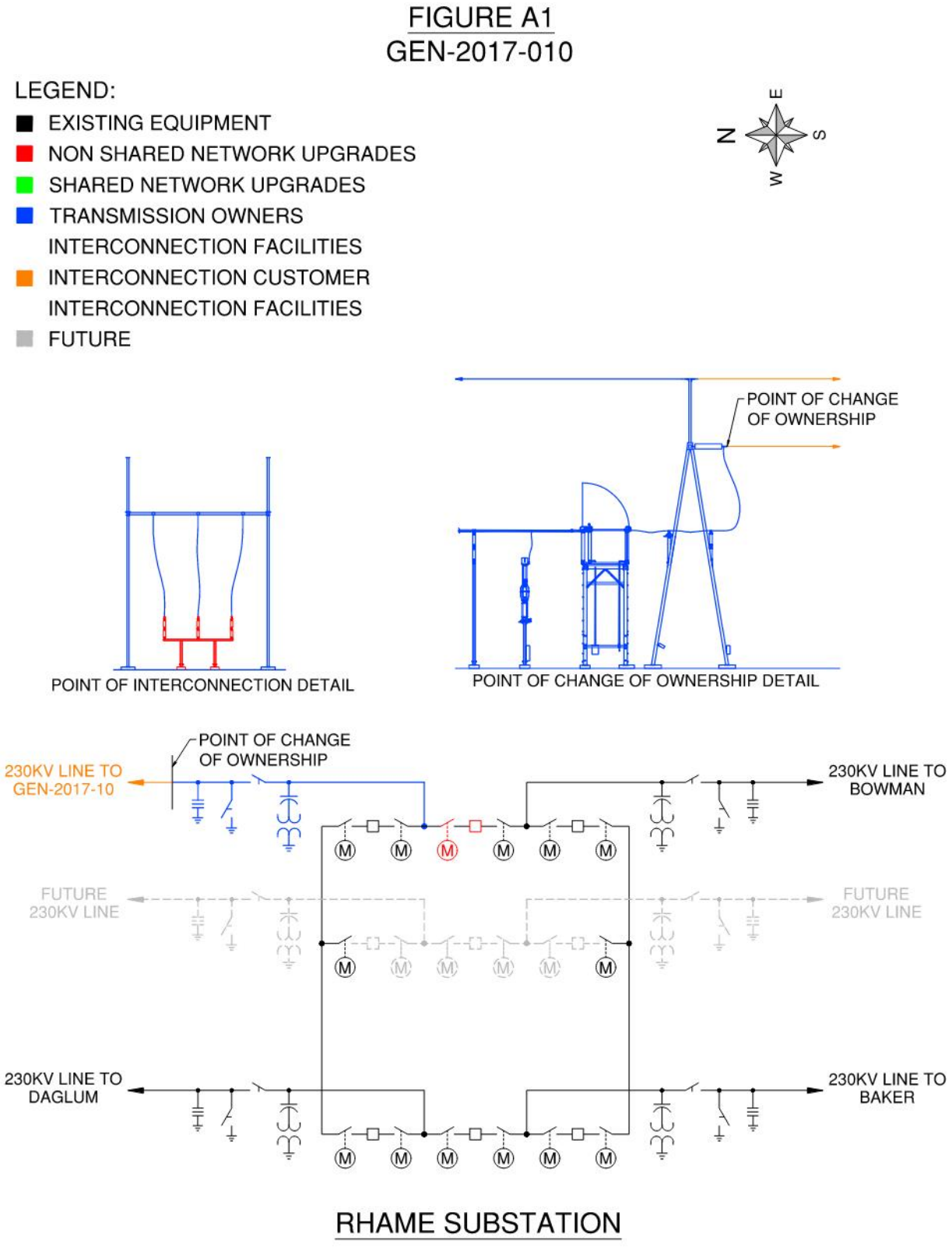
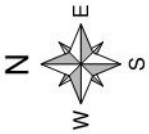


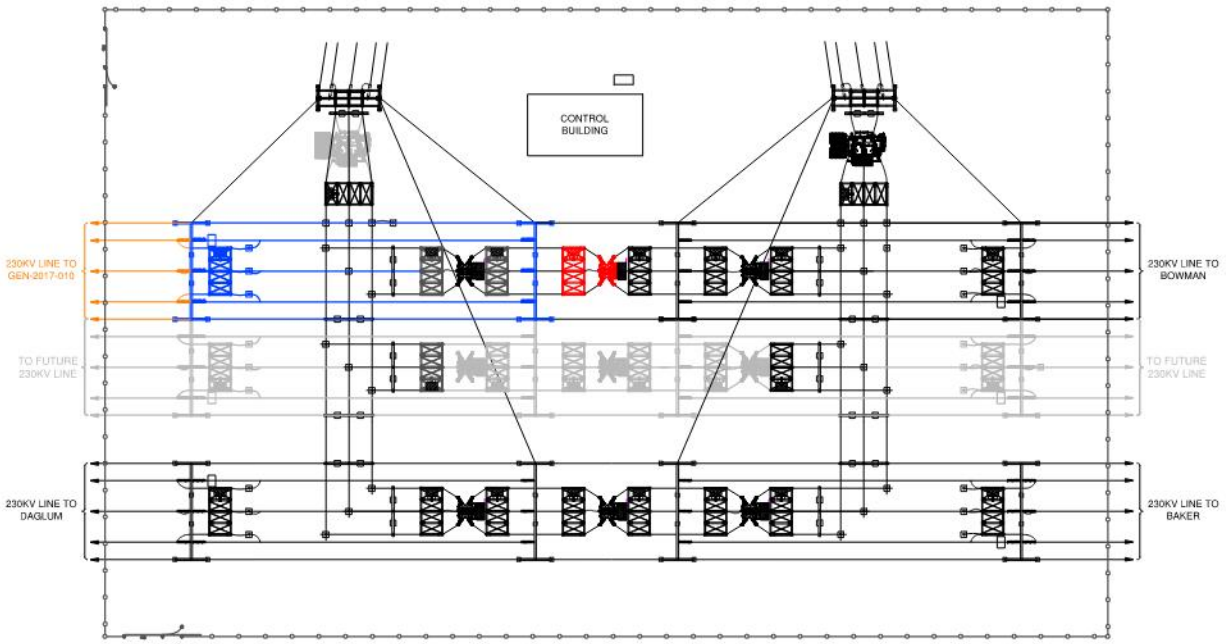
**Figure A2: Proposed General Arrangement**

FIGURE A2
GEN-2017-010

LEGEND:

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




RHAME SUBSTATION

# ATTACHMENT A

# SPP INTERCONNECTION FACILITIES STUDY REQUEST LETTER

SPP Southwest Power Pool

HELPING OUR MEMBERS WORK TOGETHER TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE

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 ther 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 |

## 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<br>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**

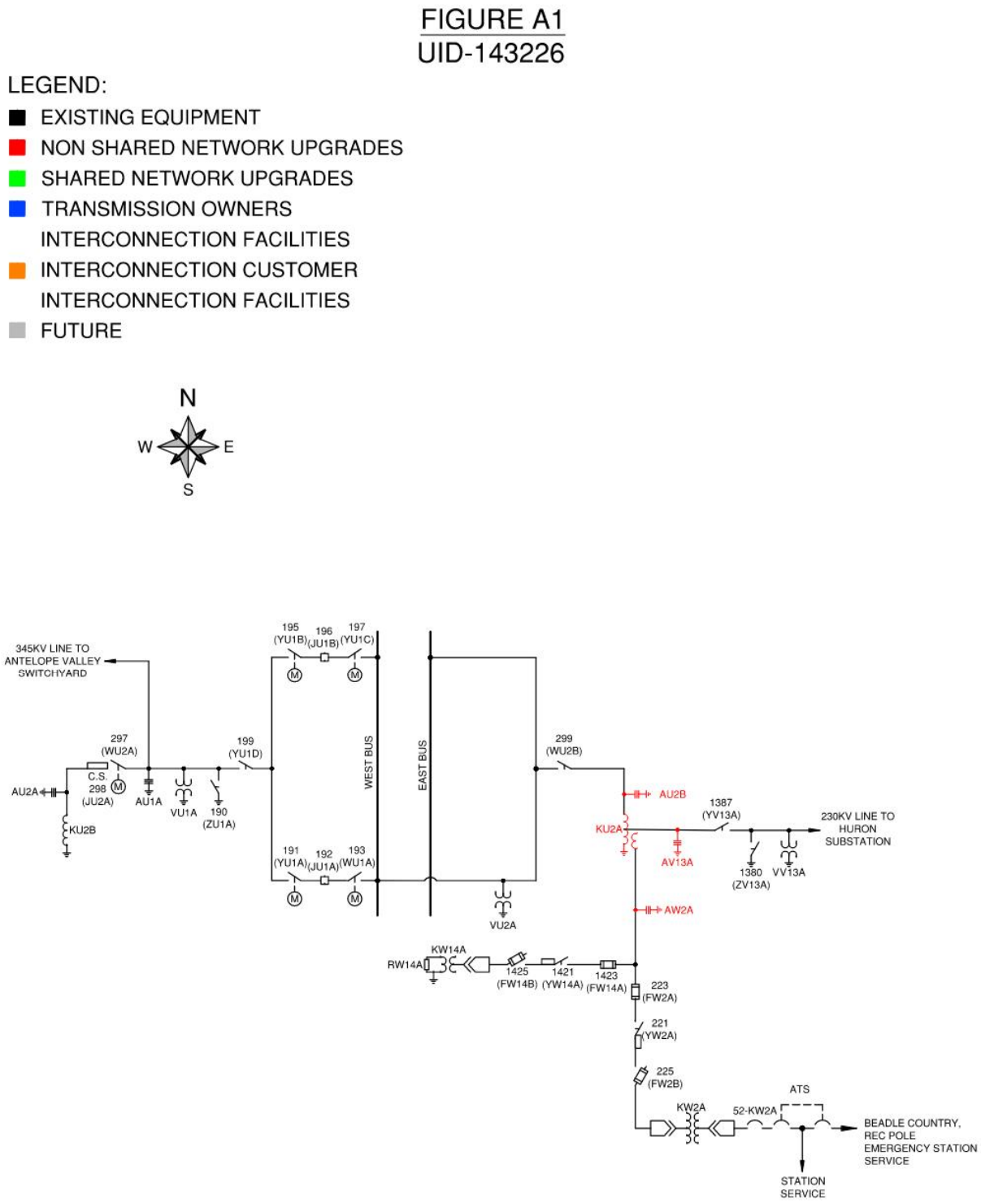
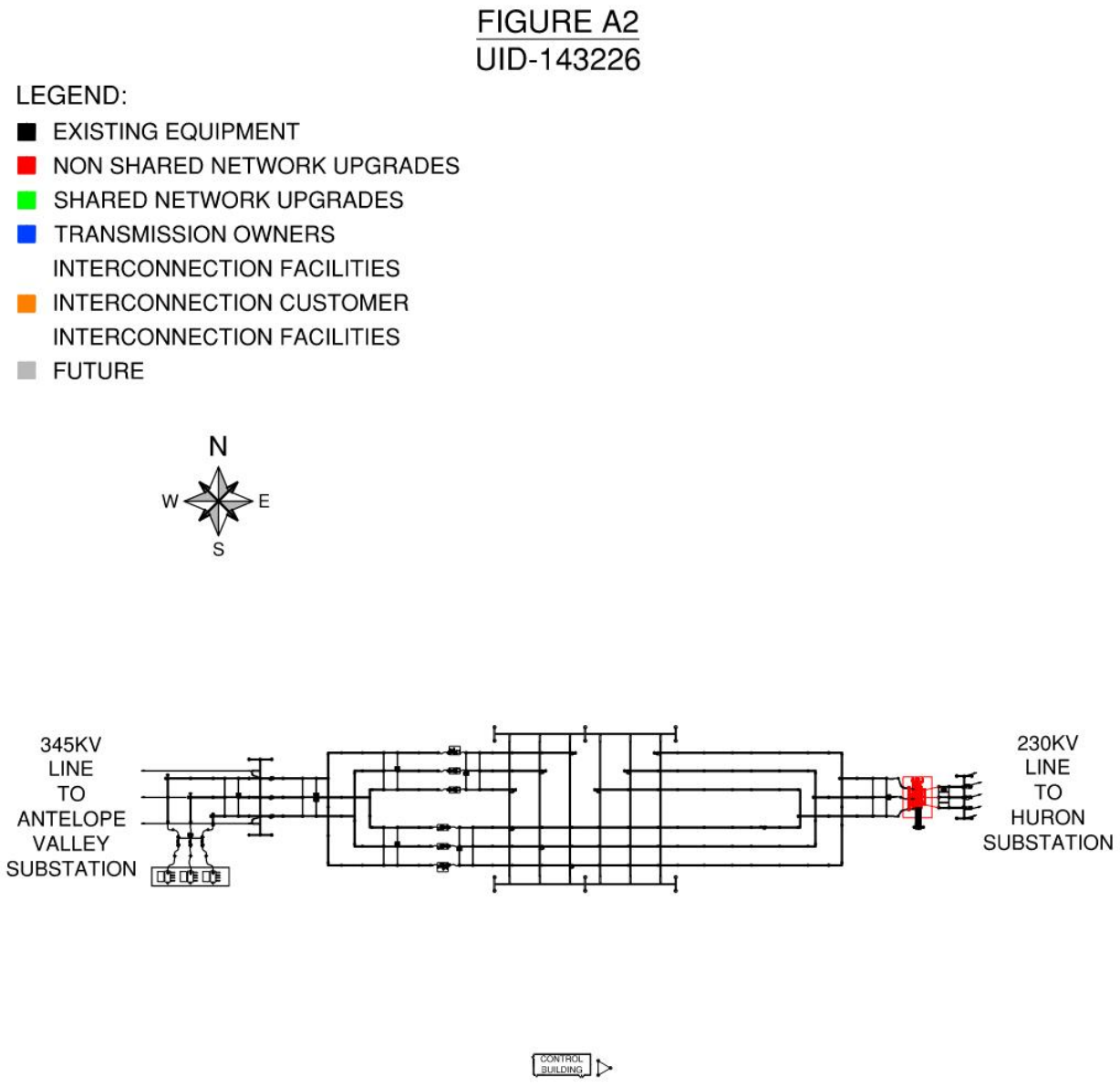


**Figure A2: Proposed General Arrangement**



# ATTACHMENT A

# SPP INTERCONNECTION FACILITIES STUDY REQUEST LETTER

SPP Southwest Power Pool

HELPING OUR MEMBERS WORK TOGETHER TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE

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 ther 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@bepc.com | basinelectric.com