INTERCONNECTION FACILITIES STUDY REPORT

GEN-2017-004

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
01/07/2022	SPP	Initial draft report issued.
01/10/2022	SPP	Updated draft report issued to match the Affected Systems costs listed in the MISO AFS report
08/02/2022	SPP	Updated Report for Evergy's relay settings review and Affected Systems Restudy posting.
02/02/2023	SPP	Updated for MISO's Affected Systems costs listed in the AFS report.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2017-004 is for a 201.6 MW generating facility located in Cloud County, KS. The Interconnection Request was studied in the DISIS-2017-001 Impact Study and DISIS-2017-001-1 Impact Restudy for Energy Resource Interconnection Service (ERIS).The Interconnection Customer's requested in-service date is December 31, 2023.

The interconnecting Transmission Owner, ITC Great Plains (ITCGP), 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 fifty-six (56) 3.6 MW Vestas wind turbines for a total generating nameplate capacity of 201.6 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 345 kV transformation substation with associated 34.5 kV and 345 kV switchgear;
- One 345/34.5 kV 138/184/230 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- An approximately 6 mile overhead mile overhead kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 345 kV bus at existing Transmission Owner substation ("Elm Creek - Summit 345 kV") 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 **Table 2** 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
Elm Creek – Summit 345 kV GEN-2017-004 Interconnection (TOIF) (ITCGP) (132936): Construct one (1) set of 345kV CCVTs, two (2) paths of OPGW fiber optic cable, one (1) 345kV line relaying panel, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility.	$880,335	100%	$880,335	24 Months
Total	**$880,335**		**$880,335**	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
Elm Creek – Summit 345 kV GEN-2017-004 Interconnection (Non-Shared NU) (ITCGP) (132937): Construct new 345kV 3-breaker ring bus, eight (8) 345kV disconnect switch stands, nineteen (19) 345kV bus supports, four (4) 345kV wave trap stands, three (3) H-frame line entrance structures, six (6) 345kV CCVT stands, six (6) 345kV surge arrester stands, and all other associated work and materials.	Not Eligible	$13,943,022	100%	$13,943,022	24 Months

Evergy – Summit 345 kV Substation: Review relay settings and apply adjusted settings at Summit 345kV substation	Not Eligible	$24,937	100%	$24,937	26 Weeks
Total		**$13,967,959**		**$13,967,959**	

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
None	N/A	$0	N/A	$0	N/A
Total		**$0**		**$0**	

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 either MISO or AECI 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 ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
DISIS-2017-001 MISO AFS: 100 MVAR Capacitor Bank at Montezuma 345 kV	$6,000,000	16.48%	$989,247
DISIS-2017-001 MISO AFS: 100 MVAR SVC/Statcom at Blackhawk 345 kV	$50,000,000	8.8%	$4,400,000
Total	$56,000,000		$5,389,247

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 201.6 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)	$880,335
Non-Shared Network Upgrade(s)	$13,967,959
Shared Network Upgrade(s)	$0
Affected System Upgrade(s)	$5,389,247
Total	**$20,237,541**

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).

Generation Interconnection Facilities Study Report For GEN 2017-004 – 201 MW Wind Generating Facility In Cloud County, Kansas. Revised September 6, 2021

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1.0 Overview

ITC Great Plains ("ITCGP") has performed a facility study at the request of Southwest Power Pool ("SPP") for Generation Interconnection request GEN-2017-004 under the SPP Open Access Transmission Tariff. The subject request entails interconnecting 400MW wind powered generation facilities in Cloud County, Kansas. The project will interconnect at the new substation that will be built on the Elm Creek to Summit 345 kV line at approximately 13.5 miles from the Elm Creek Substation. It is scheduled for completion by December 31, 2024. This date will be revised further into the process.

The ITCGP scope of this Facility Study is to provide a cost estimate for the Customer's interconnection facilities. This study does not directly address any of the Network Upgrades that may be identified in the DISIS 2017-001, the facilities that are being constructed by the interconnection customer, or any potential sub-transmission facilities (if any) that may be required.

1.1 Facility Study Summary

ITCGP estimates the total project cost of the customer's interconnection facilities will be **$14,823,357** (+/ - 20 % accuracy) including applicable company overheads in 2021 dollars. It includes **$13,943,022**for Network Upgrades and **$880,335** for Transmission Owner Interconnection Facilities. It is further estimated that the required legal/real estate acquisition and construction activities will require approximately 24 months after the GIA is executed. The attached report contains additional details regarding the estimate as well as results of short circuit studies, review of reactive compensation, and information on Interconnection & Operating requirements.

ITCGP intends to self-fund the network upgrades for this project and will require a Facility Service Agreement to be negotiated in parallel with the GIA for this project.

The GEN 2017-004 interconnection facilities will require Network Upgrades on the ITCGP system to connect the new generation. Network Upgrades consist of the following:

- A new 3-breaker 345 kV ITCGP GEN 2017-004 interconnection station at the POI on the Elm Creek to Summit Line.
- Looping the Elm Creek to Summit Line into the new Substation.

In addition to the identified Network Upgrades, there are specific Interconnection Facilities which ITCGP will construct, own, operate, and maintain. These facilities include the new line entrance structure and 345kV disconnect switch on the end of the radial line from GEN 2017-004 at the ITCGP switching station as well as any ITCGP relaying and control equipment required for the protection of the developer's radial line.

The Interconnection Customer is responsible for constructing all sole-use facilities such as the wind farm collector station and the radial 345kV line from the collector station to the new ITCGP switching station. While this report does define Interconnection Customer owned Interconnection Facilities in enough detail to explain basic requirements, it does not define or contain all of the detailed requirements. Additional metering, communications, and operational requirements may be identified as the Interconnection and Operating Agreements are developed and further communications between the Transmission Owner and Interconnection Customer take place. The Interconnection Customer's low voltage system is not defined in this report.

2.0 Voltage Guidelines:

Reactive power, voltage regulation and operating requirements will be as per Transmission Operator (TOP) and Transmission Provider directives. Interconnection Customer will operate the Generating Facility to a voltage schedule of 350 kV (1.014 pu) with a bandwidth of +/- 6 kV (0.017 pu) at the Point of Interconnection (POI) utilizing the Generating Facility's required power factor design capability as indicated in SPP DISIS 2017-001. As per SPP DISIS 2017-001, the Interconnection Customer's required power factor capability is 0.95 lagging to 0.95 leading (at the POI).

For further clarification, the Interconnection Customer may meet the +/- 0.95 power factor requirement by utilizing reactive capability from the wind generators or by adding external reactive compensation. Note that any reactive compensation installed by the Interconnection Customer shall not cause voltage distortion in accordance with Article 9.7.6 Power Quality of the Generation Interconnection Agreement.

The Interconnection Customer will regulate the Generating Facility's voltage to the specified voltage set-point within the defined bandwidth stated above using an automatic voltage controller utilizing the inherent reactive power capability in the wind turbines and if applicable external reactive compensation.

The above voltage schedule is subject to change. If the need for a change is identified, it will be done within the limits of the GIA provisions stated in Section 9.6 and the Generating Facility's power factor design criteria as stated above. If a schedule change is needed, appropriate written documentation of the change will be provided to the Interconnection Customer.

The Interconnection Customer is required to have a generator operator available for 24/7 communication with the TOP. The TOP may, at any time request a variance from the schedule in response to system operating/security requirements.

3.0 Network Upgrades

3.1 New ITCGP GEN 2017-004 interconnection substation

3.1.1 Project Location:

The new substation that will be built on the Elm Creek to Summit 345 kV line at approximately 13.5 miles from the Elm Creek Substation.

3.1.2 Project Overview:

The purpose of this project is to build a 345kV Substation to provide a transmission system interconnection for the GEN 2017-004 Wind Farm. The switchyard will consist of three 345kV circuit breakers arranged in a breaker and a half configuration.

The new 345kV switchyard will have a new control house with adequate AC and DC station service supplies, new control and protection panels and a new RTU for communication with the Transmission Owner's master control station.

The new switchyard will cut into the 345kV Elm Creek to Summit Line.

3.1.3 Design Criteria:

The Transmission Owner's standards will be applicable. Where no applicable standards are available, the Transmission Owner will substitute industry standards and other good utility practices.

3.1.4 One-Line Diagrams:

See Figure 1 for Transmission Owner One-Line.

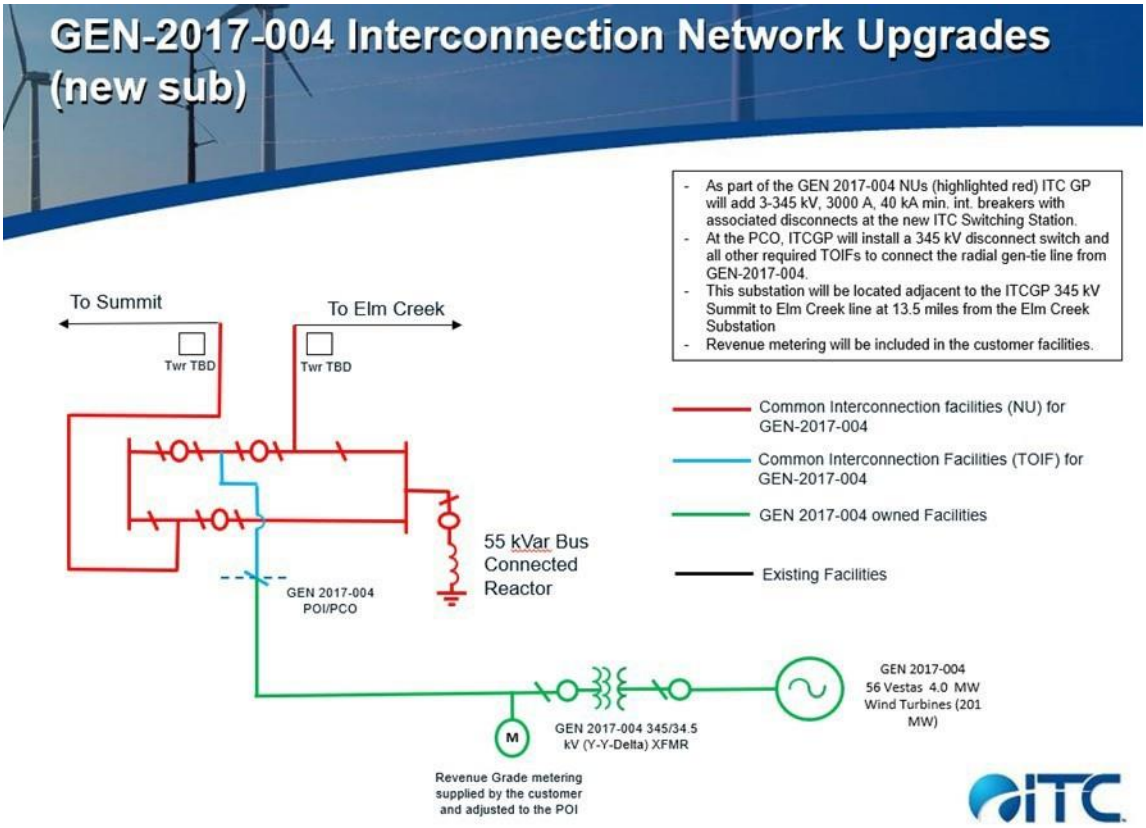


Figure 1 GEN 2017-004 Interconnection Substation One Line

3.1.5 Route Information: N/A

3.1.6 Right-of-Way Information:
It is assumed that the interconnection customer will be responsible for building the 345 kV line required to connect the ITCGP Switching Station at the POI with the customer's substation. As such, the interconnection costs contained herein do not include any costs for extending the ITCGP transmission line. Please see section 6 for generalguidelines.

3.1.7 Permitting:
The Interconnection Customer will be responsible for satisfying all community or governmental site plan or zoning approval requirements which may include wetland or flood plain permits. The Transmission Owner will be responsible for the control center building permit and the KDHE storm water construction permits associated with the Transmission Owner portions of the construction.

3.1.8 Metering & Ownership Demarcation: Covered in section 4.1.9

3.1.9 Protection & Control Overview:

Two sets of 345kV CCVTs will be installed, one set for each line.

Two 345kV wave traps will be installed for each line.

Three 345kV breaker control panels with microprocessor-based relays will be installed. Breaker failure protection, automatic reclosing supervised by synchronism check will be provided.

Two 345kV line relaying panels with microprocessor-based relays will be installed.

3.1.10 Insulation Coordination:
345kV, 1050kV BIL

3.1.11 Short Circuit Study Results - Bus Fault Levels:
ITCGP calculated bus fault levels for the interconnection substation and adjacent substations to determine if the added generation will cause fault currents to exceed interrupting ratings for existing equipment and for use in sizing future equipment. Calculations are based on data for the interconnection transformer and installed wind turbines supplied by the Interconnection Customer. Variance from supplied data could materially change calculated short circuit values. Results are displayed in Table 1.

Table 1 – Short Circuit Results

Fault Location	Maximum Fault Current (Amps)	
	Phase	Ground
Elm Creek Substation	4939	3990
Summit Substation	9538	9125
GEN 2017-004	5639	455

Fault currents shown in Table 1 are within the circuit breaker interrupting capabilities with the addition of 201 MW contributed by GEN 2017-004.
3.1.12 Reactive Compensation:
ITCGP evaluated the impact of the proposed interconnection on the reactive compensation equipment presently planned or in service at the Elm Creek Substation facilities. ITCGP studies concluded that no additional reactive compensation is required for interconnection of GEN 2017-004 at this time. ITCGP may review the need for reactive compensation at a future time during which the size of a reactor would be further refined with additional studies after the GIA is signed.

3.1.13 Other Equipments & Materials:

- Gas Circuit Breakers (GCB): three (3) 345 kV, 3000A rated, 63kAIC.
- Disconnect Switch: eight (8) 345 kV, 3000A rated, 1050 kVBIL.
- CCVTs: six (6) 345kV, 3-winding, 1550kV BIL.
- Insulators: sixty (60) 345 kV, 1050 kV BIL station post, porcelain.

- Wave traps: four (4) 345kV, 3000A, doublefrequency.

- Surge Arresters: six (6) 345kV, vertical mount, 209MCOV, polymer.

- Control Cable: Control cables per Transmission Owner standards will be installed in direct buried PVC conduits, above grade LFMC conduits and in pre-cast cable trench. All control cables from the yard will be terminated at the relaying control panels. The control building will have overhead cable trays for necessary cable runs and inter-panelconnections.

3.1.14 Relaying, Control, & SCADA: Panel Requirements

- 3 – RD3024 – Tie Breaker Control (SEL-351S)
- 2 – RD3070 – "A" Line Relaying, Carrier (SEL-421 & UPLC)
- 2 – RD3076 – "B" Line Relaying, Carrier (SEL-311C &UPLC)

3.1.15 Grounding System:
The grounding system will be designed and installed per Transmission Owner's standards. These standards follow the IEEE 80 standards.

3.1.16 Lightning Shielding Design:
Lightning shielding will be provided per Transmission Owner's standards. Multiple H-frame structures along with shield wire will be used for lightning protection.

3.1.17 Yard Lighting:
Yard lighting will be installed to be sufficient for visual indication of the disconnect switch positions or egress of personnel, and will not serve as task lighting.

3.1.18 Structures:
The required new outdoor steel structures listed below will be hot-dipped galvanized wide flange structures or tubular steel:

- Eight (8) 345 kV disconnect switch stands
- Nineteen (19) 345 kV bus support
- Four (4) 345kV wave trap stands
- Three (3) H-frame line entrancestructures
- Six (6) 345kV CCVT stands
- Six (6) 345kV surge arrester stands

3.1.19 Foundations:
Foundations and slabs will be designed and installed in accordance with the owner's standards and specifications. The minimum design depth to firm bearing is contingent upon soil borings at the site.

3.1.21 Scheduling Requirements:
Legal/Real Estate Procurement 9 weeks
Material Procurement / Design 52 weeks

Substation Construction	32 weeks
Closeout Activities	4 weeks

3.1.20 Site Work:
Site grading will be required for the new 345kV switchyard.

3.1.21 Total Cost: $11,737,548
Total Cost Estimate Accuracy: +/- 20%

Note that the cost estimate provided is expressed in 2021 terms and includes applicable company overheads.

3.2 Loop Elm Creek to Summit Line into GEN 2017-004 interconnectionsubstation

3.2.1 Project Location:
The new substation that will be built on the Elm Creek to Summit 345 kV line at approximately 13.5 miles from the Elm Creek Substation.

3.2.2 Project Overview:
The project involves opening the existing Elm Creek to Summit 345 kV line and looping it into the new GEN 2017-004 Interconnection Substation.

3.2.3 Design Criteria:
Design Standards will be Transmission Owner Standards. Where no applicable standards are available, the Transmission Owner will utilize industry standards and good Utilitypractices.

3.2.4 One-Line Diagrams: N/A

3.2.5 Site Plan: N/A

3.2.6 Route Information**:**
The routing associated with looping the Elm Creek to Summit circuit into the GEN 2017-004 Sub is minimal and will be contained to the property surrounding the GEN 2017-004 Substation.

3.2.7 Right-of-Way Information:
The new transmission line structures will be located on existing easement or on the new substation property. Please see section 6 for general guidelines

3.2.8 Permitting:
Same as that covering section 3.1.8.

3.2.9 Metering & Ownership Demarcation: N/A

3.2.10 Protection & Control Overview: N/A

3.2.11 Insulation Coordination: N/A

3.2.12 Short Circuit Study Results - Bus Fault Levels: N/A

3.2.12 Other Equipments & Materials: **N**/A

3.2.13 Relaying, Control, & SCADA: N/A

3.2.14 Grounding System: N/A

3.2.15 Lightning Shielding Design:
Lightning shielding design will be in accordance with the Transmission Owner's standards and specifications.

3.2.16 Yard Lighting: N/A

3.2.17 Structures:
The new transmission line structures will be 345 kV galvanized steel monopoles or lattice towers, pending the most feasible and appropriate design. Two structure(s) will be required to loop the line into the new station.

3.2.18 Foundations:
Foundations will be designed and installed in accordance with the Transmission Owner's standards and specifications. The transmission structure foundations will be drilled piers.

3.2.19 Conductors, Shield Wires, & OPGW:
The conductor will be a bundled T2-477 kcmil (26/7) ACSR "Hawk" per phase. The shield wire will be 159 kcmil (12/7) ACSR "Guinea."

3.2.20 Insulators:
Insulators will be 345 kV polymer insulators.

3.2.21 Removal of Existing Facilities:
TBD – tentatively no existing facilities will be removed.

3.2.22 Site Work: N/A

3.2.23 Total Cost: $2,205,473

Total Cost of Network Upgrades: $11,737,548 + $2,205,473 = **$13,943,022** Total Cost Estimate Accuracy: +/- 20%

Note that the cost estimate provided is expressed in 2021 terms and includes applicable company overheads.

4.0 Transmission Owner Interconnection Facilities
4.1 GEN 2017-004 – Interconnection Facilities

4.1.1 Project Location:
The new substation that will be built on the Elm Creek to Summit 345 kV line at approximately 13.5 miles from the Elm Creek Substation

4.1.2 Project Overview:
A new line entrance structure will be added at the ITCGP GEN 2017-004 interconnection switchyard for termination of the line from the collector substation. A disconnect switch will be installed beneath this structure for isolation of the developer's line. Line relaying will be added to protect the line. A set of CCVT's and surge arresters will be added to the line terminal.

4.1.3 Design Criteria:
The Transmission Owner's standards will be applicable. Where no applicable standards are available, the Transmission Owner will substitute industry standards and other good utility practices.

4.1.4 One-Line Diagrams: See Figure 1

4.1.5 Site Plan: See Figure 2.

4.1.6 Route Information: N/A

4.1.7 Right-of-Way Information: N/A

4.1.8 Permitting: Same as that covering section 3.1.8

4.1.9 Metering & Ownership Demarcation:
The Interconnection Customer or others will provide, own, operate and maintain revenue metering. The specifics of the revenue metering will be defined during the detailed engineering phase of the project. The customer must cooperate with the Transmission Provider and Local Transmission Owner requirements in the metering design. Revenue metering equipment will be required at customer's project substation with loss compensation to the Point of Interchange in the Transmission Owner's substation.

The ownership demarcation will be at first substation steel H-frame within the security fence of the Transmission Owner substation.

The Interconnection Customer will be required to provide enough conductor to terminate on the H-frame and extend down to reach grade level.

4.1.10 Protection & Control Overview:
- One set of 345kV CCVTs will be installed on the GEN 2017-004 line.

- Two paths of fiber optic cable (OPGW) will be required for line protection. They will be supplied by the Interconnection Customer.
- One 345kV line relaying panel with microprocessor-based relays will beinstalled.

4.1.11 Insulation Coordination:
345kV, 1050kV BIL

4.1.12 Short Circuit Study Results - Bus Fault Levels: See Section 3aabove

4.1.13 Other Equipments & Materials:

- Disconnect Switch: One (1) 345 kV, 3000A rated, 1050 kVBIL.
- CCVTs: Three (3) 345 kV, 3-winding, 1550kV BIL.
- Surge Arresters: Three (3) 345 kV, vertical mount, 209 kV MCOV,polymer.
- Control Cables: Control cables per Transmission Owner standards will be installed in direct buried PVC conduits, above grade LFMC conduits and in pre-cast cable trench. All control cables from the yard will be terminated at the relaying control panels. The control building will have overhead cable trays for necessary cable runs and inter-panelconnections.

4.1.14 Relaying, Control, & SCADA:
Panel Requirements: One RD3048 Panel – Fiber optic current differential (SEL 311L Relays)

4.1.15 Grounding System:
The grounding system will be designed and installed per Transmission Owner's standards. These standards follow the IEEE 80 standards.

4.1.16 Lightning Shielding Design:
The attachment of the OPGW shield wire from the developer's line to the H-frame will provide lightning protection for the Interconnection Facility equipment at GEN 2017-004 interconnection substation.

4.1.17 Yard Lighting:
Yard lighting will be installed to be sufficient for visual indication of the disconnect switch position or egress of personnel and will not serve as task lighting.

4.1.18 Structures:
The required new outdoor steel structures listed below will be hot-dipped galvanized wide flange structures or tubular steel:

- One (1) 345 kV disconnect switch stand
- Two (2) H-frame line entrance structures
- Three (3) 345 kV CCVT stands
- Three (3) 345 kV surge arrester stands

4.1.19 Foundations:
Foundations will be designed and installed in accordance with the owner's standards and specifications. The minimum design depth to firm bearing is contingent upon soil borings at the site.

4.1.20 Conductors, Shield Wires, & OPGW: N/A

4.1.21 Insulators: N/A

4.1.22 Removal of Existing Facilities: N/A

4.1.23 Site Work: N/A
4.1.24 Total Cost: $**880,335**
Total Cost Estimate Accuracy: +/- 20%
Total Project cost (Network Upgrades and Interconnection facilities): $14,823,357

Note that the cost estimate provided is expressed in 2021 terms and includes applicable company overheads and potential tax gross ups.

5.0 Interconnection Customer InterconnectionFacilities 5.1 GEN 2017-004 Interconnectionfacilities

All facilities within the Interconnection Customer's collector substation and between the Interconnection Customer's substation and ITCGP's new GEN 2017-004 interconnection substation are not included in this report and are the sole responsibility of the Interconnection Customer. Some of the key facilities are briefly mentioned below. The Point of Interconnection (POI) and the Point of Change of Ownership (PCO) are shown in Figure.

The Interconnection Customer shall construct the 345 kV radial line from the wind farm collector station to ITCGP's new GEN 2017-004 interconnection substation. Installation of OPGW shield wire on the radial line from GEN 2017-004 containing at least 12 single mode fibers will be required for ITCGP relaying and communication purposes.

The customer's step-up transformer between the wind farm's 34.5 kV collector network and the 345 kV facilities will require a high side breaker capable of interrupting a transformer high side winding fault.

All Interconnection Customer owned 345 kV apparatus as well as the revenue metering equipment located in the Interconnection Customer's substation shall comply with ITCGP standards and will be subject to ITCGP approval. ITCGP will provide the Interconnection Customer with standards during detailed design or upon request. The Interconnection Customer is solely responsible for the SCADA and telecommunications facilities necessary to operate and monitor its facility.

Necessary trip and close signal interlocks will be provided by ITCGP to the Interconnection Customer's generation facility for the safe operation of the system. Interconnection Customer will provide breaker status and current transformer signals to ITCGP for system operation and protection.

Total Project Cost: N/A
Total Cost Estimate Accuracy: N/A

6.0 Right of Way Requirements

The Interconnection Customer shall obtain easements from the Transmission Owner to work in or drive through the Transmission Owner's transmission line right-of-way. The Transmission Owner and Interconnection Customer will also cooperatively negotiate any easements required for the Interconnection Customer's transmission lines and structures. The Transmission Owner agrees to not unreasonably withhold easements.

For the Network Upgrades and any Transmission Owner Interconnection facilities identified in this report, the Transmission Owner agrees to obtain all necessary easements/right-of-way as required to construct those facilities that will be owned and operated byITCGP.

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

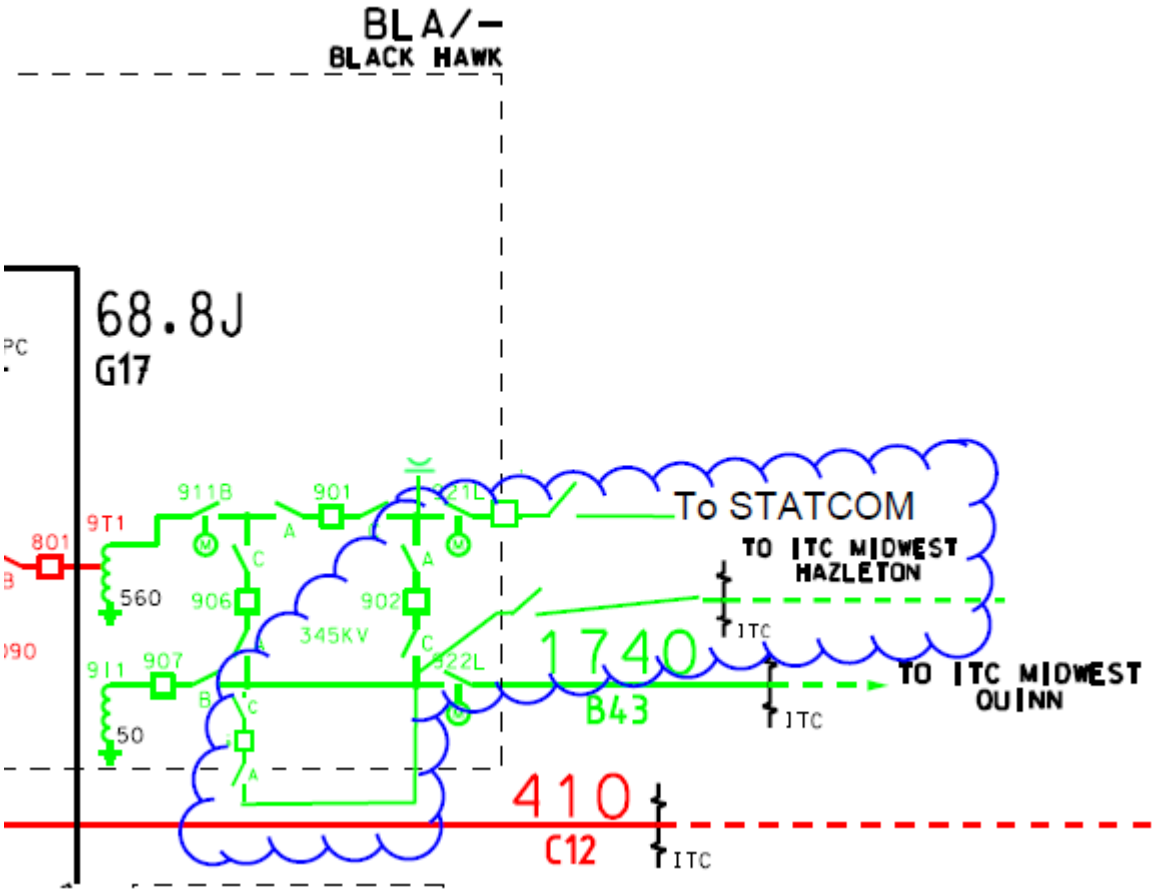
Not Applicable

A1-2 Site Map for IC Project

Not Applicable

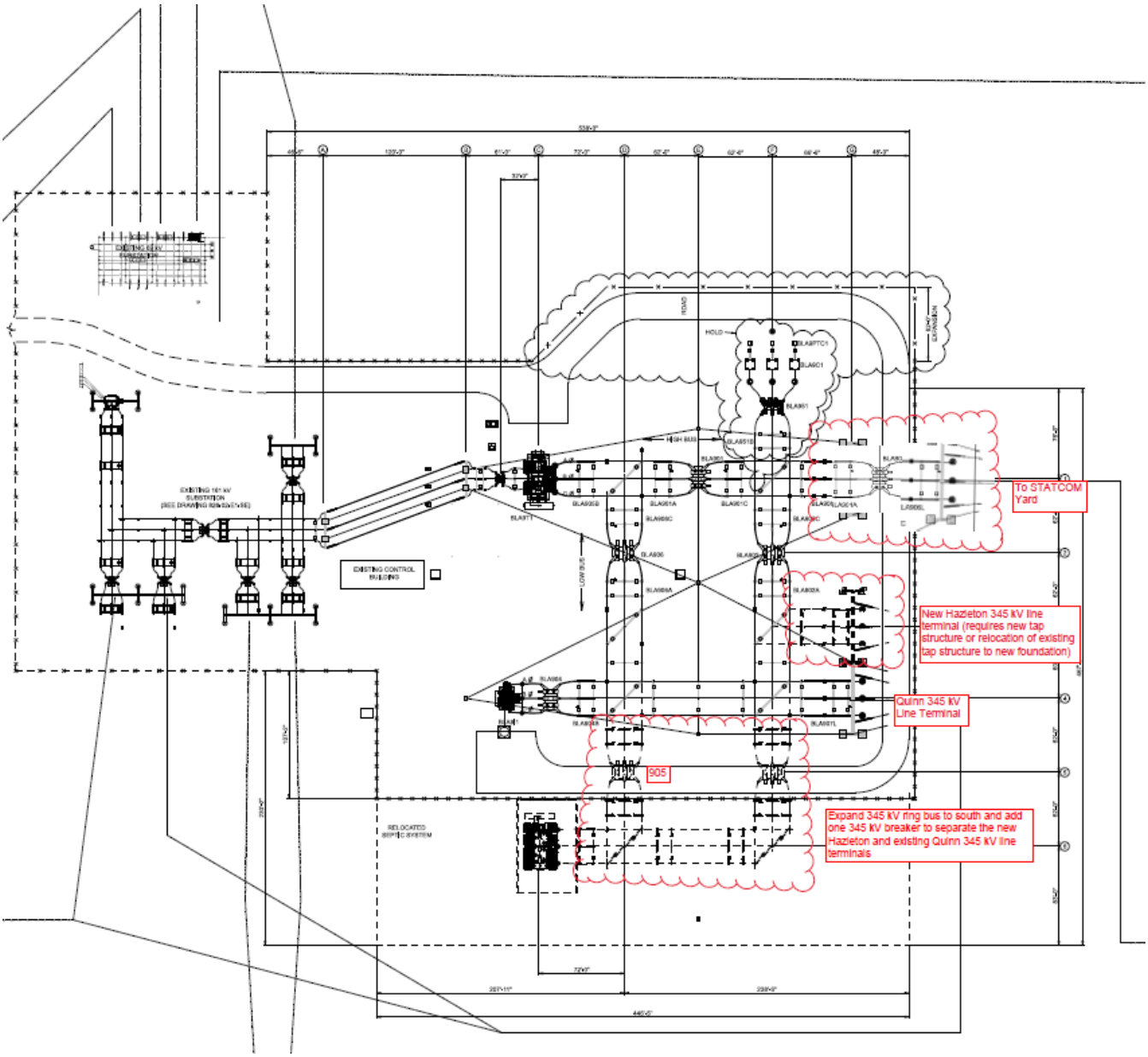
7.2 A2 - Transmission Owner One Line

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

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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

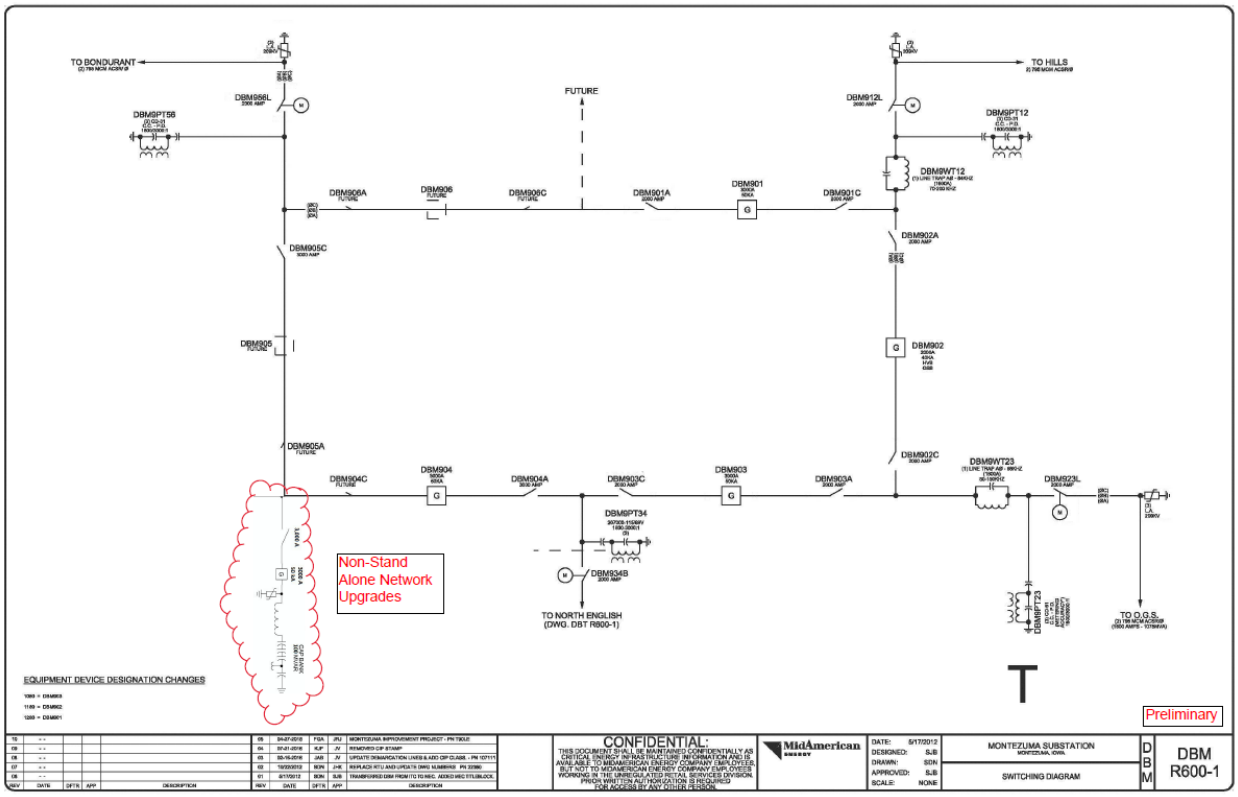
Not Applicable

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