



# **INTERCONNECTION FACILITIES STUDY REPORT**

GEN-2016-094  
(IFS-2016-002-25)

Published June 2022

By SPP Generator Interconnections Dept.

## REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
09/28/2020	SPP	Initial draft report issued.
10/07/2020	SPP	Updated draft report issued. Corrected transformer rating on Page 2, added bullet underneath table 3, and corrected total upgrade cost in Table 6.
10/15/2020	SPP	Updated final report issued.
07/29/2021	SPP	Updated final report issued. Updated Tables 3, 4, 5 and 6 based on DISIS Power Flow Reposting and MISO AFS Addendum
10/01/2021	SPP	Updated Tables 5 and 6 based on MISO AFS Addendum
06/06/2022	SPP	Updated Contingent Facilities and Affected Systems Upgrades based on updated report postings

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## SUMMARY

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### INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-094/IFS-2016-002-25 is for a 200 MW generating facility located in Hyde, SD. The Interconnection Request was studied in the DISIS-2016-002 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). This request was restudied in the DISIS-2016-002-2 Impact Study for ERIS. The Interconnection Customer's requested in-service date is November 15th, 2020.

The interconnecting Transmission Owner, Western Area Power Administration (WAPA), 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 eighty (80) GE 2.5 MW - 116 Wind Turbine Generation Systems for a total generating nameplate capacity of 200 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 170/220/280 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- A 3 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 ("Fort Thompson - Oahe 230 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 Turbine 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 communications 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
<b><u>GEN-2016-094 Interconnection (TOIF) (WAPA) - 112339:</u></b> 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.	\$250,000	100%	\$250,000	24 Months
<b>Total</b>	<b>\$250,000</b>		<b>\$250,000</b>	

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<b><u>GEN-2016-094 Interconnection (NU) (WAPA) - 112340:</u></b> Construct one (1) new 230 kV switchyard on the Oahe - Fort Thompson North 230 kV transmission that will consist of a three (3) breaker ring bus, three (3) 230 kV power circuit breakers, nine (9) 230 kV disconnect switches, instrument transformers, associated control and protection equipment, high voltage bus, three (3) line take-off structures, conductor, overhead optical ground wire, communication equipment, and a control building.	Ineligible	\$8,805,000	100%	\$8,805,000	24 Months
<b>Total</b>		<b>\$8,805,000</b>		<b>\$8,805,000</b>	

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

<b>Shared Network Upgrades Description</b>	<b>ILTCR</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated Percent (%)</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Estimated Lead Time</b>
None	N/A	\$0	N/A	\$0	N/A
<b>Total</b>		<b>\$0</b>		<b>\$0</b>	

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 Share (%)	Allocated Cost Estimate (\$)
<b><u>MISO Affected System Impact Study SPP DISIS-2016- 002:</u></b> Install 1 (one) 20 MVAR 115 kV capacitor bank, 2 (two) 115kV SF6 breakers, 3 (three) 115kV gang operated switches, 3 (three) 115kV CCVT, and support foundations.	\$808,145	16.1%	\$130,111
<b>Total</b>	<b>\$808,145</b>		<b>\$130,111</b>

## CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for [Insert Interconnection Amount] 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 [Insert all upgrades (TOIF, non-shared NU, shared NU, affected system, etc)] that is required for full interconnection service is summarized in the table below.

*Table 6: Cost Summary*

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilitie Upgrade(s)	\$250,000
Non-Shared Network Upgrade(s)	\$8,805,000
Shared Network Upgrade(s)	\$0
Affected System Upgrade(s)	\$130,111
<b>Total</b>	<b>\$9,185,111</b>

\*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

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

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

# Interconnection Facilities Study Report

*Southwest Power Pool, Inc. (SPP) Generator  
Interconnection Request GEN-2016-094*

(IFS-2016-002-25)



**Western Area  
Power Administration**

Upper Great Plains Region (WAPA-UGP)

*June 2020*



## **1.0 Background:**

The Western Area Power Administration Upper Great Plains Region (WAPA-UGP<sup>1</sup>) received a request for an Interconnection Facilities Study in accordance with the Southwest Power Pool Inc. (SPP) Open Access Transmission Tariff (Tariff) for interconnection of a Generating Facility in Hyde County, South Dakota to one circuit of WAPA-UGP's Oahe-Fort Thompson North 230-kV Double Circuit Transmission Line. SPP generator interconnection request GEN-2016-094 represents a 200 MW nameplate wind generation facility with Point of Interconnection (POI) at the 230kV bus of a new WAPA-UGP owned switchyard on the Oahe-Fort Thompson North 230-kV Transmission Line approximately 15 miles from the Fort Thompson Substation.

The wind generation facility's proposed collector station would be located north of the POI to WAPA-UGP's Oahe-Fort Thompson North 230-kV Transmission Line. The collector substation will consist of one (1) 230/34.5-kV transformer and multiple 34.5-kV deliveries to interconnect the individual wind turbines. The Interconnection Customer will construct, own, and maintain the radial 230-kV transmission line between the collector substation and the WAPA-UGP owned switchyard on the Oahe-Fort Thompson North 230-kV Transmission Line. The Point of Interconnection will be at the 230-kV bus at the new WAPA-UGP owned switchyard on the Oahe-Fort Thompson North 230-kV Transmission Line. The Point of Change of Ownership between Interconnection Customer and WAPA-UGP will be at the points where Interconnection Customer's conductors, jumpers, and insulators connect to WAPA-UGP's 230-kV take-off structure and the rigid bus underhung from the 230-kV take-off structure, as illustrated in Attachment B.

This Interconnection Facilities Study does not address transmission service or any delivery component of transmission service; only the interconnection requirements and operating impacts of the interconnection service component of the Generating Facility.

## **2.0 Study Requirements:**

This Interconnection Facilities Study includes an evaluation of the following:

- 2.1** Prepare/develop a substation layout, perform a preliminary bus design, and determine all electrical equipment requirements to accommodate the Request. Develop/compile cost estimates for all WAPA-UGP labor, overheads, equipment additions, modifications, etc. to accommodate the generator interconnection.
- 2.2** Review and document any other interconnection/control area requirements. Document these additional requirements (such as indication/metering, monitoring, control, relaying) and include these in the cost estimate.

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<sup>1</sup> WAPA-UGP is also referred to as "Western-UGP" in the SPP Tariff.



**2.3** Determination of need to develop an Operating Guide for WAPA-UGP's Dispatch to document the conditions under which the new Generating Facility must be operated to protect against unacceptable pre- or post-contingent transient voltage and loading conditions.

**2.4** Develop an overall time schedule for completion of the necessary addition/modifications.

### **3.0 Study Results:**

The following results document the analysis of the addition of the Generating Facility to WAPA-UGP's transmission system and fulfill the tasks outlined in Section 2.0 above:

#### **3.1 Required Facility Additions by WAPA-UGP:**

WAPA-UGP has determined that following addition is required to maintain a safe and reliable interconnection to WAPA-UGP's transmission system:

A new 230-kV switchyard on the Oahe-Fort Thompson North 230-kV Transmission Line that will sectionalize one of the two circuits. WAPA-UGP's minimum requirement for a new 230-kV interconnection to an existing transmission line is a three (3) breakerring bus. Construction of the new WAPA-UGP owned 230-kV switchyard will require three (3) 230-kV powercircuit breakers, nine (9) 230-kV disconnect switches, instrument transformers, associated control and protection equipment, high voltage bus, three (3) transmission line take-off-structures, conductor, overhead optical ground wire, communication equipment and a control building.

WAPA-UGP's estimated cost for labor, overhead, equipment, construction, and other miscellaneous costs for the new WAPA-UGP owned 230-kV switchyard are outlined in Attachment A. The total cost is estimated at \$9,055,000.

**3.1.1 Transmission Owner's Interconnection Facilities:** Equipment installed by WAPA-UGP for the sole purpose of this interconnection, such as the Transmission Owner's Interconnection Facilities, which includes equipment between of the Point of Interconnection and Point of Change of Ownership, interrogation, and communication equipment, are considered direct assignment facilities and not subject to inclusion as Network Upgrades. The direct assigned costs for such equipment are estimated at \$250,000 based upon WAPA-UGP's understanding of the SPP Tariff provisions and are included in the total cost estimate provided in Attachment A.

**3.1.2 Network Upgrades constructed by Transmission Owner:** Network Upgrades to be designed, procured, constructed, installed and owned by WAPA-UGP that are the cost responsibility of the Interconnection Customer. This includes the new WAPA-UGP owned 230-kV switchyard on the Oahe-Fort Thompson North 230-kV Transmission Line. The cost estimate for the Network Upgrades constructed by Transmission Owner is \$8,805,000. Based on WAPA-UGP's understanding of the SPP Tariff, these Network Upgrades are considered Non-Capacity Network Upgrades and would be evaluated under Attachment Z2 of the SPP Tariff



as Non-Capacity Network Upgrades. These upgrades would not be subject to the transmission service credits described in Article 11.5 of the SPP Generator Interconnection Agreement (GIA).

### 3.2 Contractual Agreements:

Pursuant to the SPP Tariff, SPP and WAPA-UGP will need to execute a GIA (or initially an Interim GIA, if applicable, with a subsequent execution of a GIA) with Interconnection Customer for the interconnection of the Generating Facility. The GIA will address specific funding requirements and provide an advanced payment schedule for facility additions and upgrades to address WAPA-UGP's requirements. The GIA, which discusses the construction and interconnection aspects of this project, will need to be developed and offered by SPP, pursuant to their obligations and procedures under the SPP Tariff, and forwarded to the Interconnection Customer for review and signature. A schedule for payment(s) based on design, procurement, and construction activities will be included in the GIA consistent with the SPP Tariff provisions.

### 3.3 Other Interconnection, Metering Requirements:

Basic indication, monitoring, control, and relaying requirements due to a generator interconnection are included in the cost estimate. A list of specific needs will be provided by WAPA-UGP's Operations Office and WAPA-UGP's South Dakota Maintenance Office once design has progressed.

Interconnection Customer shall install metering at their 230/34.5-kV collector substation in accordance with SPP and WAPA-UGP metering requirements. WAPA-UGP's generation metering requirements, as an SPP Transmission Owner, must be also met, unless specific SPP's metering requirements are more restrictive, in accordance with the most current **Western Area Power Administration Meter Policy** posted at the "WAPA Meter Policy" link at the following page: <http://www.oasis.oati.com/WAPA/WAPAdocs/Western-Common-Business-Practices.html>

Any WAPA-UGP specific implementation of more restrictive SPP metering requirements are also posted on WAPA-UGP's OASIS home page under the "Effective Business Practices" folder at the "UGP Meter Policy Modifications" link at the following URL: <http://www.oasis.oati.com/wapa/index.html>

Western's **General Requirements for Interconnection** must also be met in accordance with the *General Requirements for Interconnection* document posted at the "General Requirements for Interconnection (GRI)" link at the following page: <http://www.oasis.oati.com/WAPA/WAPAdocs/Western-Common-Business-Practices.html>





### **3.4 Operating Guide/Operating Agreement:**

Prior to energization, an Operating Guide will need to be developed by WAPA-UGP in coordination with SPP, if necessary, to outline any required operating restrictions under which the generation interconnection must be energized (or de-energized) to protect against unacceptable system stability limits and/or pre-contingent and post-contingent voltage and loading conditions. The Operating Guide will be developed by WAPA-UGP's Transmission System Planning Division in coordination with SPP Staff. In addition, an Operating Agreement will be developed by WAPA-UGP's Operations Office, jointly with the Interconnection Customer and SPP, if necessary, as will be set forth in the GIA to outline the necessary operations coordination and requirements not otherwise set forth in the GIA.

### **3.5 Schedule:**

Attachment A outlines WAPA-UGP's estimated schedule for planning, design and construction of the facilities required to accommodate the Interconnection Customer's Request. WAPA-UGP anticipates the new 230-kV switchyard on the Oahe-Fort Thompson North 230-kV Transmission Line would be completed by October 1, 2022. This schedule is based on the GIA (or Interim GIA) being executed prior to September 1, 2020, and issuance of the NEPA Finding of No Significant Impact or Record of Decision by July 1, 2021.

### **3.6 Environmental Review:**

The Environmental Review for this project, as described in Attachment V, Sections 3.3.5, and 8.6.1, and any other applicable sections of the SPP Tariff, is being coordinated between WAPA-UGP and Interconnection Customer. WAPA and Interconnection Customer will execute a separate Environmental Review agreement. The Environmental Review is performed at the Interconnection Customer's expense, and those costs are considered direct assigned costs and are ineligible for credits under the SPP Tariff.

### **4.0 Facilities Study Cost:**

WAPA-UGP will audit the Interconnection Facilities Study costs and provide a summary of costs once the study is completed or the interconnection request is withdrawn.



## ATTACHMENT A

### NEW 230-kV SWITCHYARD ON THE OAHE-FORT THOMPSON NORTH 230-KV TRANSMISSION LINE

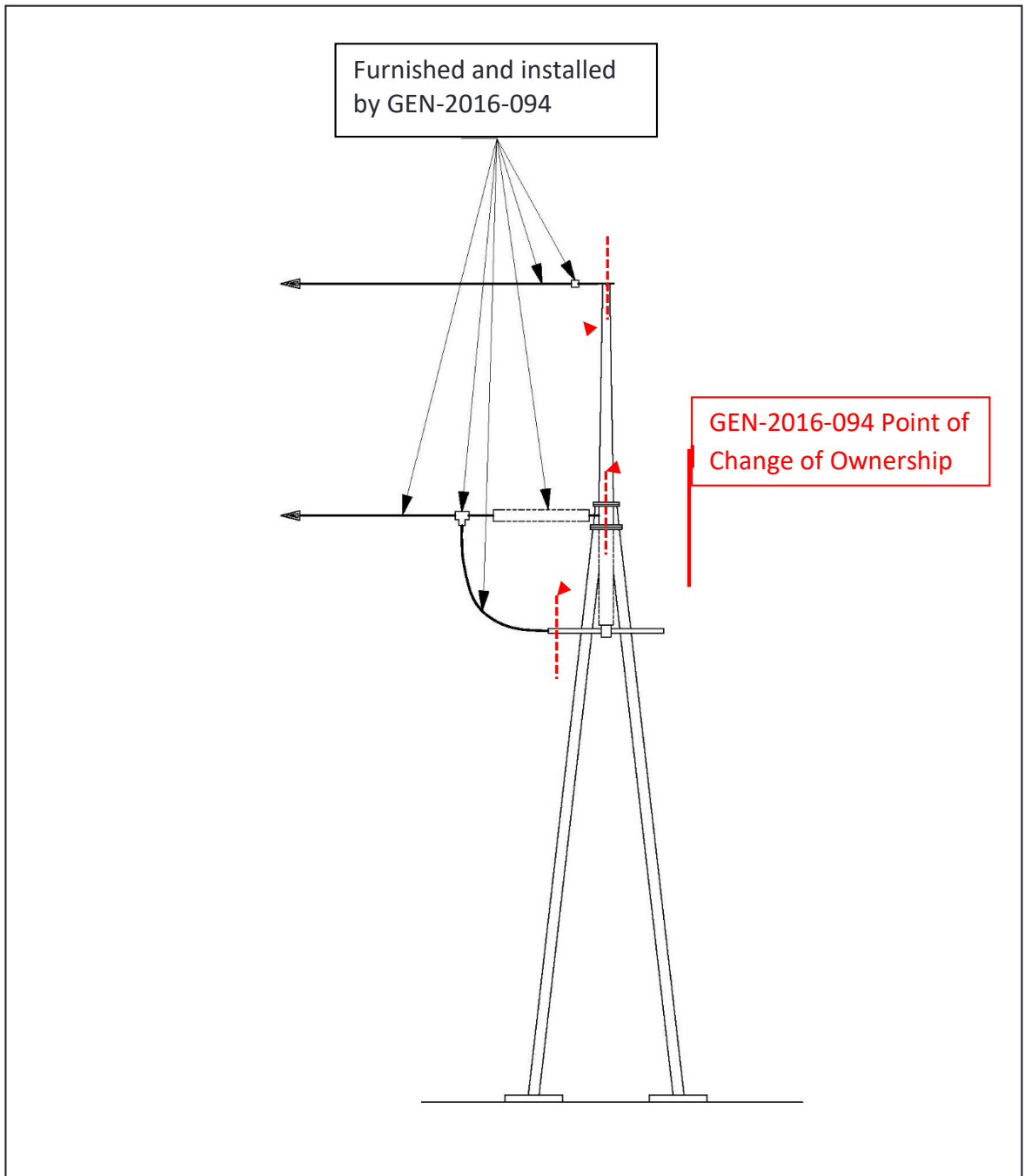
PROJECT ACTIVITY	ESTIMATED START DATE	ESTIMATED COST, MILESTONE PAYMENT DUE
Preconstruction activities – planning, project management, etc.	30 Calendar Days Following GIA Execution*	\$250,000
Provide staff and other resources to engineer, design, and plan construction	30 Calendar Days Following GIA Execution*	\$755,000
Procure equipment, parts, and control equipment necessary to construct	January 1, 2021	\$1,900,000
Development & Solicitation of Construction Contract(s)	March 1, 2021	\$100,000
WAPA-UGP Construction Activities	March 1, 2021	\$5,800,000
Commissioning, Energization, and construction supervision	September 1, 2022	\$250,000
In-Service (Estimated Completion Date)	October 1, 2022	
<b>TOTAL ESTIMATED COSTS</b>		<b>\$9,055,000**</b>

\*Assumes Execution of GIA NLT September 1, 2020. In-service date estimated to be 24 months after receiving initial payment.

\*\*Includes Transmission Owner Interconnection Facilities costs estimated at \$250,000 and Network Upgrades constructed by Transmission Owner costs estimated at \$8,805,000. Based on WAPA-UGP's understanding of the SPP Tariff, these Network Upgrades are considered Non-Capacity Network Upgrades and would be evaluated under Attachment Z2 of the SPP Tariff as Non-Capacity Network Upgrades.



## ATTACHMENT B



# **DISIS-2016-002-2 GENERATION INTERCONNECTION FACILITY STUDY**

## **NPPD**

**SPP GEN-2016-074 200.0 MW at Sweetwater 345 kV Substation**

**SPP GEN-2016-106 400.0 MW at GGS 345 kV Substation**

## **WAPA/BEPC**

**SPP GEN-2016-110 152.0 MW on LRS-Stegall 345 kV line**

## **TSGT**

**SPP GEN-2016-147 40.0 MW at Sidney 115 kV Substation**

**SEPTEMBER 2020**

**PREPARED FOR:  
SOUTHWEST POWER POOL**

**PREPARED BY:  
NEBRASKA PUBLIC POWER DISTRICT OPERATIONS  
TRANSMISSION ASSET PLANNING  
T&D ENGINEERING & ASSET MANAGEMENT**



**Nebraska Public Power District**  
*"Always there when you need us"*



The *NPPD DISIS-2016-002-2 Facility Study* was performed to document the interconnection facilities and network upgrades for generation projects that are proposed to interconnect to the NPPD transmission system. These projects have developed through the SPP Definitive Interconnection System Impact Study process and have advanced to the facility study stage. SPP has requested that NPPD perform the Facility Study associated with the generation interconnection projects listed below:

<u>Project</u>	<u>MW</u>	<u>Type</u>	<u>Point-of-Interconnection</u>
GEN-2016-074	200.00	Wind	NPPD Sweetwater 345 kV
GEN-2016-106	400.00	Wind	NPPD GGS 345kV

GI requests for other TO's in Nebraska GI Group 9:

<u>Project</u>	<u>MW</u>	<u>Type</u>	<u>Point-of-Interconnection</u>
GEN-2016-110	152.00	Wind	WAPA/BEPC LRS-Stegall 345 kV
GEN-2016-147	40.00	Solar	TSGT Sidney 115 kV

SPP entered into a facility study agreement with each of the generation interconnection customers and subsequently requested that NPPD perform the Facility Study for each request. This facility study focused on the generation interconnection facilities and network upgrades identified in the SPP DISIS studies. The NPPD Facility Study includes detailed cost estimates and estimated project schedules for the interconnection and network upgrades identified in the SPP studies.

### **Interconnection Facilities & Network Upgrades**

NPPD's Engineering, Asset Management, and Project Management groups have reviewed the list of interconnection facility and network upgrades that are required for DISIS-2016-002-2 projects. Detailed cost estimates have been prepared for the facility upgrades that were identified in the system impact study for the requests. The prepared cost estimates are study level estimates (+20%/-20%) and assume implementation of standard NPPD construction and procurement practices. The cost estimates for the interconnection facilities and network upgrades are below:

#### **Interconnection Facilities**

- GEN-2016-074: Expand existing Sweetwater 345 kV Substation to accommodate new GI.

**\$ 9,700,000**

- GEN-2016-106: Construct satellite 345 kV Substation near GGS 345 kV substation to accommodate new GI. The existing GGS 345 kV substation is full and additional terminals at this location will require a remote satellite substations and re-route of existing transmission lines to interconnect the new satellite substation and the existing GGS 345 kV substation. This cost estimate is an initial proposed design which will need to be refined and validated through additional study work and field work to determine an acceptable long-term plan for new interconnections at this location. The current working assumption is a new satellite substation approximately 15-miles southwest of the existing GGS substation.

**\$ 94,900,000**

### Network Upgrades

- Construct Keystone – Red Willow 345 kV line & substation expansions.

**\$ 295,000,000**

- Construct Red Willow – Post Rock 345 kV line (portion of line in State of Nebraska) & Red Willow substation expansion.

**\$ 111,000,000**

- Construct Holt County – Antelope 345 kV line & substation expansions.

**\$ 70,000,000**

The results of DISIS-2016-002-2 documented that these requests are contingent on the completion of the following previously-allocated required network upgrades:

- Gentleman – Thedford - Holt County (R-Project) and Thedford 345/115kV Transformer project

The substation one-line diagrams highlighting the required facility upgrades for each generator interconnection are on the following pages. NPPD will work with the generation interconnection projects to develop project schedules for the interconnection facilities and network upgrade projects listed above during the development of the generation interconnection agreement. Typical implementation schedules for new transmission lines ( $\geq 115$  kV) are roughly 4 years or longer to accommodate the public routing process and construction schedules. For the DISIS-2016-002-2 network upgrades (Keystone – Red Willow – Post Rock), the construction schedule will likely be much

longer (> 6 Years) due to the length of the projects and complex project scope involving multiple state jurisdictions. Substation additions require less land acquisition and typically can be implemented in less time or approximately 2-3 years. Project schedule details will be further discussed in the development of the generator interconnection agreement (GIA) and the milestones associated with the generation interconnection projects.

It should also be noted that the interconnection plan for the DISIS-2016-002-2 generation projects are dependent on the transmission upgrades/additions that are required as part of the previous SPP DISIS GI Studies and SPP ITP Studies. If there are any modifications to these previous studies and related upgrades, then the interconnection plan for the DISIS-2016-002-2 projects could be affected. There is no interconnection capacity for the DISIS-2016-002-2 projects without the previously identified upgrades.

If the generation interconnection projects proceed to the generation interconnection agreement, then an operating study may need to be performed to fully assess and evaluate the operation of the generation facility and network upgrades in accordance with NERC Standards. The operating study requirement will be included in the generation interconnection agreement with NPPD. The generation interconnection projects will have significant impact on the GGS Stability Interface (Flowgate #6006) and LRS/DC stability limitations in western NE and the operating study will need to take these issues into account.



GEN-2016-074

200 MW



**Sweetwater 345 kV**

To GGS 345 kV



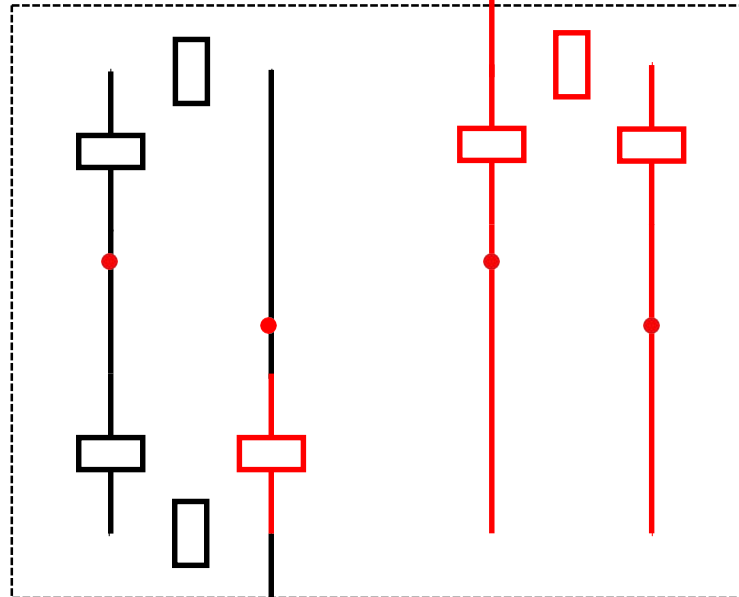
To Grand Island  
345 kV



To GGS 345 kV



To Axtell 345 kV



● DISIS-2016-002 Interconnection Facilities for GEN-2016-074

GEN-2016-106  
400 MW

To Keystone  
345 kV #1

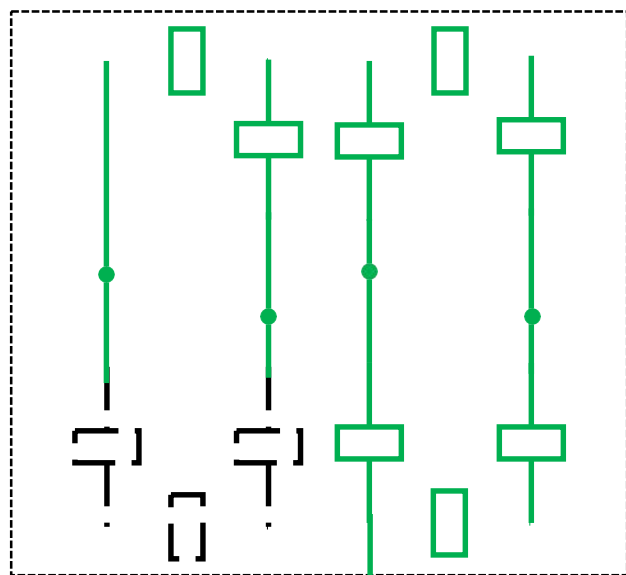


Gentleman  
345 kV

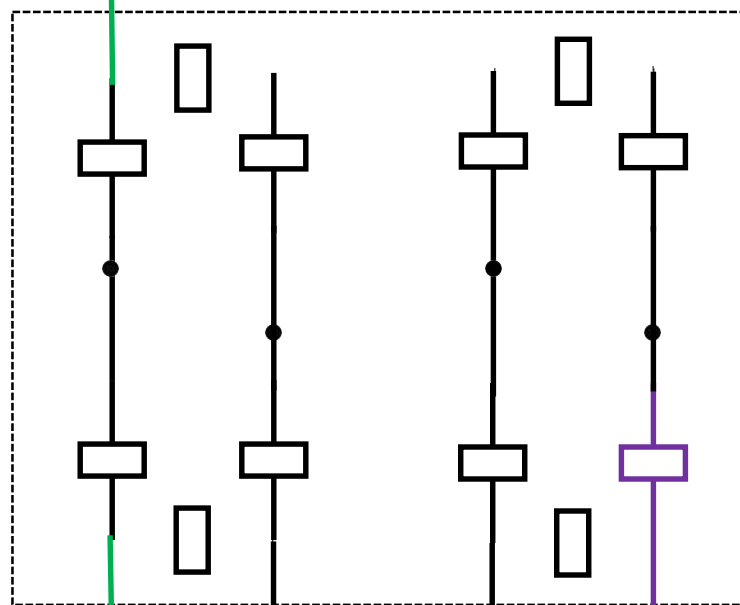
To GGS  
345/230 kV

To GGS  
345/230 kV

To GGS Unit #2  
(700 MW)



Satellite Sub  
345 kV



To  
Sweetwater  
345 kV

To  
Sweetwater  
345 kV

To  
Thedford  
345 kV

To  
Red  
Will  
ow  
345  
kV