

# INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-092 (IFS-2016-002-68)

Published February 2021

By SPP Generator Interconnections Dept.

### **REVISION HISTORY**

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
01/19/2021	SPP	Initial draft report issued.
02/19/2021	SPP	Final report issued with no changes

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### SUMMARY

### INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request <u>GEN-2016-092/IFS-2016-002-68</u> is for a <u>175 MW</u> generating facility located in <u>Hyde, SD</u>. The Interconnection Request was studied in the <u>DISIS-2016-002 Impact Study for Energy Resource Interconnection Service (ERIS)</u> and Network Resource Interconnection Service (NRIS). This request was restudied in the <u>DISIS-2016-002 Impact Study for ERIS</u>. The Interconnection Customer's requested in-service date is <u>December 1st, 2020</u>.

The interconnecting Transmission Owner, <u>Basin Electric Power Cooperative (BEPC)</u>, 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.

Southwest Power Pool, Inc.

### INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES

The Generating Facility is proposed to consist of <u>one-hundred nine (109) GE 2.3 MW Wind Turbine</u> <u>Generation Systems</u> for a total generating nameplate capacity of <u>175 MW</u>.

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 135/180/225 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- A 5 mile overhead mile overhead 345 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 ("Fort Thompson Leland Olds 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 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 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.

<b>Transmission Owner Interconnection</b> <b>Facilities (TOIF)</b>	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
<b>GEN-2016-092 Interconnection (TOIF)</b> ( <b>BEPC) - 122691:</b> Construct one (1) 345kV line terminal, line switches, dead end structure, line relaying, communications, revenue metering, line arrestor, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility	\$1,471,376	100%	\$1,471,376	15 Months
Total	\$1,471,376		\$1,471,376	

### Table 1: Transmission Owner Interconnection Facilities (TOIF) (TOIF)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate (\$)	Allocated Percent (%)	Allocated Cost Estimate (\$)	Estimated Lead Time
GEN-2016-092 Interconnection (Non-Shared NU) (BEPC) – 122692: Construct two (2) 345 kV breaker disconnect switches, one (1) set of line potential transformers, one (1) set of current transformers, one (1) set of line surge arrestors, and all other associated work needed to review and update relay/protection settings.	Ineligible	\$2,531,356	100%	\$2,531,356	15 Months
Total		\$2,531,356		\$2,531,356	

### 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
Antelope – Holt 345kV CKT1 (DISIS- 2016-002-2) – 122699: Build approximately 30 miles of 345kV from Antelope – Holt with a minimum emergency rating of 1793 MVA.	Eligible	\$70,000,000	18.75%	\$13,125,000	48 Months
<b>Ft. Thompson Xfmr Upgrade CKT1</b> ( <b>DISIS-2016-002-2</b> ) – <b>122704</b> : Replace Ft. Thompson 345/230kV Transformer CKT 1 with minimum emergency rating of 390 MVA.	Eligible	\$7,000,000	100%	\$7,000,000	36 Months
<b>Ft. Thompson Xfmr Upgrade CKT2</b> ( <b>DISIS-2016-002-2</b> ) – <b>122711:</b> Replace Ft. Thompson 345/230kV Transformer CKT 2 with minimum emergency rating of 390 MVA.	Eligible	\$7,000,000	100%	\$7,000,000	36 Months
Total		\$84,000,000		\$27,125,000	

\*The "Antelope – Holt 345 kV CKT 1" Upgrade saw a reduction in cost from the DISIS results to the Facility Study provided by NPPD. The current cost in this IFS Summary reflects a +/-20% cost accuracy.

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.

Contingent Network Upgrade(s) Description	Current Cost Assignment	Estimated In- Service Date
None	\$0	N/A

### Table 4: Interconnection Customer Contingent Network Upgrade(s)

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.

#### Southwest Power Pool, Inc.

### 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.

Affected System Upgrades	<b>Total Cost Estimate</b>	Allocated	Allocated Cost	
Description	(\$)	Share (%)	Estimate (\$)	
MISO Affected System Impact				
Study SPP DISIS-2016-002:	\$500,000	0%	\$0	
Structure replacements for Min	4200,000	0,0		
Valley to Granite Falls 115kV line				
MISO Affected System Impact				
Study SPP DISIS-2016-002:	\$50,000,000	9.6%	\$4 821 404	
Blackhawk 345kV + 150 MVAR	<i>400,000,000</i>	2.070	φ <del>1</del> ,021, <del>1</del> 01	
SVC/STATCOM				
MISO Affected System Impact				
Study SPP DISIS-2016-002:	\$60,000,000	6%	\$3 598 839	
Montezuma 345kV + 200 MVAR	\$00,000,000	070	+=,=,=,=,==,	
SVC/STATCOM				
MISO Affected System Impact				
Study SPP DISIS-2016-002:	\$3,000,000	12.9%	\$386.022	
Wahpeton 115kV 3 x 20 MVAR	<i>42,000,000</i>	12.770	<i><i><i>vvvvvvvvvvvvv</i></i></i>	
capacitor banks				
MISO Affected System Impact				
Study SPP DISIS-2016-002: Hensel	\$1,000,000	10%	\$99,870	
69kV 1 x 20 MVAR capacitor bank				
MISO Affected System Impact	<b>**</b>		<b>*</b> • • • • • •	
Study SPP DISIS-2016-002: Lyon	\$2,000,000	5.1%	\$101,194	
County 200 MVAR capacitor bank				
MISO Affected System Impact				
Study SPP DISIS-2016-002: Big	\$650.000	10.6%	\$68,783	
Sand 69kV 2 x 7.5 MVAR capacitor	<i>4000,000</i>	20.070	<i>400,700</i>	
banks				
Total	\$117,150,000		\$9,076,111	

#### Table 5: Interconnection Customer Affected System Upgrade(s)

### 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)	\$1,471,376
Non-Shared Network Upgrade(s)	\$2,531,356
Shared Network Upgrade(s)	\$27,125,000
Affected System Upgrade(s)	\$9,076,111
Total	\$40,203,843

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

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).



## 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).

### Basin Electric Power Cooperative Interconnection Facilities Study GEN-2016-092

### 1. Background:

**1.1** Per SPP Generation Interconnection Process 2019 revision<sup>1</sup>, Basin Electric Power Cooperative (Basin Electric) received a request to perform an Interconnection Facility Study Analysis for the following Interconnection Requests:

GI Request #	Point of Interconnection	Capacity (MW)	Fuel Type	Comments
GEN-2016-092	Fort Thompson- Leland Olds 345 kV	175	Wind	<ul> <li>Please provide interconnection upgrades and costs estimates needed to interconnection into the POI (SCERT UIDs # 122691 and 122692).</li> <li>DISIS cluster interconnection cost estimates was \$6,808,192*.</li> <li>Note: GEN-2016-103 was studied in DISIS-2016-002 at the same POI with GEN-2016-092. After the DISIS results posting, GEN-2016-103 has chosen to park to DISIS-2017-001 cluster study.</li> </ul>

<sup>1</sup> SPP Tariff Attachment V Generator Interconnection Procedures (GIP) Section 8.4.4

### 2. Status of Existing Studies Applicable to Request:

GEN-2016-092 will utilize GEN-2016-017 facilities via a terminal addition to accommodate the generator lead to the Point of Interconnection (POI).

### 3. Study Requirements:

Basin Electric has performed this Interconnection Facility Study Analysis in accordance with SPP Tariff Attachment V, Generator Interconnection Procedures (GIP) Section 8.4.4 for the Interconnection Request(s) as described in Section 1.

- **3.1.** The Interconnection Facility Study Analysis includes an evaluation of the following:
  - **3.1.1.** Perform/develop a substation layout, perform a preliminary bus design, determine all electrical equipment requirements, and if necessary determine a suitable site location to accommodate the Request. Develop/compile cost estimates for all Basin Electric labor, overheads, equipment additions, modifications, etc. to accommodate the generator interconnection.
  - **3.1.2.** Develop an overall construction schedule for completion of the necessary additions and/or modifications.
  - **3.1.3.** Point Of Change of Ownership. For the purposes of this Study Analysis, the Point of Change of Ownership location is defined as the take-off structure(s) at the Basin Electric Substation/Switching Station where the Interconnection Customer's transmission line(s) connects to the take-off structure(s). Interconnection Customer will furnish and install the conductor jumper and insulator assembly to the take-off structure(s).

**3.1.4.** Other Interconnection/Metering Requirements. Basic indication, metering, monitoring, control, and relaying requirements due to a generator interconnection are included in the cost estimate. Basin Electric's generation metering requirements, as an SPP Transmission Owner, must be met. A list of specific needs will be provided by Basin Electric once design has progressed.

### 4. Study Results for GEN-2016-092:

**4.1.** The following results document the analysis of the required facilities for this Interconnection Request as outlined in Section 1 for a new 345kV line terminal at the Chapelle Creek Switchyard. Basin Electric has determined that the following additions and improvements are required to maintain a safe and reliable interconnection to Basin Electric's transmission system.

### 4.2. Substation/Switchyard

A 345kV terminal addition will be built to accommodate the new generation resource interconnection. This terminal will be added to the existing ring bus switchyard. Reference Attachments C and D. All equipment will follow Basin Electric's internal design standards for minimum BIL, ampacity, and fault capabilities.

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

- (1) 345kV Line Take-Off Structure
- (1) 345kV Breaker
- (2) 345kV Breaker Disconnect Switches
- (1) Sets of Line Potential Transformers
- (1) Set of Current Transformers
- (1) Sets of Line Surge Arrestors

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

### 4.3. Environmental Requirements

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

### 4.4. Cost Estimate

GEN-2016-092 Estimated Costs	Current Year \$		
Non Shared Network Upgrades			
Line Costs			
Engineering Labor	\$0		
Construction Labor	\$0		
Reactive Compensation (Labor & Materials)	\$0		
Material	\$0		
Right of Way	\$0		
Line Sub Total	\$0		
Station Costs			
Engineering Labor	\$207,520		
Construction Labor	\$952,623		
Site Property Rights	\$0		
Reactive Compensation	\$0		
Material	\$717,947		
Right of Way	\$0		
Station Sub Total	\$1,878,090		
AFUDC	\$0		
Contingency	\$653,266		
Non - Shared Network Upgrades total	\$2,531,356		

GEN-2016-092 Transmission Owner Interconnect Facilities	Current Year \$
Line Costs	
Engineering Labor	\$0
Construction Labor	\$0
Reactive Compensation (Labor & Materials)	\$0
Material	\$0
Right of Way	\$0
Line Sub Total	\$0
Station Costs	
Engineering Labor	\$200,000
Construction Labor	\$468,064
Site Property Rights	\$0
Reactive Compensation	\$0
Material	\$499,234
Right of Way	\$0
Station Sub Total	\$1,167,298
AFUDC	\$0
Contingency	\$304,078
TOIF Subtotal	\$1,471,376

Total Interconnection Cost	\$4,002,732
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### 4.5. Construction Schedule

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

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

#### Figure A1: Proposed Switching Diagram







FIGURE A2 GEN-2016-092



### ATTACHMENT A

### SPP INTERCONNECTION FACILITIES STUDY REQUEST LETTER

### ATTACHMENT A



February 17, 2020

### Subject: Interconnection Facilities Study (IFS) for GI Cluster Impact Study DISIS-2016-002

Dear Mr. Trester:

Per the SPP Generator Interconnection Procedures (GIP)<sup>1</sup>, SPP requests that Basin Electric Power Cooperative (BEPC) perform facilities study in accordance with the Scope of Interconnection Facilities Study GIP Section 8.10 and the Interconnection Facilities Study Procedures in accordance with GIP Section 8.11 for the following Interconnection Request(s):

GI Request #	Point of Interconnection	Capacity (MW)	Fuel Type	Comments
GEN-2016-092	Fort Thompson- Leland Olds 345 kV	175	Wind	<ul> <li>Please provide interconnection upgrades and costs estimates needed to interconnection into the POI (SCERT UIDs # 122691 and 122692).</li> <li>DISIS cluster interconnection cost estimates was \$6,808,192*.</li> <li><u>Note:</u> GEN-2016-103 was studied in DISIS-2016-002 at the same POI with GEN-2016-092. After the DISIS results posting, GEN-2016-103 has chosen to park to DISIS-2017-001 cluster study.</li> </ul>

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

The scope of the Interconnection Facilities Study is to determine interconnection related costs of upgrades for the addition of the SPP-GI Interconnection Request(s) mentioned above.

Identified upgrades and cost estimates should include:

- Costs estimates of equipment, engineering, procurement, and construction
- Associated lead times

If applicable, the DISIS Facilities Analysis conducted during DISIS impact study stage by BEPC can be used for the cost estimated and identified upgrades. If the DISIS Facilities Analysis is no longer applicable, please provide an updated cost estimate and lead time of upgrades needs.

Per GIP Section 8.11, SPP requests that BEPC provide an Interconnection Facilities Study grade estimate (+/-20%) and lead time necessary for the construction within ninety (90) calendar days of the receipt of this letter.

<sup>&</sup>lt;sup>1</sup>SPP Tariff Attachment V Generator Interconnection Procedures (GIP) Section 8.10 and 8.11 are to be referred to in the SPP Tariff Attachment V prior to 7/1/2019.



If any Interconnection Requests (not limited to the Interconnection Requests mentioned above) require BEPC assigned Network Upgrades in the DISIS-2016-002 Impact study, then a separate Interconnection Facilities Study Request Letter will be sent for those in the near future. The ninety (90) days for completion for those networks upgrade facility studies will start on the date the letters are received.

For the completion of the Interconnection Facilities Study, please provide an Interconnection Facilities Study report to SPP within ninety (90) calendar days. If the DISIS Facilities Analysis upgrades and costs are no longer applicable, please provide an updated and completed Standardized Cost Estimate Reporting Template (SCERT) in accordance with SPP Business Practice 7060<sup>2</sup>.

Please find attached to this Interconnection Facilities Study Request Letter, the Interconnection Customer executed Interconnection Facilities Study Agreement along with the supporting documentation.

If you have any questions, please feel free to contact SPP GI Department @ GIStudies@spp.org

Sincerely,

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

<sup>&</sup>lt;sup>2</sup> Business Practice Link https://www.spp.org/documents/37750/spp%20oatt%20business%20practices%2020160412.pdf

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

### <u>NPPD</u>

SPP GEN-2016-074200.0 MW at Sweetwater 345 kV SubstationSPP GEN-2016-106400.0 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



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:

Project	MW	Type	Point-of-Interconnection
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:

Project [Variable]	MW	Type	Point-of-Interconnection
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.

• 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 345/115 kV 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.



<sup>•</sup> DISIS-2016-002 Interconnection Facilities for GEN-2016-074



# Interconnection Facilities Study Report

Southwest Power Pool, Inc. DISIS-2016-002-2 Network Upgrade(s)



# Western Area Power Administration Upper Great Plains Region

January 2021



### 1.0 Background:

The Western Area Power Administration Upper Great Plains Region (WAPA-UGP<sup>1</sup>) received notice from Southwest Power Pool Inc. (SPP) requesting WAPA-UGP perform an Interconnection Facilities Study (IFS) in accordance with the SPP Open Access Transmission Tariff (Tariff). The DISIS-2016-002-2 study identified Network Upgrade(s) on the WAPA-UGP system, specifically replacement of the Fort Thompson 230/345-kV transformers (KU1A and KU1B) with transformers that each have a minimum emergency rating of 390 MVA. WAPA-UGP's IFS evaluates facilities at the Fort Thompson Substation (230-kV yard) and the adjacent Fort Thompson 2 Substation (345-kV yard), also collectively referred to as Fort Thompson. The replacement of KU1A and KU1B and associated improvements at WAPA-UGP's Fort Thompson facilities are considered "Network Upgrades constructed by other transmission owning entity" and will require a Notification to Construct from SPP.

This IFS does not address transmission service or any delivery component of transmission service.

### 2.0 Study Requirements:

WAPA-UGP has performed this IFS to determine a good faith estimate of (i) the cost estimate for the required upgrades, and (ii) the time required to complete construction of the required upgrades. This IFS includes an evaluation of the following:

- Develop/compile cost estimates for all WAPA-UGP labor, overheads, equipment additions, modifications, etc.
- 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.
- Develop an overall time schedule for completion of the necessary addition/modifications.

### 3.0 Study Results:

WAPA-UGP performed the following tasks to evaluate the additions to the system to accommodate the transformer rating increase request as studied and outlined in Section 2.0 above:

- <u>3.1</u> Facility Replacements & Additions: The evaluation of facilities and equipment at Fort Thompson to accommodate the replacement of the two existing 230/345-kV transformers with units each rated at 312 MVA (390 MVA emergency rating) identified the following requirements:
  - Purchase & install two new 230/345-kV 312 MVA transformers. Installation of the two new transformers involves:
    - Realignment of 230-kV take-off structures due to the increase in size of the new transformers and rebuilding of each transformer's tertiary circuits.
    - Removal of existing foundations and placement of new foundations. Foundations at Fort Thompson require extensive piers due to the expansive nature of the soils there.

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

- Construction of an isolation wall between the new transformers is required to maintain reliability due to the increase in size of new transformers and proximity to each other.
- Addition of two new 230-kV circuit breakers to address the 230-kV bus configuration that would open both 230-kV circuits to the new transformers if a breaker failure situation occurred.
- Removal and transportation of KU1B to an alternate location and decommissioning of KU1A.

WAPA-UGP's cost for labor, overhead, materials, and other miscellaneous costs to replace the existing Fort Thompson 230/345-kV transformers (KU1A and KU1B) and add two 230-kV circuit breakers to the existing bus at Fort Thompson is estimated to be \$14,000,000. The interconnection customer(s) will be responsible for the entire cost of the project.

<u>3.2</u> Contractual Agreements: Pursuant to the SPP Tariff, SPP and the Point of Interconnection Transmission Owner will need to execute a Generator Interconnection Agreement (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. The interconnection customer will be responsible for the actual costs of the facility additions at WAPA-UGP's Fort Thompson and Fort Thompson 2 Substations, and WAPA-UGP will require advance funding to proceed with the project. Upon completion of the work WAPA-UGP will own, operate, and maintain the modifications and improvements to WAPA-UGP's Fort Thompson and Fort Thompson 2 Substations.

### 3.3 Interconnection/Control Area Requirements: N/A

<u>3.4</u> **Schedule:** WAPA-UGP's estimated milestone schedule for Fort Thompson replacements and additions are shown in Attachment A. The schedule is subject to execution of a GIA, advance funding being provided, outage availability, and completion of an Environmental Review.

### 4.0 Environmental Review:

WAPA-UGP is a federal agency under the U.S. Department of Energy and is subject to the National Environmental Policy Act (NEPA), 42 U.S.C §4321, et seq., as amended. WAPA-UGP anticipates a Categorical Exclusion level of NEPA review will be required for these replacements and additions. The cost for WAPA-UGP to complete its Environmental Review is included as part of the estimate provided in Attachment A.

### 5.0 Facilities Study Cost:

WAPA-UGP will audit the Interconnection Facilities Study costs and provide a summary of these costs to SPP.



### ATTACHMENT A

### FORT THOMPSON 230/345-kV TRANSFORMER CAPACITY INCREASE

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	\$750,000
Procure equipment, parts, and control equipment necessary to construct	October 1, 2021	\$9,400,000
Development & Solicitation of Construction Contract(s)	March 1, 2022	\$550,000
WAPA-UGP Construction Activities	November 1, 2022	\$2,500,000
Commissioning, Energization, and construction supervision	December 2022	\$550,000
In-Service (Estimated Completion Date)	December 2023	
TOTAL ESTIMATED COSTS		\$14,000,000