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**SOAH DOCKET NO. 473-19-6862**
**PUC DOCKET NO. 49737**

| | | |
|---|---|---|
| **APPLICATION OF SOUTHWESTERN ELECTRIC POWER COMPANY FOR CERTIFICATE OF CONVENIENCE AND NECESSITY AUTHORIZATION AND RELATED RELIEF FOR THE ACQUISITION OF WIND GENERATION FACILITIES** | § § § § § § § | **BEFORE THE STATE OFFICE OF ADMINISTRATIVE HEARINGS** |

**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**SEPTEMBER 3, 2019**

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- ETEC_NTEC_1_017_Attachment_3.pdf
- ETEC_NTEC_1-12_Attachment_1.pdf
- ETEC_NTEC_1-12_Attachment_3.pdf
- ETEC_1_4_Attachment_1.xlsx
- ETEC_NTEC 1-32 Attachment 1.xlsx

**SOAH DOCKET NO. 473-19-6862**
**PUC DOCKET NO. 49737**

**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-1:**

Please refer to the first full paragraph on page 6 of SWEPCO's Petition filed with its Application. Please provide a list of SWEPCO's customers that are seeking or requiring increasing amounts of energy provided by renewable resources. For each customer listed, please provide:

a) the customer's name,

b) the state the customer's facilities are located in,

c) the customer's total annual energy requirements,

d) the portion of their energy requirements sought or required to be provided by renewable resources,

e) whether the customer is a retail or wholesale customer, and

f) whether the customer is "seeking" or "requiring" additional renewable energy.

**Response No. 1-1:**

The information responsive to this request is HIGHLY SENSITIVE under the terms of the Protective Order. The Highly Sensitive information is available for review at the Austin offices of American Electric Power Company (AEP), 400 West 15th Street, Suite 1520, Austin, Texas, 78701, (512) 481-4562, during normal business hours.

See attachment ETEC_NTEC_1_001_Highly_Sensitive_Attachment_1

See response to question 1-3 for the Company's response to subsection f of this question.

| | |
|---|---|
| Prepared By: Christopher N. Martel | Title: Regulatory Consultant Sr |
| Prepared By: Jonathan M. Griffin | Title: Regulatory Consultant Staff |
| Prepared By: Lynn M. Ferry-Nelson | Title: Dir Regulatory Svcs |
| Sponsored By: Thomas P. Brice | Title: VP Regulatory & Finance |

**SOAH DOCKET NO. 473-19-6862**
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**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-2:**

Please provide the same information requested in the prior request for information ("RFI") for Public Service Company of Oklahoma ("PSO") customers.

**Response No. 1-2:**

The requested information concerning PSO has not been developed.

Prepared By: Jonathan M. Griffin    Title: Regulatory Consultant Staff

Sponsored By: Thomas P. Brice    Title: VP Regulatory & Finance

**SOAH DOCKET NO. 473-19-6862**
**PUC DOCKET NO. 49737**

**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-3:**

Please explain how some of SWEPCO's customers are "requiring" that increasing amounts of their energy be provided by renewable resources. Please provide references to all requirements or regulations that customers are relying on.

**Response No. 1-3:**

Numerous SWEPCO customers have stated goals for renewable energy use. In many cases, they have stated their goals publicly and identified action plans for achieving them. Government customers' goals may be part of binding policy or law. For example, 10 U.S.C. § 2911(g) establishes a goal for the Department of Defense to produce or procure 25 percent of its facilities' energy consumption from renewable energy by 2025. See response to ETEC/NTEC question 1-1 for additional information.

| | |
|---|---|
| Prepared By: Christopher N. Martel | Title: Regulatory Consultant Sr |
| Prepared By: Jonathan M. Griffin | Title: Regulatory Consultant Staff |
| Prepared By: Lynn M. Ferry-Nelson | Title: Dir Regulatory Svcs |
| Sponsored By: Thomas P. Brice | Title: VP Regulatory & Finance |

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**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-4:**

Please provide revised computer file copies of Exhibit JOA-1 and JOA-2 for the following scenarios:

a) The Arkansas Public Service Commission ("APSC") does not approve SWEPCO's certification application,
b) The Louisiana Public Service Commission ("LPCS") does not approve SWEPCO's certification application,
c) The Oklahoma Corporation Commission ("OCC") does not approve PSO's rate recovery application,
d) Both the APSC and OCC do not approve the respective applications,
e) Both the LPSC and OCC do not approve the respective applications, and
f) Both the APSC and LPSC do not approve SWEPCO's certification applications.

**Response No. 1-4:**

Revised copies of Exhibit JOA-1 and JOA-2 associated with these scenarios have not been prepared.

See Company witness Brice's testimony. The scalability discussion describes what is being requested in all three SWEPCO states. SWEPCO's states have been offered the chance to approve a non-approving state's share (i.e. to "flex up"). The flex up options would include constructing enough capacity so that the FERC jurisdictional customers could receive the same 9.6% of the total approved by SWEPCO as if all three states approve. If the two approving states do flex up and approve the full non approving state's and FERC's share, then all 1,485 MW of the three facilities will be built and the net benefits to customers shown in the direct testimony would not be impacted.

a), b), & c) If the two approving SWEPCO states don't flex-up for the entire non-approving state's share, then less than 1,485 MW will be built. In accordance with the Buyer Flex Down Right in the confidential PSAs with the Sellers, all three facilities can be scaled down to a minimum number of megawatts without changing the price per MW. Those minimum megawatts are 810 MW for Traverse, 240 MW for Maverick, and 170 MW for Sundance. The Companies have the option to designate any number of MWs from any of the three projects and reduce down to these minimum levels (e.g. not a pro-rata reduction at each site), provided that a minimum of 810 MW from Traverse must be included.

See ETEC 1-4 Attachment 1(provided electronically on the PUC Interchange) for a calculation of the amount of capacity AEP would expect to build from each facility given scenarios in the a, b, and c.

d) & e) The minimum capacity that can be built at the same price per MW per the PSA's with the sellers is 810 MW from the Traverse facility. None of the facilities would be built in these scenarios unless the two approving SWEPCO states elect to flex up and approve 810 MW between them.

f) With approval in Texas and Oklahoma 983 MW would be acquired. 309 MW of that for Texas. This scenario would result in the acquisition of the Traverse facility only.

| | |
|---|---|
| Prepared By: James F. Martin | Title: Regulatory Case Mgr |
| Prepared By: Jacob A. Miller | Title: Regulatory Consultant Sr |
| Sponsored By: Thomas P. Brice | Title: VP Regulatory & Finance |
| Sponsored By: John O. Aaron | Title: Dir Reg Pricing & Analysis |

**SOAH DOCKET NO. 473-19-6862**
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**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-5:**

Please provide a revised Exhibit JOA-2 that provides revenue and rate impacts shown on page 669 of SWEPCO's Application for the years 2025 through 2034.

**Response No. 1-5:**

SWEPCO has not calculated revenue and rate impacts for the years 2025 through 2034.

Prepared By: Jacob A. Miller Title: Regulatory Consultant Sr

Sponsored By: John O. Aaron Title: Dir Reg Pricing & Analysis

**SOAH DOCKET NO. 473-19-6862**
**PUC DOCKET NO. 49737**

**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-6:**

Please explain how unused production tax credits (PTCs) will be treated for purposes of determining rates for SWEPCO's wholesale customers.

**Response No. 1-6:**

Unused PTC's will be accounted for in Accumulated Deferred Income Taxes, which is a component of rate base for SWEPCO's wholesale customers.

In tax expense, PTC's will be credited on the books to either FERC Account 409, 410, or 411 current tax expense or deferred tax expense account which is included in formula rate income tax calculations in the year earned, depending on whether they can be used in that year to offset the Company's tax obligation. All of these accounts are included in the formula rate effective income tax rate calculation, and therefore FERC customers will receive the benefits as PTC's are earned, whether or not the PTC's are usable in the year earned.

Prepared By: James F. Martin — Title: Regulatory Case Mgr
Prepared By: Jacob A. Miller — Title: Regulatory Consultant Sr

Sponsored By: John O. Aaron — Title: Dir Reg Pricing & Analysis

**SOAH DOCKET NO. 473-19-6862**
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**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-7:**

When does SWEPCO plan to seek the approval of FERC for the wholesale rate treatment of the costs associated with the proposed acquisition of the Selected Wind Facilities? If SWEPCO does not plan to seek FERC approval for the cost recovery, please explain how SWEPCO intends to recover the costs of the Selected Wind Facilities in wholesale rates.

**Response No. 1-7:**

SWEPCO is not required to make a specific filing at FERC to recover the costs of Selected Wind Facilities. The currently effective generation formula rate template allows for recovery of generation facilities. See also the Company's response to ETEC/NTEC 1-14.

| | |
|---|---|
| Prepared By: Christopher N. Martel | Title: Regulatory Consultant Sr |
| Prepared By: Jonathan M. Griffin | Title: Regulatory Consultant Staff |
| Prepared By: Lynn M. Ferry-Nelson | Title: Dir Regulatory Svcs |
| Sponsored By: Thomas P. Brice | Title: VP Regulatory & Finance |

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**Question No. 1-8:**

Please refer to the "JOA – Allocations" tab of WP "Aaron – AEP Witness Aaron Exhibits SWEPCO-TX" provided in the workpapers of SWEPCO witness John Aaron. Provide the FERC wholesale amounts shown on line 24 by state and by wholesale customer.

**Response No. 1-8:**

SWEPCO and ETEC/NTEC are discussing resolution of potential objections to this request.

Prepared by: Counsel

Sponsored by: Counsel

**SOAH DOCKET NO. 473-19-6862**
**PUC DOCKET NO. 49737**

**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-9:**

Please provide working computer file copies, with all links and linked data intact, of Exhibits JOA-1 and JOA-2 and of the workpapers of SWEPCO witness John Aaron.

**Response No. 1-9:**

Working computer files of Exhibits JOA-1 and JOA-2 and the associated workpapers of SWEPCO witness John Aaron are available on the PUCT interchange, Item No. 12, with the following link:

http://interchange.puc.texas.gov/Search/Documents?controlNumber=49737&itemNumber=12.

Prepared By: Jacob A. Miller Title: Regulatory Consultant Sr

Sponsored By: John O. Aaron Title: Dir Reg Pricing & Analysis

**SOAH DOCKET NO. 473-19-6862**
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**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-10:**

1-10 Please provide a working computer file copy of all studies, models and/or analyses that forecast the impact of the proposed Selected Wind Facilities on:
a) SWEPCO's and PSO's total FERC jurisdiction wholesale customers,
b) SWEPCO's FERC jurisdiction wholesale customers in Texas, and
c) Each of SWEPCO's FERC jurisdiction wholesale customers.

**Response No. 1-10:**

SWEPCO and ETEC/NTEC are discussing resolution of potential objections to this request.

Prepared by: Counsel

Sponsored by: Counsel

**SOAH DOCKET NO. 473-19-6862**
**PUC DOCKET NO. 49737**

**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-11:**

Please provide a copy of all facility studies conducted by the Southwest Power Pool ("SPP") of: (1) the Traverse Wind Facilities, (2) the Maverick Wind Facilities, and/or (3) the Sundance Wind Facilities. If any of these SPP studies have not yet been concluded, please provide the study as soon as it becomes available.

**Response No. 1-11:**

Please see ETEC NTEC 1-11 Attachments 1 through 4.

| | |
|---|---|
| Prepared By: Joseph A. Karrasch | Title: Dir Renewable Energy Devlpmnt |
| Prepared By: Edward J. Locigno | Title: Regulatory Analysis & Case Mgr |
| Sponsored By: Jay F. Godfrey | Title: VP Energy Mktng & Renewables |

SPP Southwest Power Pool

# INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-045

(IFS-2016-001-34)

Published April 2019

By SPP Generator Interconnections Dept.

# REVISION HISTORY

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION |
|---|---|---|
| 2/1/2019 | SPP | Initial draft report issued. |
| 4/2/2019 | SPP | Final report issued. |
| | | |

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# SUMMARY

### *INTRODUCTION*

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-045/IFS-2016-001-34 is for a 500.00 MW generating facility located in Cimarron and Texas County, Oklahoma. The Interconnection Request was studied in the DISIS 2016-001 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). The Interconnection Request was restudied in the DISIS 2016-001-1 for ERIS only. The Interconnection Customer's original requested in-service date is 8/31/2018 and the revised in-service date in the Facilities Study Agreement is 12/01/2020.

The interconnecting Transmission Owner, Oklahoma Gas and Electric (OKGE) 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, Previous 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, Interconnection Service will not be available until all Interconnection Facilities and Network Upgrade(s) can be placed in service.

### *CREDITS/COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)*

Interconnection Customer shall be entitled to compensation in accordance with Attachment Z2 of the SPP OATT for the cost of SPP creditable-type Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, that are not otherwise refunded to the Interconnection Customer. Compensation shall be in the form of either revenue credits or incremental Long Term Congestion Rights (iLTCR).

*INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES*

The Generating Facility is proposed to consist of two hundred and seventeen (217) GE 2.3 MW wind turbine generators for a total generating nameplate capacity of 499.1 MW.

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

- 34.5 kV underground cable collection circuits;
- 34.5 kV to 345 kV transformation substation with associated 34.5 kV and 345 kV switchgear;
- Four (4) 345/34.5 kV 100/133/166 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnecting Customer at the Interconnection Customer's substation;
- A 290.5 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 Mathewson 345 kV Substation that is owned and maintained by Transmission Owner;
- All transmission facilities required to connect the Interconnection Customer's substation to the POI;
- Equipment at the Interconnection Customer's substation necessary to maintain a composite power delivery at continuous rated power output at the high-side of the generator substation at a power factor within the range of 95% lagging and 95% leading in accordance with Federal Energy Regulatory Commission (FERC) Order 827. Additionally approximately 317.5 Mvars[1] of reactors will be required to compensate for injection of reactive power into the transmission system under no/reduced generating conditions. 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.

The Interconnection Customer shall coordinate relay, protection, control, and communication system configurations and schemes with the Transmission Owner.

[1] This approximate minimum reactor amount is needed for the current configuration of GEN-2016-045 as studied in the DISIS-2016-001 Impact Study and DISIS-2016-001-1 Re-study.

## *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 |
|---|---|---|---|---|
| **OKGE Mathewson 345 kV Interconnection Substation:** Construct Two (2) 345 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. | $11,834,688 | 100% | $11,834,688 | 12 Months |
| **Total** | **$11,834,688** | **100%** | **$11,834,688** | |

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

| Non-Shared Network Upgrades Description | Z2 Type[2] | Total Cost Estimate ($) | Allocated Percent (%) | Allocated Cost Estimate ($) | Estimated Lead Time |
|---|---|---|---|---|---|
| **OKGE Mathewson 345 kV Interconnection Substation:** Install three (3) 5000 continuous ampacity breakers, control panels, line relaying, acquire land, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials. | Non-Creditable | $3,269,267 | 100% | $3,269,267 | 12 Months |
| **Total** | | **$3,269,267** | **100%** | **$3,269,267** | |

[2] Indicates the method used for calculating credit impacts under Attachment Z2 of the Tariff.

### *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 Upgrades*

| Shared Network Upgrades Description | Z2 Type | 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.

### *PREVIOUS NETWORK UPGRADE(S)*

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

*Table 4: Interconnection Customer Previous Network Upgrade(s)*

| Previous Network Upgrades 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 Previous 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 ($) | Allocated Share (%) | Allocated Cost Estimate ($) |
|---|---|---|---|
| **None** | $0 | N/A | $0 |
| **Total** | **$0** | | **$0** |

## *CONCLUSION*

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 499.1 MW can be granted. Interconnection Service will be delayed until the upgrades (TOIF, non-shared NU, shared NU, previously allocated, affected system, etc) that are required for full interconnection service are completed. The Interconnection Customer's estimated cost responsibility for all upgrades (TOIF, non-shared NU, shared NU, previously allocated, affected system, etc) that are required for full interconnection service are summarized in the table below.

*Table 6: Cost Summary*

| Description | Allocated Cost Estimate |
|---|---|
| Transmission Owner Interconnection Facilities | $11,834,688 |
| Network Upgrades | $3,269,267 |
| **Total** | **$15,103,955** |

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

See next page for the Transmission Owner's Interconnection Facilities Study Report.

OG&E

# Revised
# FACILITY STUDY

## for

# Generation Interconnection Request 2016-045

500 MW Wind Generating Facility
In Canadian County
Oklahoma

August 8, 2017

Andrew R. Aston, P.E.
Lead Engineer
Transmission Planning
**OG&E Electric Services**

## Summary

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Oklahoma Gas and Electric (OG&E) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer for SPP Generation Interconnection request Gen-2016-045. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The requirements for interconnection consist of adding 3 breakers, 2 line reactors, and 2 new line terminals for a new wind farm. In addition an engineering EMTP study will need to be completed. Costs for any mitigation steps taken due to EMTP study results will need to be added to the facility study's estimate. The total cost for OKGE to add 3 breakers, 2 line reactors, and 2 new line terminals for a new wind farm and have an EMTP study at Matthewson 34kV substation, the interconnection facility, is estimated at $15,103,955.

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## Introduction

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting a wind generating facility within the service territory of OG&E Electric Services (OKGE) in Canadian County Oklahoma. The proposed 345kV point of interconnection is at Mathewson Substation in Canadian County. This substation is owned by OKGE. The cost for adding 2 new 345kV terminals and 2 line reactors to Mathewson Substation, the required interconnection facility, is estimated at $11,834,688.

Network Constraints in the Southwest Public Service (SPS), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

Other Network Constraints in the American Electric Power West (AEPW), Southwest Public Service (SPS), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

**Interconnection Facilities**

The primary objective of this study is to identify attachment facilities. The requirements for interconnection consist of adding a new 345kV terminal at Mathewson substation. This 345kV addition shall be constructed and maintained by OKGE. It is assumed that obtaining all necessary right-of-way for the line into the new OKGE 345kV substation facilities will be performed by the interconnection customer.

The total cost for OKGE to add 2 new 345kV terminal in an existing EHV Substation, the interconnection facility, is estimated at $1,784,688. The estimated cost of adding line reactors is estimated at $10,050,000. This cost does not include building the 345kV line from the Customer substation into the new EHV Substation. The Customer is responsible for this 345kV line up to the point of interconnection. This cost does not include the Customer's 345-34.5kV substation and the cost estimate should be determined by the Customer.

This Facility Study does not guarantee the availability of transmission service necessary to deliver the additional generation to any specific point inside or outside the Southwest Power Pool (SPP) transmission system. The transmission network facilities may not be adequate to deliver the additional generation output to the transmission system. If the customer requests firm transmission service under the SPP Open Access Transmission Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP OATT.

The costs of interconnecting the facility to the OKGE transmission system are listed in Table 1.

Short Circuit Fault Duty Evaluation

It is standard practice for OG&E to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its interrupting rating with re-closer de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.

For this generator interconnection, no breakers were found to exceed their interrupting capability after the addition of the Customer's 500MW generation and related facilities. OG&E found no breakers that exceeded their interrupting capabilities on their system. Therefore, there is no short circuit upgrade costs associated with the Gen-2016-045 interconnection.

**Table 1: Required Interconnection Network Upgrade Facilities**

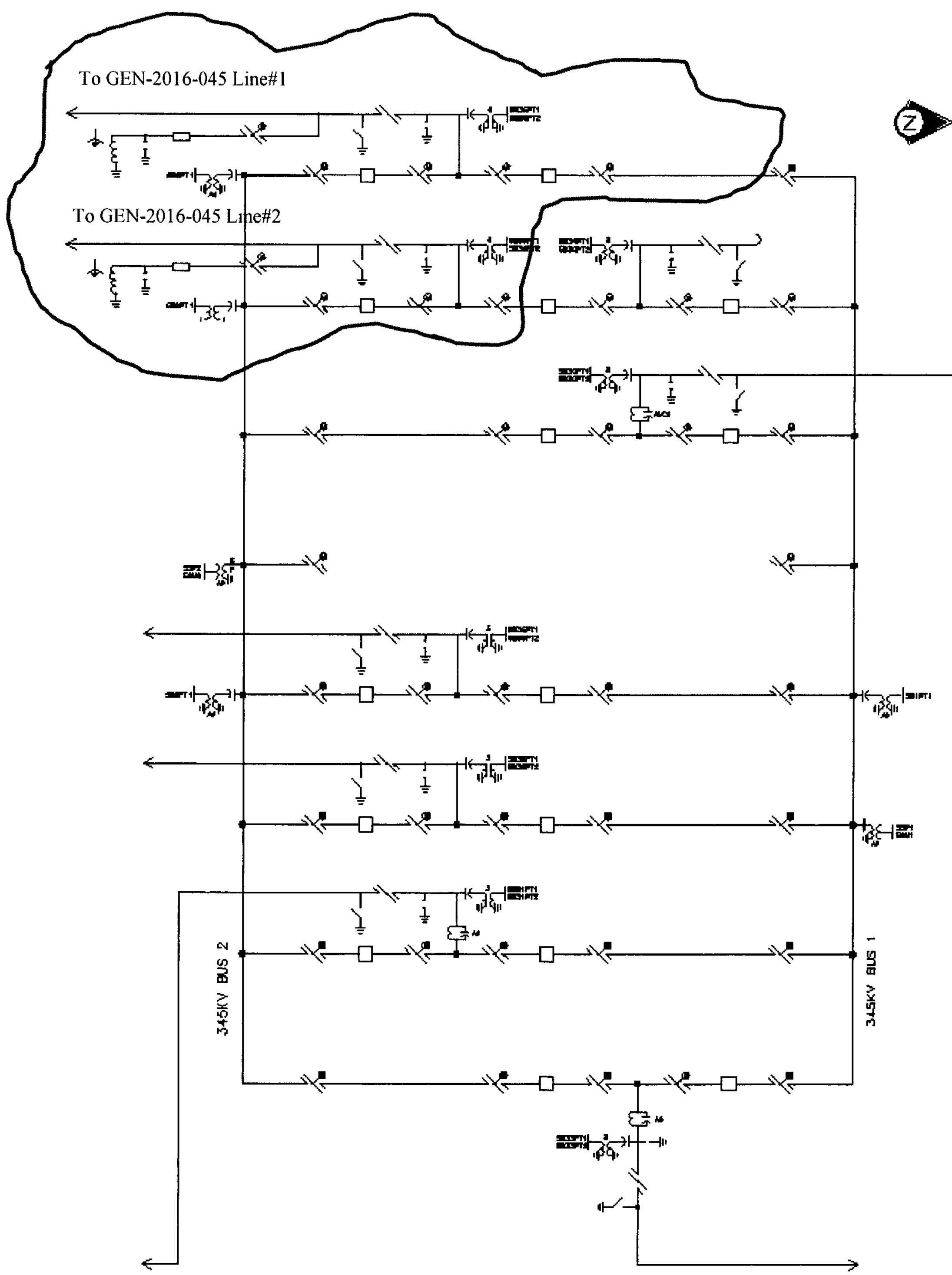
| [illegible] | [illegible] |
|---|---|
| OKGE – **Interconnection Facilities**- Add two 345kV line terminals to an existing EHV Substation. Two dead end structures, line switches, line relaying, revenue metering including CTs and PTs | **$1,784,688** |
| OKGE-**Reactive Interconnection Facilities** - Add two line reactors, two FISs, switches, relaying and protection. | **$10,050,000** |
| OKGE – **Network Upgrades** at an existing EHV sub, Install three-345kV 5000A breakers, line relaying, disconnect switches, and associated equipment. | **$3,269,267** |
| OKGE - Right-of-Way for 345kV terminal addition | No Additional ROW |
| **Total** | **$15,103,955** |

Prepared by Andrew R. Aston, PE August 8, 2017

Lead Engineer, Transmission Planning
OG&E Electric Services

Reviewed by:
Steve M. Hardebeck, P.E.
Manager, Transmission Planning

## Mathewson Substation



SPP Southwest Power Pool

# INTERCONNECTION FACILITIES STUDY REPORT

## GEN-2016-057

## IFS-2016-001-35

Published April 2019

By SPP Generator Interconnections Dept.

# REVISION HISTORY

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION |
|---|---|---|
| 02/1/2019 | SPP | Initial draft report issued. |
| 4/2/2019 | SPP | Final report issued. |
| | | |

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# SUMMARY

## *INTRODUCTION*

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-057/IFS-2016-001-35 is for a 500 MW generating facility located in Cimarron and Texas County, Oklahoma. The Interconnection Request was studied in the DISIS 2016-001 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). The Interconnection Request was restudied in the DISIS 2016-001-1 for ERIS only. The Interconnection Customer's original requested in-service date is 8/31/2018 and the revised in-service date in the Facilities Study Agreement is 12/01/2020.

The interconnecting Transmission Owner, Oklahoma Gas & Electric (OKGE), 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 interconnect facilities (TOIF), non-shared network upgrades, shared network upgrades, previously allocated, 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, Interconnection Service will not be available until all Interconnection Facilities and Network Upgrade(s) can be placed in service.

## *CREDITS/COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)*

Interconnection Customer shall be entitled to compensation in accordance with Attachment Z2 of the SPP OATT for the cost of SPP creditable-type Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, that are not otherwise refunded to the Interconnection Customer. Compensation shall be in the form of either revenue credits or incremental Long Term Congestion Rights (iLTCR).

## *INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES*

The Generating Facility is proposed to consist of two hundred and seventeen (217) GE 2.3 MW wind turbine generators for a total generating nameplate capacity of 499.1 MW.

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

- 34.5 kV underground cable collector circuits;
- 34.5 kV to 345 kV transformation substation with associated 34.5 kV and 345 kV switchgear;
- Four (4) 34.5/345 kV, 100/133/166 MVA (ONAN/ONAF/ONAF) step-up transformers to be owned and maintained by the Interconnecting Customer at the Interconnection Customer's substation;
- A 296.9 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 OKGE substation Mathewson 345kV that is owned and maintained by OKGE;
- 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. Additionally approximately 333.0 Mvars[1] of reactors will be required to compensate for injection of reactive power into the transmission system under no/reduced generating conditions. 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.

The Interconnection Customer shall coordinate relay, protection, control, and communication system configurations and schemes with the Transmission Owner.

[1] This approximate minimum reactor amount is needed for the current configuration of GEN-2016-057 as studied in the DISIS-2016-001 Impact Study and DISIS-2016-001-1 Restudy.

## *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 |
|---|---|---|---|---|
| **OKGE Mathewson 345 kV Interconnection Substation:** Construct Two (2) 345 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. | $11,834,688 | 100% | $11,834,688 | 12 Months |
| **Total** | **$11,834,688** | **100%** | **$11,834,688** | |

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

| Non-Shared Network Upgrades Description | Z2 Type[2] | Total Cost Estimate ($) | Allocated Percent (%) | Allocated Cost Estimate ($) | Estimated Lead Time |
|---|---|---|---|---|---|
| **OKGE Mathewson 345 kV Interconnection Substation:** Install three (3) 5000 continuous ampacity breakers, control panels, line relaying, acquire land, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials. | Non-Creditable | $3,269,267 | 100% | $3,269,267 | 12 Months |
| **Total** | | **$3,269,267** | **100%** | **$3,269,267** | |

[2] Indicates the method used for calculating credits impacts under Attachment Z2 of the Tariff.

### *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 Upgrades*

| Shared Network Upgrades Description | Z2 Type | 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.

### *PREVIOUS NETWORK UPGRADE(S)*

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

*Table 4: Interconnection Customer Previous Network Upgrade(s)*

| Previous Network Upgrade(s) Description | Current Cost Assignment | Estimate 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 Previous 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 ($) | Allocated Share (%) | Allocated Cost Estimate ($) |
|---|---|---|---|
| **None** | $0 | N/A | $0 |
| **Total** | **$0** | | **$0** |

## *CONCLUSION*

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 499.1 MW can be granted. Interconnection Service will be delayed until the transmission owner interconnect facilities (TOIF), non-shared network upgrades, shared network upgrades, previously allocated, and affected system upgrades that are required for full interconnection service are completed. The Interconnection Customer's estimated cost responsibility is summarized in the table below.

*Table 6: Cost Summary*

| Description | Allocated Cost Estimate |
|---|---|
| Transmission Owner Interconnection Facilities | $11,834,688 |
| Network Upgrades | $3,269,267 |
| **Total** | **$15,103,955** |

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

See next page for the Transmission Owner's Interconnection Facilities Study Report.

OG&E

# Revised
# FACILITY STUDY

## for

## Generation Interconnection Request 2016-057

500 MW Wind Generating Facility
In Canadian County
Oklahoma

August 8, 2017

Andrew R. Aston, P.E.
Lead Engineer
Transmission Planning
**OG&E Electric Services**

## Summary

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Oklahoma Gas and Electric (OG&E) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer for SPP Generation Interconnection request Gen-2016-057. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The requirements for interconnection consist of adding 3 breakers, 2 line reactors, and 2 new line terminals for a new wind farm. In addition an engineering EMTP study will need to be completed. Costs for any mitigation steps taken due to EMTP study results will need to be added to the facility study's estimate. The total cost for OKGE to add 3 breakers, 2 line reactors, and 2 new line terminals for a new wind farm and have an EMTP study at Matthewson 34kV substation, the interconnection facility, is estimated at $15,103,955.

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## Introduction

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting a wind generating facility within the service territory of OG&E Electric Services (OKGE) in Canadian County Oklahoma. The proposed 345kV point of interconnection is at Mathewson Substation in Canadian County. This substation will be owned by OKGE. The cost for adding 2 new 345kV terminals and 2 line reactors to Mathewson Substation, the required interconnection facility, is estimated at $11,834,688.

Network Constraints in the Southwest Public Service (SPS), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

Other Network Constraints in the American Electric Power West (AEPW), Southwest Public Service (SPS), and OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

**Interconnection Facilities**

The primary objective of this study is to identify attachment facilities. The requirements for interconnection consist of adding a new 345kV terminal at Mathewson substation. This 345kV addition shall be constructed and maintained by OKGE. It is assumed that obtaining all necessary right-of-way for the line into the new OKGE 345kV substation facilities will be performed by the interconnection customer.

The total cost for OKGE to add 2 new 345kV terminal in an existing EHV Substation, the interconnection facility, is estimated at $1,784,688. The estimated cost of adding line reactors is estimated at $10,050,000. This cost does not include building the 345kV line from the Customer substation into the new EHV Substation. The Customer is responsible for this 345kV line up to the point of interconnection. This cost does not include the Customer's 345-34.5kV substation and the cost estimate should be determined by the Customer.

This Facility Study does not guarantee the availability of transmission service necessary to deliver the additional generation to any specific point inside or outside the Southwest Power Pool (SPP) transmission system. The transmission network facilities may not be adequate to deliver the additional generation output to the transmission system. If the customer requests firm transmission service under the SPP Open Access Transmission Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP OATT.

The costs of interconnecting the facility to the OKGE transmission system are listed in Table 1.

Short Circuit Fault Duty Evaluation

It is standard practice for OG&E to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its interrupting rating with re-closer de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.

For this generator interconnection, no breakers were found to exceed their interrupting capability after the addition of the Customer's 500MW generation and related facilities. OG&E found no breakers that exceeded their interrupting capabilities on their system. Therefore, there is no short circuit upgrade costs associated with the Gen-2016-057 interconnection.

**Table 1: Required Interconnection Network Upgrade Facilities**

| [illegible] | [illegible] |
|---|---|
| OKGE – **Interconnection Facilities-** Add two 345kV line terminals to an existing EHV Substation. Two dead end structures, line switches, line relaying, revenue metering including CTs and PTs | **$1,784,688** |
| OKGE-**Reactive Interconnection Facilities -** Add two line reactors, two FISs, switches, relaying and protection | **$10,050,000** |
| OKGE – **Network Upgrades** at an existing EHV sub, Install three-345kV 5000A breakers, line relaying, disconnect switches, and associated equipment. | **$3,269,267** |
| OKGE - Right-of-Way for 345kV terminal addition | No Additional ROW |
| **Total** | **$15,103,955** |

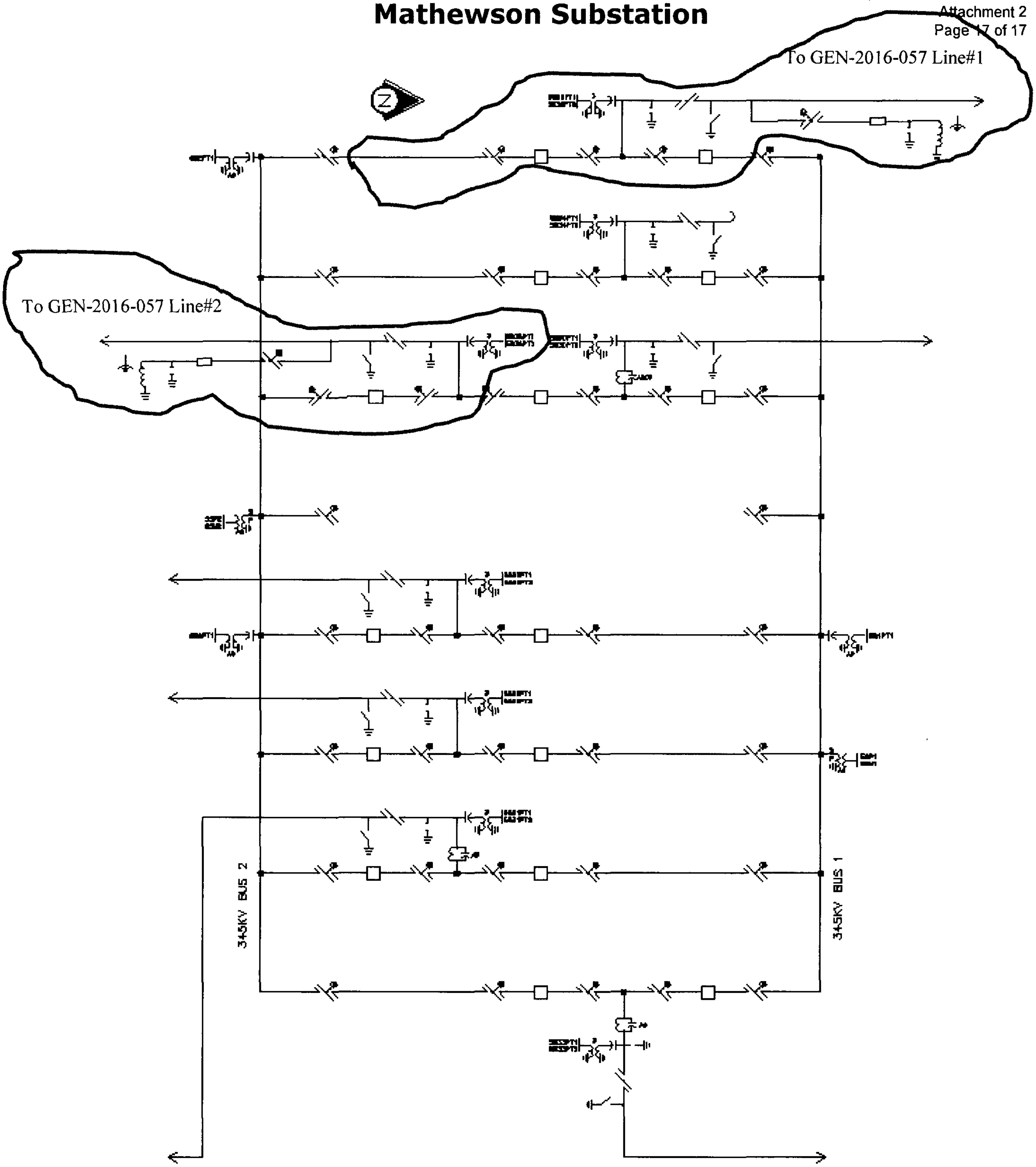
Prepared by Andrew R. Aston, PE August 8, 2017

Lead Engineer, Transmission Planning
OG&E Electric Services

Reviewed by:

Steve M. Hardebeck, P.E.
Manager, Transmission Planning

# Mathewson Substation



SPP Southwest Power Pool

# INTERCONNECTION FACILITIES STUDY REPORT

GEN-2015-048

(IFS-2015-002-11)

Published August 2017

By SPP Generator Interconnections Dept.

# REVISION HISTORY

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION | COMMENTS |
|---|---|---|---|
| **2/1/2017** | **SPP** | **Initial draft report issued.** | |
| 3/17/2017 | SPP | Initial final report issued. | |
| **8/28/2017** | **SPP** | **Initial draft revision 1 report issued.** | **Network Upgrade cost allocation update based on DISIS-2015-002-3 restudy.** |

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# SUMMARY

## *INTRODUCTION*

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2015-048/IFS-2015-002-11 is for a 200.00 MW generating facility located in Major County, Oklahoma. The Interconnection Request was studied in the DISIS-2015-002 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). Prior to an executed IFS agreement, the Interconnection Customer requested to withdraw NRIS per Section 4.4.1 of the Southwest Power Pool (SPP) Generator Interconnection Procedures (GIP), therefore ERIS-only was analyzed for this request in the DISIS-2015-002-1 Impact Restudy and DISIS-2015-002-2 Impact Restudy. The Interconnection Customer's requested in-service date is December 1, 2017.

The interconnecting Transmission Owner, Oklahoma Gas and Electric Company (OKGE), 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, Shared Network Upgrade(s), Non-Shared Network Upgrade(s), and Other Network Upgrade(s) are completed.

The primary objective of the IFS is to identify necessary Transmission Owner Interconnection Facilities, Network Upgrade(s), other direct assigned upgrade(s), and associated upgrade lead times needed to grant the requested Interconnection Service at the specified Point of Interconnection (POI).

## *PHASE(S) OF INTERCONNECTION SERVICE*

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

## *CREDITS/COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)*

Interconnection Customer shall be entitled to compensation in accordance with Attachment Z2 of the SPP OATT for the cost of SPP Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, that are not otherwise refunded to the Interconnection Customer. Compensation shall be in the form of either revenue credits or incremental Long Term Congestion Rights (iLTCR).

*INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES*

The Generating Facility is proposed to consist of one hundred (100) 2.0 MW Vestas wind generators for a total generating nameplate capacity of 200.00 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:

- A 34.5kV collector system;
- One (1) 138/34.5kV 150/200/250 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- A twenty (20) mile overhead 138kV line to connect the Interconnection Customer's substation to the POI at the 138 kV bus existing OKGE substation ("Cleo Corner") to be owned and maintained by OKGE;
- 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 power factor at the POI between 95% lagging and 95% leading, including approximately 20.3Mvars[1] of reactors to compensate for injection of reactive power into the transmission system under no/reduced generating conditions. The Interconnection Customer may use wind 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.

The Interconnection Customer shall coordinate relay, protection, control, and communication system configurations and schemes with the Transmission Owner.

[1] This approximate minimum reactor amount is needed for the current configuration of the wind farm as studied in the DISIS-2015-002 Impact Study

## *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** 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: Interconnection Customer TOIF and Non-Shared Network Upgrade(s)*

| TOIF and Non-Shared Network Upgrades Description | Allocated Cost Estimate ($) | Allocated Percent (%) | Total Cost Estimate ($) | Estimated Lead Time |
|---|---|---|---|---|
| **OKGE Cleo Corner Substation: Transmission Owner Interconnection Facilities** 138kV Substation work for one (1) new line terminal, line switch, dead end structure, line relaying, communications, revenue metering, and line arrestor. | $410,000 | 100% | $410,000 | |
| **OKGE Cleo Corner Substation - Non-Shared Network Upgrades** install four (4) 2000A circuit breakers, control panel replacement, line relaying, disconnect switches, and associated material and equipment. Reroute transmission line to the south to open up the north terminal. | $2,558,000 | 100% | $2,558,000 | |
| **Cleo Corner - Cleo Plant Tap 138kV Circuit #1** Change CT tap setting and testing | $61,890 | 100% | $61,890 | |
| **Total** | **$3,029,890** | **100%** | **$3,029,890** | |

### *SHARED NETWORK UPGRADE(S)*

The Interconnection Customer's share of costs for Shared Network Upgrades is estimated in **Table 2** below.

*Table 2: Interconnection Customer Shared Network Upgrades*

| Shared Network Upgrades Description | Allocated Cost Estimate ($) | Allocated Percent (%) | Total Cost Estimate ($) |
|---|---|---|---|
| Currently, None | $0 | N/A | $0 |
| **Total** | **$0** | **N/A** | **$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.

### *OTHER NETWORK UPGRADE(S)*

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

1) Woodward EH Phase Shifting Transformer circuit #1 build, assigned to DISIS-2011-001 Interconnection Customer(s). Placed in-service in 2017.

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 Other Network Upgrades.

## *CONCLUSION*

After all Interconnection Facilities and Network Upgrade(s) have been placed into service, Interconnection Service for 200.00 MW can be granted. Full Interconnection Service will be delayed until the Transmission Owner Interconnection Facilities, Shared Network Upgrade(s), Non-Shared Network Upgrade(s) and Other Network Upgrades are completed. The Interconnection Customer's estimated cost responsibility for Transmission Owner Interconnection Facilities, Non-Shared Network Upgrades, and Shared Network Upgrades is summarized in the table below.

*Table 3: Cost Summary*

| Description | Allocated Cost Estimate |
|---|---|
| Transmission Owner Interconnection Facilities | $410,000 |
| Network Upgrades | $2,619,890 |
| **Total** | **$3,029,890** |

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

See next page for the Transmission Owner's Interconnection Facilities Study Report.

OG&E

# FACILITY STUDY

## for

# Generation Interconnection Request 2015-048

200 MW Wind Generating Facility
In Major County
Oklahoma

January 18, 2016

Andrew R. Aston, PE
Lead Engineer
Transmission Planning
**OG&E Electric Services**

## Summary

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Oklahoma Gas and Electric (OG&E) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer for SPP Generation Interconnection request Gen-2015-048. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The requirements for interconnection consist of adding 3 breakers, replacing 1 breaker and adding a line terminal to Cleo Corner substation. The total cost for OKGE to add 3 breakers, replace 1 breaker, and add a terminal in Cleo Corner substation, the interconnection facility, is estimated at $2,968,000.

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## Introduction

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting a wind generating facility within the service territory of OG&E Electric Services (OKGE) in Major County Oklahoma. The proposed 138kV point of interconnection is at Cleo Corner Substation in Major County Oklahoma. This substation is owned by OKGE.

The cost for adding a new 138kV terminal to the Substation, the required interconnection facility, is estimated at $410,000.

Network Constraints in the Southwest Public Service (SPS), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

## Interconnection Facilities

The primary objective of this study is to identify attachment facilities. The requirements for interconnection consist of adding a new 138kV terminal in Cleo Corner Substation. This 138kV addition shall be constructed and maintained by OKGE. The Customer did not propose a route of its 138kV line to serve its 138kV facilities. It is assumed that obtaining all necessary right-of-way for the line into the new OKGE 138kV substation facilities will not be a significant expense.

The total cost for OKGE to add a new 138kV terminal in an existing substation, the interconnection facility, is estimated at $410,000. This cost does not include building the 138kV line from the Customer substation into Cleo Corner substation. The Customer is responsible for this 138kV line up to the point of interconnection. This cost does not include the Customer's 138-34.5kV substation and the cost estimate should be determined by the Customer.

This Facility Study does not guarantee the availability of transmission service necessary to deliver the additional generation to any specific point inside or outside the Southwest Power Pool (SPP) transmission system. The transmission network facilities may not be adequate to deliver the additional generation output to the transmission system. If the customer requests firm transmission service under the SPP Open Access Transmission Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP OATT.

The costs of interconnecting the facility to the OKGE transmission system are listed in Table 1.

Short Circuit Fault Duty Evaluation

It is standard practice for OG&E to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its interrupting rating with re-closer de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.

For this generator interconnection, no breakers were found to exceed their interrupting capability after the addition of the Customer's generation and related facilities. OG&E found no breakers that exceeded their interrupting capabilities on their system. Therefore, there is no short circuit upgrade costs associated with the Gen-2015-048 interconnection.

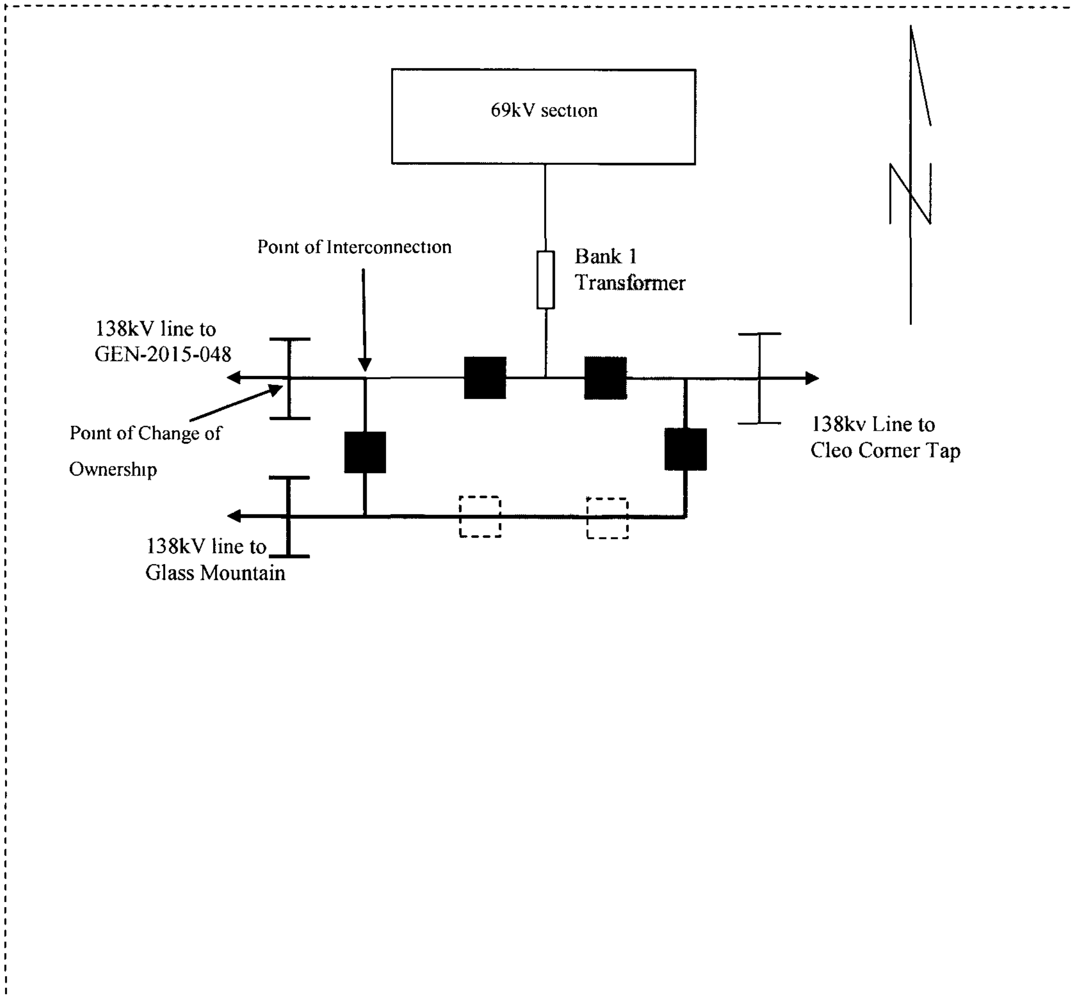
**Table 1: Required Interconnection Network Upgrade Facilities**

| [illegible] | ESTIMATED COST (2016 DOLLARS) |
|---|---|
| OKGE – **Interconnection Facilities**- Add a single 138kV line terminal to an existing substation. Dead end structure, line switch, line relaying, revenue metering including CTs and PTs | **$410,000** |
| OKGE-**Transmission Line**-Reroute transmission line to the south to open up the north terminal to the windfarm | **$81,000** |
| OKGE – **Network Upgrades** at an existing 138kV sub, Install 4-138kV 2000A breaker, line relaying, disconnect switches, and associated equipment. | **$2,477,000** |
| OKGE - Right-of-Way for 138kV terminal addition | No Additional ROW |
| | |
| **Total** | **$2,968,000** |

Prepared by Andrew R. Aston, P.E. — January 18, 2016
Lead Engineer, Transmission Planning
OG&E Electric Services

Reviewed by:
*Steve M Hardebeck P.E.*
Steve M. Hardebeck, P.E.
Manager, Transmission Planning

# Cleo Corner Substation



Southwest Power Pool

# INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-118

(IFS-2016-002-05)

Published July 2019

By SPP Generator Interconnections Dept.

# REVISION HISTORY

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION |
|---|---|---|
| 06/10/2019 | SPP | Initial draft report issued. |
| 07/12/2019 | SPP | Final report issued. |

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Southwest Power Pool, Inc.

# SUMMARY

## *INTRODUCTION*

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-118/IFS-2016-002-05 is for a 288.00 MW generating facility located in Kingfisher County, Oklahoma. The Interconnection Request was studied in the DISIS-2016-002 Impact Study for Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS). The interconnection customer elected not to pursue NRIS in the Facility Study Agreement. The Interconnection Customer's original requested Commercial Operation Date (COD) was 12/1/2019. The COD was revised in the Facility Study Agreement to 9/1/2020.

The interconnecting Transmission Owner, Western Farmers Electric Cooperative (WFEC), performed a detailed IF 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, Previous 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.

## *CREDITS/COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)*

Interconnection Customer shall be entitled to compensation in accordance with Attachment Z2 of the SPP OATT for the cost of SPP creditable-type Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, that are not otherwise refunded to the Interconnection Customer. Compensation shall be in the form of either revenue credits or incremental Long Term Congestion Rights (iLTCR).

*INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES*

The Generating Facility is proposed to consist of one hundred forty four (144) Vestas 2.0 MW wind generators for a total generating nameplate capacity of 288.00 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:

- 34.5kV underground cable collection circuits;
- 34.5kV to 138kV transformation substation with associated 34.5kV and 138kV switchgear;
- Two (2) 138kV/34.5kV 90/120/150 MVA (ONAN/ONAF/ONAF) step-up transformers to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- Approximately ten (10) mile overhead 138kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 138kV bus at existing Transmission Owner substation ("Dover Switchyard") 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.

The Interconnection Customer shall coordinate relay, protection, control, and communication system configurations and schemes with the Transmission Owner.

Southwest Power Pool, Inc.

### *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 |
|---|---|---|---|---|
| **Transmission Owner's 138kV Dover Switch Interconnection Substation:** Construct one 138kV 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. | $400,000 | 100% | $400,000 | 27 Months |
| **Total** | **$400,000** | **100%** | **$400,000** | |

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

| Non-Shared Network Upgrades Description | Z2 Type[1] | Total Cost Estimate ($) | Allocated Percent (%) | Allocated Cost Estimate ($) | Estimated Lead Time |
|---|---|---|---|---|---|
| **Transmission Owner's 138kV Dover Switch Interconnection Substation:** Construct a new breaker and half configuration, eleven (11) 138kV 2000 continuous ampacity breakers, control panels, line relaying, re-terminate, transferring 138/69 kV autotransformer to the new station, acquire land, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials. | non-creditable | $6,100,000 | 100% | $6,100,000 | 27 Months |
| **Oklahoma Gas & Electric (OKGE):** Dover - Henessey 138kV CKT 1_Upgrade terminal equipment from 800A CT to 1200A CT. | creditable | $142,965 | 100% | $142,965 | 2 Months |

[1] Indicates the method used for calculating credit impacts under Attachment Z2 of the Tariff.

| Non-Shared Network Upgrades Description | Z2 Type[1] | Total Cost Estimate ($) | Allocated Percent (%) | Allocated Cost Estimate ($) | Estimated Lead Time |
|---|---|---|---|---|---|
| **OKGE's Network Upgrades:** Update relay settings | non-creditable | $10,000 | 100% | $10,000 | TBD |
| **Total** | | **$6,252,965** | | **$6,252,965** | |

### *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 Upgrades*

| Shared Network Upgrades Description | Z2 Type | 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.

### *PREVIOUS NETWORK UPGRADE(S)*

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

*Table 4: Interconnection Customer Previous Network Upgrade(s)*

| Previous 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 Previous 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 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 ($) | Allocated Share (%) | Allocated Cost Estimate ($) |
|---|---|---|---|
| AECI Affected System Upgrades* | $15,399,300 | 3.8% | $580,363 |
| **Total** | **$15,399,300** | | **$580,363** |

*Refer to AECI AFS of DISIS-2016-002 Report for specific upgrade details.

## *CONCLUSION*

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 288.00 MW can be granted. Full Interconnection Service will be delayed until the TOIF, Non-Shared Network Upgrades, Shared Network Upgrades, Previous Network Upgrades, Affected System Upgrades that are required are completed. The Interconnection Customer's estimated cost responsibility for TOIF, Non-Shared Network Upgrades and Affected System Upgrades are summarized in the table below.

*Table 6: Cost Summary*

| Description | Allocated Cost Estimate |
|---|---|
| Transmission Owner Interconnection Facilities | $400,000 |
| Network Upgrades | $6,252,965 |
| Affected System Upgrades | $580,363 |
| **Total** | **$7,233,328** |

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 NETOWORK UPGRADES REPORT(S)

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

wfec
western farmers
electric cooperative

# FACILITY STUDY

## for

# Generation Interconnection Request 2016-118

**288MW Wind Generation in Kingfisher County near Hennessey, OK.**

**April 2019**

## SUMMARY

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Western Farmers Electric Cooperative (WFEC) performed the following facility Study to satisfy the Facility Study agreement executed by the requesting customer for SPP Generation Interconnection request Gen-2016-118. The request for interconnection was placed with SPP in accordance with SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The requirements for interconnection consist of rebuilding WFEC Dover Switch Station from a ring bus to a breaker-and-half configuration to support an additional 138kV terminal. The total cost for WFEC to expand Dover Switch Station to accommodate the interconnection request is $6,500,000.

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# Introduction

The Southwest Power Pool has requested a facility Study for the purpose of interconnecting 288MW of wind generation within the service territory of WFEC in Kingfisher County, Oklahoma. The proposed 138kV interconnection is at Dover Switch Station, this station is owned by WFEC.

The cost for reconfiguring Dover Switch and adding a 138kV terminal to the switch station, the required interconnection facility, is estimated at $6,500,000.

SPP's DISIS-2016-002 identified network upgrades required on WFEC's system associated with GEN-2016-118. Cost for those upgrades are not included in this Facility Study as only stand-alone interconnection cost are considered, and the allocated cost of network upgrades to the customer may fluctuate depending on withdrawal of higher queued projects.

Network constraints within WFEC, OG&E, and AEP may be verified with a transmission service request and associated studies.

## Interconnection Facilities

The primary objective of this study is to identify interconnection facilities. The existing Dover Switch Station has reached the recommended limits for the number of terminals served from a ring bus configuration (6). Figure 1 below shows the current running arrangement of Dover Switch 138kV.

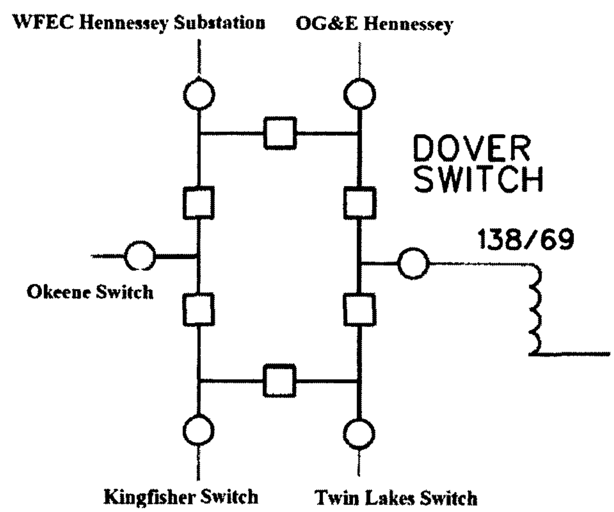


Figure 1: Existing WFEC Dover Switch Station

To accommodate a 7th 138kV terminal into Dover Switch for GEN 2016-118 WFEC will reconfigure the station from a Ring bus to a breaker-and-half arrangement, as shown below in Figure 2. The customer will construct a new 138kV transmission line from their wind farm collector sub to the WFEC Dover Switch Station. WFEC will require the customer to install OPGW for communications from Customer's wind farm collector sub to WFEC's switch station.

The total cost for WFEC to add a new 138kV terminal in the switch station for the interconnection is estimated at $6,500,000. This cost does not include the construction of the 138kV line from the customer substation into the new terminal at Dover Switch Station. The customer is responsible for this

138kV line up to the point of interconnection. This cost does not include the Customer's 138/34.5kV substation and this cost estimate should be determined by the Customer.

This facility study does not guarantee the availability of transmission service necessary to deliver additional generation to any specific point inside or outside of the SPP transmission system. The transmission network facilities may not be adequate to deliver any additional generation output to the system. If the customer requests firm transmission service under the SPP open access transmission tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP OATT.

The costs of interconnecting the facility to the WFEC transmission system are listed in Table 1 below.

**Short Circuit Fault Duty Evaluation:**

It is standard practice for WFEC to recommend replacing a circuit breaker when the current through the breaker for a potential fault exceeds 100% of its interrupting rating, as determined by the ANSI/IEEE standard C37-010-2016 breaker rating methods.

WFEC has evaluated the potential maximum fault current in this area and no issues with short circuit duty ratings are expected on existing WFEC breakers with the proposed interconnection of 288MW at Dover Switch 138kV.

## Interconnection Cost

Table 1: Required Interconnection Facilities

| Facilities | Estimated Cost (2019 Dollars) |
|---|---|
| **Transmission Owner Interconnection Facilities (TOIF)**<br>WFEC Dover Switch Interconnection Substation: Construct one (1) 138 kV line terminal connection terminal 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. | $400,000 |
| **Non-Shared Network Upgrades**<br>WFEC Dover Switch Interconnection Substation: Construct a new breaker and half configuration, eleven (11) 138 kV 2,000 continuous ampacity breakers, control panels, line relaying, re-terminate, transferring 138/69 kV autotransformer to the new station, acquire land, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials. | $6,100,000 |
| | $6,500,000 |

## One-Line diagram of Interconnection

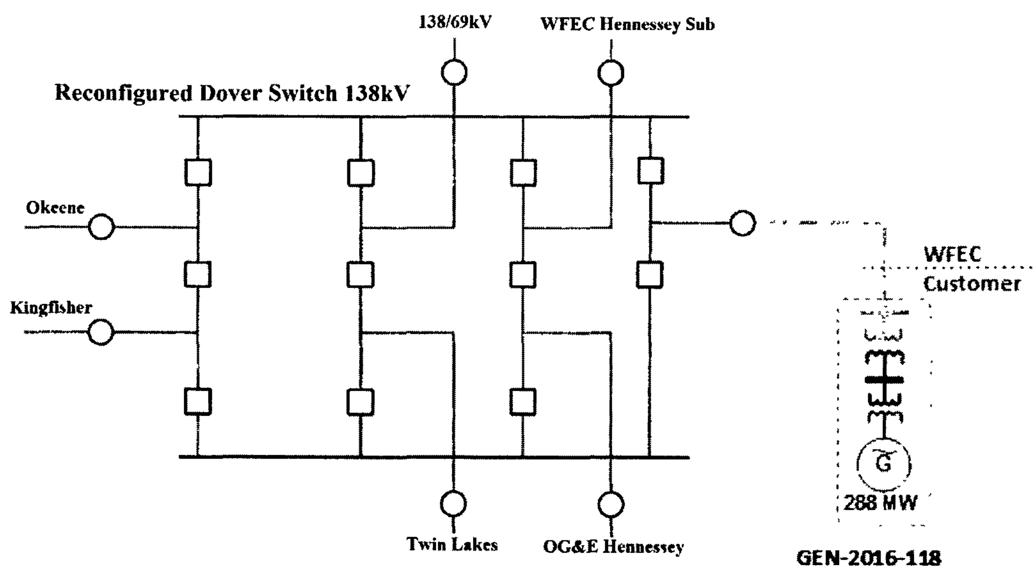


**Figure 2: Proposed WFEC Dover Switch Station 138kV**

OG&E

# FACILITY STUDY

# for

# Generation Interconnection Request 2016-118

288 MW Wind Generating Facility
In Kingfisher County
Oklahoma

April 11, 2018

Andrew R. Aston, P.E.
Lead Engineer
Transmission Planning
**OG&E Electric Services**

**Summary**

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Oklahoma Gas and Electric (OG&E) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer for SPP Generation Interconnection request Gen-2016-118. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system. The request is for adding a new 288 MW wind facility whose Point of Interconnection is at an adjacent substation to OG&E's Hennessey substation. No new or additional facilities are necessary to accommodate the additional generation. The new generating facility will require updated relay settings estimated at $10,000.

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## Introduction

The Southwest Power Pool has requested a Facility Study for the purpose of interconnecting 288 MW of new wind generation to an existing Point of Interconnection adjacent to the service territory of OG&E Electric Services (OKGE) in Kingfisher County Oklahoma. The proposed 138kV point of interconnection is at the existing Dover Switchyard Substation in Kingfisher County. This substation is owned by WFEC.

Network Constraints in the American Electric Power West (AEPW), OKGE and Western Farmers Electric Cooperative (WFEC) systems may be verified with a transmission service request and associated studies.

## Interconnection Facilities

The primary objective of this study is to identify attachment facilities. There are no requirements for additional interconnection facilities at OG&E's Hennessey substation.

This Facility Study does not guarantee the availability of transmission service necessary to deliver the additional generation to any specific point inside or outside the Southwest Power Pool (SPP) transmission system. The transmission network facilities may not be adequate to deliver the additional generation output to the transmission system. If the customer requests firm transmission service under the SPP Open Access Transmission Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP OATT.

The costs of interconnecting the facility to the OKGE transmission system are listed in Table 1.

Short Circuit Fault Duty Evaluation

It is standard practice for OG&E to recommend replacing a circuit breaker when the current through the breaker for a fault exceeds 100% of its interrupting rating with recloser de-rating applied, as determined by the ANSI/IEEE C37.5-1979, C37.010-1979 & C37.04-1979 breaker rating methods.

For this generator interconnection, no breakers were found to exceed their interrupting capability after the addition of the Customer's 288 MW generation and related facilities. OG&E found no breakers that exceeded their interrupting capabilities on their system. Therefore, there is no short circuit upgrade costs associated with the Gen-2016-118 interconnection.

**Table 1: Required Interconnection Network Upgrade Facilities**

| Facility | ESTIMATED COST (DOLLARS) |
|---|---|
| OKGE – **Interconnection Facilities**- No new interconnection facilities necessary | **$0** |
| OKGE – **Network Upgrades** Update relay settings | **$10,000** |
| OKGE - Right-of-Way for 345kV terminal addition | No Additional ROW |
| | |
| **Total** | **$10,000** |

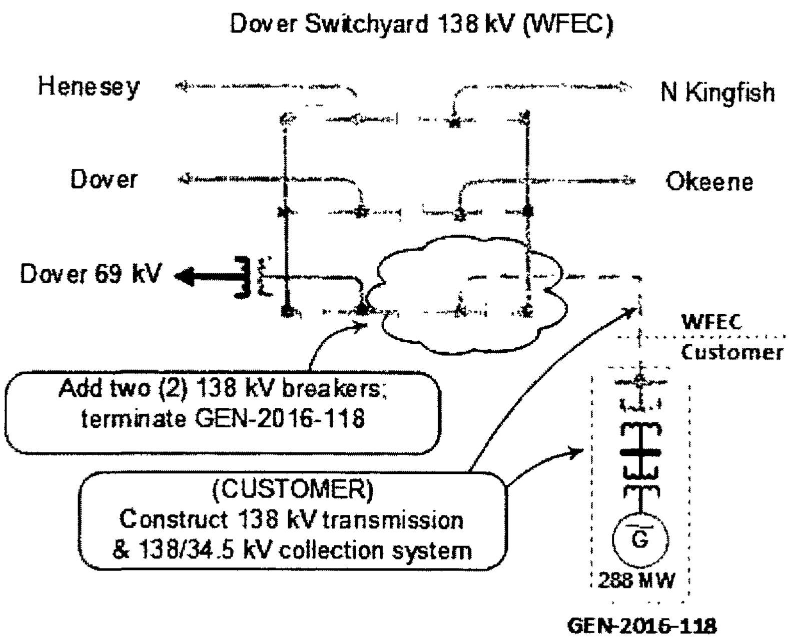
Prepared by Andrew R. Aston, P.E.
Lead Engineer, Transmission Planning
OG&E Electric Services

April 11, 2018

Reviewed by:

Steve M. Hardebeck, P.E.
Manager, Transmission Planning

# Dover Switchyard Substation (WFEC)



**SOAH DOCKET NO. 473-19-6862**
**PUC DOCKET NO. 49737**

**SOUTHWESTERN ELECTRIC POWER COMPANY'S RESPONSE TO EAST TEXAS ELECTRIC COOPERATIVE, INC. AND NORTHEAST TEXAS ELECTRIC COOPERATIVE, INC.'S FIRST REQUEST FOR INFORMATION**

**Question No. 1-12:**

Please provide a copy of all interconnection studies related to any of the Selected Wind Facilities, including without limitation any Definitive Interconnection System Impact Study/ies ("DISIS"). If any of these interconnection studies have not yet been conducted, please provide the study as soon as it becomes available.

**Response No. 1-12:**

Please see ETEC NTEC 1-12 Attachments 1 through 3. Attachments 1 and 3 are voluminous and are provided electronically via the PUC interchange.

| | |
|---|---|
| Prepared By: Joseph A. Karrasch | Title: Dir Renewable Energy Devlpmnt |
| Prepared By: Edward J. Locigno | Title: Regulatory Analysis & Case Mgr |
| Sponsored By: Jay F. Godfrey | Title: VP Energy Mktng & Renewables |

# Definitive Interconnection System Impact Study for Generation Interconnection Requests

# (DISIS-2015-002-3)

# Group 1 Restudy

**July 2017**

**Generator Interconnection**

SPP Southwest Power Pool

# Revision History

| Date | Author | Change Description |
|---|---|---|
| 2/5/2016 | SPP | Draft issued to Transmission Owners for review |
| [redacted] | [redacted] | [redacted] |
| 2/22/2016 | SPP | Draft issued to Transmission Owners for Group 2, 6, and 7 review |
| [redacted] | [redacted] | [redacted] |
| 3/17/2016 | SPP | Draft issued to Transmission Owners for Group 15, and 16 review |
| [redacted] | [redacted] | [redacted] |
| 4/28/2016 | SPP | Report Issued to include Group 16 stability analysis |
| [redacted] | [redacted] | [redacted] |
| 8/04/2016 | SPP | DISIS-2015-002-1 reposted for AECI Affected System Cost Allocation correction and update to Introduction Section Stand-Alone Language |
| [redacted] | [redacted] | [redacted] |
| 7/10/2017 | SPP | Restudy Power Flow Analysis for Group 1 only to account for withdrawn projects GEN-2011-051, GEN-2015-060, and GEN-2015-081. Report Reposted (DISIS-2015-002-3) |

# Executive Summary

Pursuant to the Generator Interconnection Procedures (GIP) of the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT), SPP has conducted this Definitive Interconnection System Impact Study (DISIS). The Interconnection Customers' requests have been clustered together for the following DISIS window which closed September 30, 2015. The Interconnection Customers will be referred to in this study as the DISIS-2015-002 Interconnection Customers. This DISIS analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling approximately 6,176.9 MW of new generation which would be located within the transmission systems of American Electric Power – Western (AEPW), Basin Electric Power Cooperative (BEPC), Nebraska Public Power District (NPPD), Oklahoma Gas and Electric (OKGE), Southwestern Public Service (SPS), Southwestern Power Administration (SWPA), Sunflower Electric Power Corporation\Mid-Kansas Electric Company, LLC (SUNC\MKEC), Western Area Power Administration (WAPA), Westar Energy, Inc. (WERE), and Western Farmers Electric Cooperative (WFEC). The various generation interconnection requests have differing proposed in-service dates[1]. The generation interconnection requests included in this DISIS are listed in Appendix A by their queue number, amount, requested interconnection service, area, requested interconnection point, proposed interconnection point, and the requested in-service date. This study represents the "Stand-Alone" analysis for remaining Interconnection Requests in the DISIS-2015-002 analysis.

Power flow analysis has indicated that for the power flow cases studied, 6,176.9 MW of nameplate generation may be interconnected with transmission system reinforcements within the SPP transmission system. For the analyses that has been completed, dynamic stability and power factor analysis has determined the need for reactive compensation in accordance with SPP stability and voltage recovery requirements including FERC Order #661-A for wind farm interconnection requests. Those reactive requirements are listed for each interconnection request within this report. Dynamic stability analysis has determined that the transmission system will remain stable with the assigned Network Upgrades and necessary reactive compensation requirements. A short circuit analysis has been performed with available short circuit values given in the stability study for each group in the appendices of this report. A short circuit analysis has been performed with available short circuit values given in the stability study for each group in the appendices of this report.

In no way does this study guarantee operation for all periods of time. This interconnection study identifies and assigns transmission reinforcements for Energy Resource Interconnection Service (ERIS) interconnection injection constraints (defined as a 20% or greater distribution factor impact

[1] The generation interconnection requests in-service dates may need to be deferred based on the required lead time for the Network Upgrades necessary. The Interconnection Customers that proceed to the Interconnection Facilities Study will be provided a new in-service date based on the Facility Study's time for completion of the Network Upgrades necessary or as otherwise provided for in the GIP.

for outage based constraints and 3% or greater distribution factor impact for system intact constraints) and Network Resource Interconnection Service (NRIS) constraints (defined as 3% or greater distribution factor impact), if requested by the Customer. These constraints are listed in Appendix G-T (Thermal) and Appendix G-V (Voltage). This interconnection study does not assign transmission reinforcements for all potential transmission constraints. It should be noted that although this study analyzed many of the most probable contingencies, it is not an all-inclusive list and cannot account for every operational situation. Because of this, it is likely that the Interconnection Customer(s) may be required to reduce their generation output to 0 MW, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

The total minimum cost for interconnecting the DISIS-2015-002 Interconnection Customers is estimated at $5,174,890 for Group 1 Interconnection Customers only and $701,503,724 for all DISIS-2015-002 Interconnection Customers. The following costs are not included in this total –

- **Costs Not Included** – Costs on Affected Systems for particularly Associated Electric Cooperative Inc. (AECI), Mid-Continent Independent System Operator (MISO), and Minnkota Power Cooperative, Inc (MPC).

These costs determined at this time are shown in Appendix E and F. For Interconnection Requests that result in an interconnection to, or modification to, the transmission facilities of the Western-UGP (WAPA), a National Environmental Policy Act (NEPA) Environmental Review will be required. The Interconnection Customer will be required to execute and Environmental Review Agreement per Section 8.6.1 of the GIP.

Interconnection Service to DISIS-2015-002 Interconnection Customers is also contingent upon higher queued customers paying for certain required network upgrades. **The in-service date for the DISIS customers will be deferred until the construction of these network upgrades can be completed.** These costs also do not include the Interconnection Customer Interconnection Facilities as defined by the SPP Open Access Transmission Tariff (OATT) or the additional SPP transmission network constraints identified through this study and shown in Appendix H.

Constraints listed in Appendix H do not require transmission reinforcement for Interconnection Service, but could require Interconnection Customer to reduce generation in operational conditions. These transmission constraints occur when this study's generation is dispatched into the SPP footprint for ERIS or when this study's generation is dispatched into the interconnecting Transmission Owner's (T.O.) area for NRIS.

It should be noted that the additional network constraints identified in Appendix H may also be identified by a Transmission Service Request (TSR) and may need to be verified by associated studies. With a defined source and sink in a TSR, the list of network constraints will be refined and expanded to account for all Network Upgrade requirements. The required interconnection costs listed in Appendix E and F do not include costs associated with the deliverability of the energy to load or other customers. These costs are determined by separate studies should the Customer decide to submit a Transmission Service Request through SPP's Open Access Same Time

Information System (OASIS) as required by Attachment Z1 of the SPP OATT. Furthermore, this DISIS neither guarantees transmission service or deliverability of the requested resource.

When applicable, affected system thermal and voltage constraints are listed in Appendix H-T-AS and Appendix H-V-AS. Affected System constraints could require an affects system impact study review by the affected party or affected system parties. The affected system impact study could result in identifying additional affected transmission system reinforcement network upgrades required for interconnection.

**NERC FAC-002-2 Compliance Statement**

SPP, as Planning Coordinator has studied the reliability impact of interconnecting new or materially modified generation requesting interconnection to the Transmission System of SPP and any affected systems as requested by those entities. Affected systems include both the systems of SPP Transmission Owners and systems not included in the SPP Tariff footprint. The impact of the generation interconnection on affected systems will be further coordinated with the following systems as part of the coordinated planning procedures as described in Section 6 of this report and summarized below.

- Impacts on Associated Electric Cooperative Inc. (AECI) – AECI has completed their review and analysis for requests impacting the AECI system
- Impacts on Mid Continent Independent System Operation (MISO) – MISO has been contacted and provided a list of interconnection requests that proceed to move forward into the Interconnection Facilities Study Queue. MISO is evaluating the Interconnection Requests for impacts.
- Impacts on Minnkota Power Cooperative, Inc (MPC) – MPC has completed their review and did not identify an impact to the MPC

This analysis adheres to NERC standards, regional, and Transmission Owner planning criteria, as related to generator interconnections. Facility interconnection requirements will be fully evaluated by the Transmission Owners during the Interconnection Facilities Study.

This analysis evaluates steady-state (Section 8), short-circuit (Section 9), and dynamic studies (Section 9) to evaluate system performance under both normal and contingency conditions. Study assumptions (Section 2) and system performance (Section 3) are documented in this report. Alternatives considered and coordinated recommendations are documented in Section 8 and Section 9.

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