



# **INTERCONNECTION FACILITIES STUDY REPORT**

GEN-2015-071  
(IFS-2015-002-26)

Published May 2019

By SPP Generator Interconnections Dept.

## REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
5/2/2017	SPP	Initial draft report issued.
5/29/2018	SPP	Revised draft report issued due to DISIS-2015-002-5 results.
6/29/2018	SPP	Final report issued.
5/10/2019	SPP	Final report revision 2 issued. Shared Network Upgrades Table 3 updated per DISIS-2015-002-7. Transmission Owner's Interconnection Facilities and Non-Shared NUs costs are updated.

# CONTENTS

---

Revision History.....	i
Summary.....	1
Introduction .....	1
Phase(s) of Interconnection Service .....	1
Credits/Compensation for Amounts Advanced for Network Upgrade(s).....	1
Interconnection Customer Interconnection Facilities .....	2
Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s).....	3
Shared Network Upgrade(s) .....	5
Previous Network Upgrade(s).....	6
Conclusion.....	6
Appendices.....	7
A: Transmission Owner’s Interconnection Facilities Study Report.....	8

# SUMMARY

---

## *INTRODUCTION*

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2015-071/IFS-2015-002-26 is for a 200.00 MW generating facility located in Beckham and Roger Mills Counties, Oklahoma. The Interconnection Request was studied in the DISIS-2015-002 Impact Study and Restudies for Energy Resource Interconnection Service (ERIS) only. The Interconnection Customer's requested in-service date is September 30, 2017.

The interconnecting Transmission Owner, American Electric Power – Public Service Company of Oklahoma (AEP-PSCO), 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, Non-Shared Network Upgrade(s), Shared Network Upgrade(s), and Previous Network Upgrade(s) 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 capacity-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 (100) 2.0 MW Vestas V110 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:

- 34.5 kV underground cable collection circuits;
- 34.5 kV to 345 kV transformation substation with associated 34.5 kV and 345 kV switchgear;
- Two (2) 345/34.5kV 66/88/110 MVA (ONAN/ONAF/ONAF) step-up transformers to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation.
- A four (4) mile overhead 345 kV line to connect the Interconnection Customer's substation to the Point of Interconnection (POI) at the 345 kV bus at planned AEP-PSCO substation ("Chisholm") that is to be owned and maintained by AEP-PSCO;
- 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 11.7 Mvars<sup>1</sup> 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.

---

<sup>1</sup> This approximate minimum reactor amount is needed for the current configuration of GEN-2015-071 as studied in the DISIS-2015-002 Impact Study and restudies.

**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)*

<b>Transmission Owner Interconnection Facilities (TOIF)</b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated %</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Estimated Lead Time</b>
<p><b><u>AEP-PSCO Chisholm Interconnection Substation:</u></b></p> <ul style="list-style-type: none"> <li>Construct one (1) 345kV line terminal, line switches, station dead end structure, line relaying, communications, revenue metering, line arrestor, control module, and all associated equipment and one span outside the Chisholm station fence to connect to Interconnection Customer’s dead-end structure in the transmission line from Interconnection Customer’s Generating Facility. Transmission Owner will own the hardware required to suspend the span.</li> <li>Install entrance duct at the Chisholm switching station to accommodate OPGW from the Generating Facility substation, allow adequate space in the Chisholm switching station control building to accommodate Interconnection Customer’s fiber and splice termination equipment, and associated equipment; and</li> <li>Identify accumulated and real-time Generating Facility and ICIF data to receive from Interconnection Customer by way of ICCP.</li> </ul>	\$1,400,000	100%	\$1,400,000	24 months
<b>Total</b>	<b>\$1,400,000</b>	<b>100%</b>	<b>\$1,400,000</b>	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	Z2 Type <sup>2</sup>	Total Cost Estimate (\$)	Allocated %	Allocated Cost Estimate (\$)	Estimated Lead Time
<p><b><u>AEP-PSCO Chisholm Interconnection Substation:</u></b> Construct ring bus configuration, three (3) 345 kV 3000 continuous ampacity breakers, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.</p>	non-creditable	\$5,500,000	100%	\$5,500,000	24 months
<b>Total</b>		<b>\$5,500,000</b>	<b>100%</b>	<b>\$5,500,000</b>	

<sup>2</sup> 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*

<b>Shared Network Upgrades Description</b>	<b>Z2 Type<sup>3</sup></b>	<b>Total Cost Estimate (\$)</b>	<b>Allocated %</b>	<b>Allocated Cost Estimate (\$)</b>	<b>Estimated Lead Time</b>
<b><u>Grapevine - Wheeler 230kV CKT 1 (SPS):</u></b> Terminal equipment upgrade, replace wavetraps at Grapevine to achieve 324 MVA (814 amps) minimum Summer emergency rating.	creditable	\$202,208	87.48%	\$176,891	12 Months
<b><u>Wheeler - Sweetwater 230kV CKT 1 (AEP):</u></b> Rebuild approximately five (5) miles of 230 kV to achieve 458 MVA (1150 amps) minimum Summer emergency rating.	creditable	\$6,780,921	87.48%	\$5,931,950	24 Months
<b>Total</b>		<b>\$6,983,129</b>		<b>\$6,108,841</b>	

All studies have been conducted assuming that higher-queued Interconnection Request(s) and the associated Network Upgrade(s) will be placed into service. If higher-queued Interconnection Request(s) withdraw from the queue, suspend or terminate service, the Interconnection Customer’s share of costs may be revised. Restudies, conducted at the customer’s expense, will determine the Interconnection Customer’s revised allocation of Shared Network Upgrades.

<sup>3</sup> Indicates the method used for calculating credit impacts under Attachment Z2 of the Tariff.



**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)*

<b>Previous Network Upgrade(s) Description</b>	<b>Current Cost Assignment</b>	<b>Estimated In-Service Date</b>
<b>None</b>	\$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.

**CONCLUSION**

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

*Table 5: Cost Summary*

<b>Description</b>	<b>Allocated Cost Estimate</b>
Transmission Owner Interconnection Facilities	\$1,400,000
Network Upgrades	\$11,608,841
<b>Total</b>	<b>\$13,008,841</b>

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.

**1. Introduction**

Interconnection Customer has requested an Interconnection Facilities Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting a 200.00 MW wind generation facility in Beckham and Roger Mills Counties, Oklahoma to the transmission system of American Electric Power – Public Service Company of Oklahoma (AEP-PSCO). The generator facility, GEN-2015-071, is comprised of one hundred (100) 2.0 MW Vestas V110 wind generators for a total generating nameplate capacity of 200.00 MW.

**2. Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades**

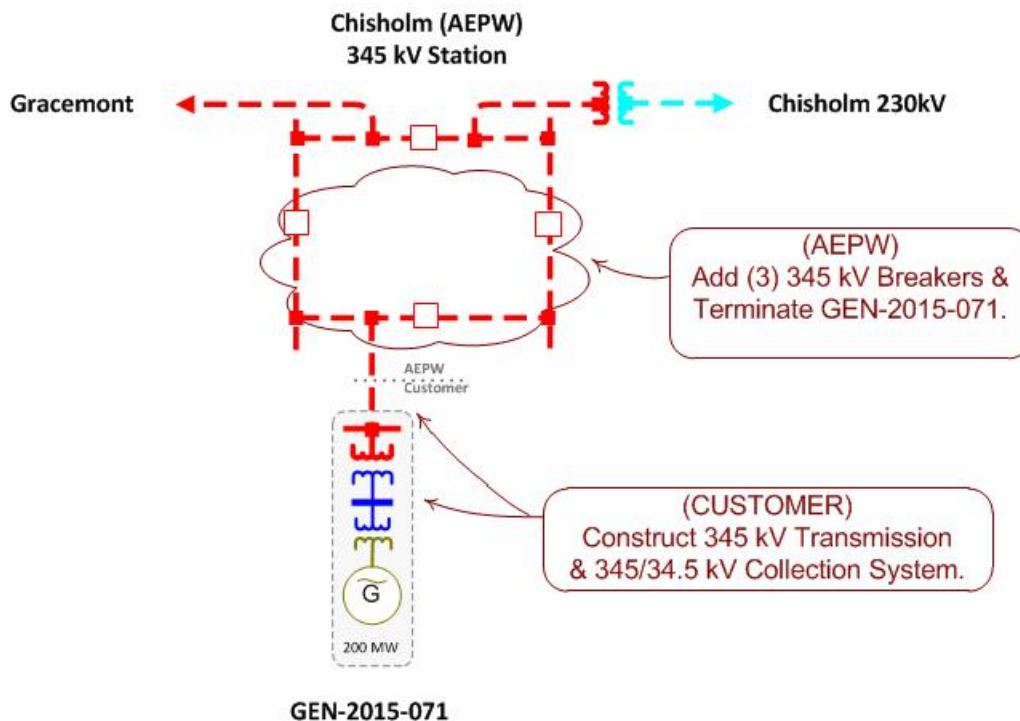
The cost for the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades is listed below in **Table 1**. GEN-2015-071/IFS-2015-002-26 is planned to interconnect at the AEP-PSCO owned 345 kV bus located at planned Chisholm Substation. The estimated lead time for Transmission Owner Interconnection Facilities and Network Upgrades is twenty-four (24) months after a fully executed Generator Interconnection Agreement (GIA). The one-line diagram is shown in **Figure 1**.

**Table 1: Required Transmission Owner Interconnection Facilities and Non Shared Network Upgrades**

Description	Total Project Cost	Allocated Cost
<p><b><u>AEP-PSCO Chisholm Interconnection Substation:</u></b>  <b><u>Transmission Owner Interconnection Facilities</u></b></p> <ul style="list-style-type: none"> <li>• Construct one (1) 345kV line terminal, line switches, station dead end structure, line relaying, communications, revenue metering, line arrester, control module, and all associated equipment and one span outside the Chisholm station fence to connect to Interconnection Customer’s dead-end structure in the transmission line from Interconnection Customer’s Generating Facility. Transmission Owner will own the hardware required to suspend the span.</li> <li>• Install entrance duct at the Chisholm switching station to accommodate OPGW from the Generating Facility substation, allow adequate space in the Chisholm switching station control building to accommodate Interconnection Customer’s fiber and splice termination equipment, and associated equipment; and</li> <li>• Identify accumulated and real-time Generating Facility and ICIF data to receive from Interconnection Customer by way of ICCP.</li> </ul>	<p>\$1,400,000</p>	<p>\$1,400,000</p>

<p><b><u>AEP-PSCO Chisholm Interconnection Substation:</u></b>  <b><u>Non-Shared Network Upgrades</u></b></p> <ul style="list-style-type: none"> <li>• Construct ring bus configuration, three (3) 345 kV 3000 continuous ampacity breakers, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.</li> </ul>	<p>\$5,500,000</p>	<p>\$5,500,000</p>
<p><b>Total:</b></p>	<p>\$5,500,000</p>	<p>\$5,500,000</p>

**Figure 1: Interconnection Configuration for GEN-2015-071**



**2.1. Interconnection Customer Facilities** – The Interconnection Customer will be responsible for its Generating Facility and its one (1) 345/34.5 kV transformer that connect to the wind generators to the Point of Interconnection. In addition, the Interconnection Customer will be required to install the following equipment in its facilities.

**2.1.1. Reactive Power Equipment** – The Customer will be responsible for reactive power compensation equipment to maintain 95% lagging (providing vars) and 95% leading (absorbing vars) power factor at the POI, which may be provided in part by the reactive power capability of the generators. Any capacitor banks installed by the Interconnection Customer shall not cause voltage distortion in accordance with Article 9.7.4 of the standard SPP Generator Interconnection Agreement.

**3. Conclusion**

The Interconnection Customer’s Interconnection Facilities and Shared Network Upgrades are estimated at \$6,900,000.