



# **INTERCONNECTION FACILITIES STUDY REPORT**

GEN-2015-084  
(IFS-2015-002-22)

Published July 2018

By SPP Generator Interconnections Dept.

## REVISION HISTORY

---

| DATE OR VERSION NUMBER | AUTHOR | CHANGE DESCRIPTION  |
|------------------------|--------|---|
| 5/4/2017               | SPP    | Initial draft report issued.  |
| 6/4/2018               | SPP    | Revised draft report issued due to DISIS-2015-002-5 results.  |
| 7/30/2018              | SPP    | Final report issued. Updated costs in Tables 1 & 2. Removed Previous Network Upgrade in Table 4 that was completed. |

# 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.....  | 7 |
| Appendices.....  | 8 |
| A: Transmission Owner’s Interconnection Facilities Study Report.....                 | 9 |

# SUMMARY

---

## *INTRODUCTION*

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2015-084/IFS-2015-002-22 is for a 51.30 MW generating facility located in Harmon 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 10, 2018.

The interconnecting Transmission Owner, American Electric Power – Public Service Company of Oklahoma (AEP-PSCO), performed a detailed IFS at the request of SPP. Western Farmers Electric Cooperative Inc. (WFEC), performed a detailed IFS at the request of SPP for Shared Network Upgrade(s). 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 twenty-seven (27) 1.9 MW General Electric (G.E.) solar inverters for a total generating nameplate capacity of 51.30 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 138 kV transformation substation with associated 34.5 kV and 138 kV switchgear;
- One (1) 138/34.5kV 37.5/50/62.5 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation.
- A four (4) mile overhead 138 kV line to connect the Interconnection Customer's substation to the Point of Interconnection (POI) at the 138 kV bus at the AEP-PSCO substation ("Hollis") that is 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 0.5 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-2015-084 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** 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> |
|--|---------------------------------|--------------------|-------------------------------------|----------------------------|
| <b><u>AEP-PSCO Hollis Interconnection Substation:</u></b><br>Construct one (1) 138 kV line terminal, line switches, dead end structure, line relaying, communications, revenue metering, line arrestor, control module, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer’s Generating Facility. | \$750,000                       | 100%               | \$750,000                           | 24 Months                  |
| <b>Total</b>   | <b>\$750,000</b>                | <b>100%</b>        | <b>\$750,000</b>                    | <b>24 Months</b>           |

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

| <b>Non-Shared Network Upgrades Description</b>   | <b>Z2 Type<sup>2</sup></b> | <b>Total Cost Estimate (\$)</b> | <b>Allocated %</b> | <b>Allocated Cost Estimate (\$)</b> | <b>Estimated Lead Time</b> |
|--|----------------------------|---------------------------------|--------------------|-------------------------------------|----------------------------|
| <b><u>AEP-PSCO Hollis Interconnection Substation:</u></b> Construct new ring bus configuration, three (3) 138 kV 2000 continuous ampacity breakers, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.          | Non-Capacity               | \$7,250,528                     | 100%               | \$7,250,528                         | 24 Months                  |
| <b><u>AEP-PSCO Hollis Tap Substation:</u></b> Construct three(3) line terminals, ring bus configuration, three (3) 138 kV 2000 continuous ampacity breakers, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials. | Non-Capacity               | \$7,250,528                     | 100%               | \$7,250,528                         | 24 Months                  |

<sup>2</sup> Indicates the method used for calculating credit impacts under Attachment Z2 of the Tariff.

| Non-Shared Network Upgrades<br>Description | Z2<br>Type <sup>2</sup> | Total Cost<br>Estimate (\$) | Allocated<br>% | Allocated<br>Cost Estimate<br>(\$) | Estimated<br>Lead Time |
|--|-------------------------|-----------------------------|----------------|------------------------------------|------------------------|
| <b>Total</b>                               |                         | <b>\$14,501,056</b>         | <b>100%</b>    | <b>\$14,501,056</b>                | <b>24 Months</b>       |

**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>WFEC Cornville Tap – Naples Tap 138kV Circuit #1:</u></b> Rebuild approximately (11) miles of 138 kV circuit with 795 ACSR conductor to at least 200MVA from Cornville Tap – Naples Tap, structures, foundations, conductors, insulators, a and upgrade associated substation equipment including work and materials. | Capacity                   | \$5,775,000                     | 24.22              | \$1,398,566                         | 24 Months                  |
| <b><u>WFEC Naples Tap – Payne 138kV Circuit #1:</u></b> Rebuild approximately eight (8) miles of 138kV with 795 ACSR conductor to at least 200MVA from Naples Tap - Payne Station , structures, foundations, conductors, insulators, a and upgrade associated substation equipment including work and materials.            | Capacity                   | \$4,200,000                     | 24.22              | \$1,017,139                         | 16 Months                  |
| <b>Total</b>  |                            | <b>\$9,975,000</b>              | <b>24.22</b>       | <b>\$2,415,705</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>Estimate In-Service Date</b> |
|--|--------------------------------|---------------------------------|
| <u>None</u>                                    | \$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 51.30 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 | \$750,000                      |
| Network Upgrades                              | \$16,916,761                   |
| <b>Total</b>                                  | <b>\$17,666,761</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**

<OMITTED TEXT> (Interconnection Customer) has requested an Interconnection Facilities Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting a 51.30 MW solar generation facility in Harmon County, Oklahoma to the transmission system of American Electric Power – Public Service Company of Oklahoma (AEP-PSCO). The generator facility, GEN-2015-084, is comprised of twenty-seven (27) 1.9 MW General Electric (G.E.) solar inverters for a total generating nameplate capacity of 51.30 MW.

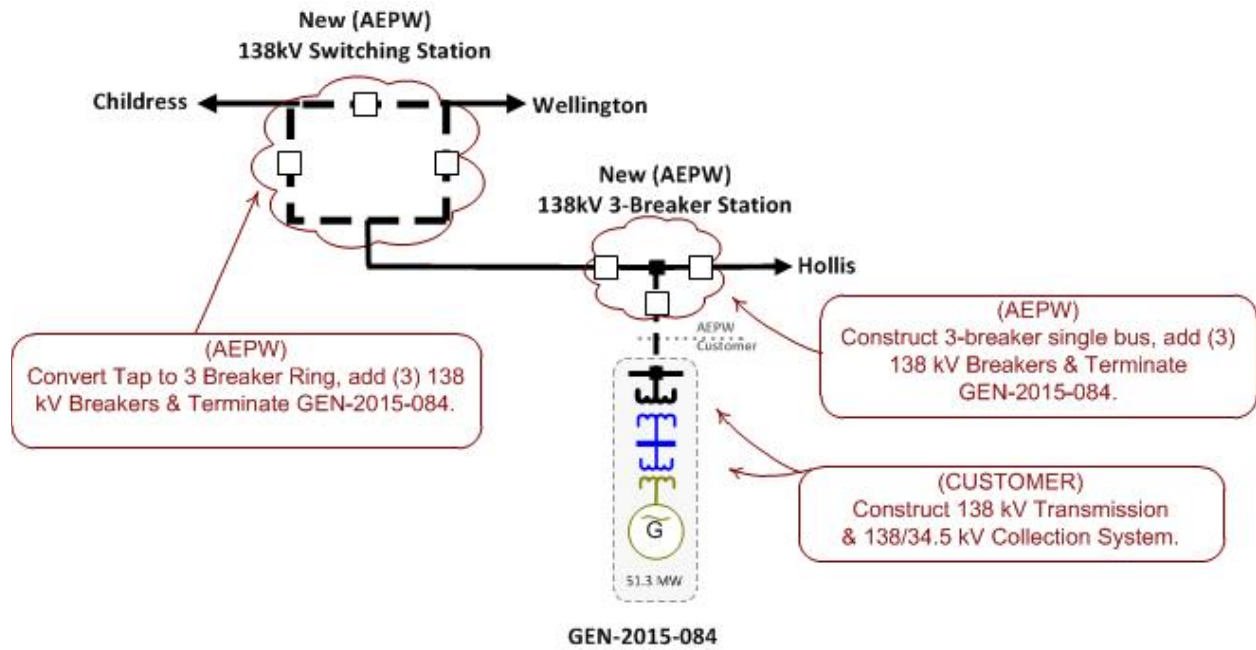
**2. Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades**

The cost for the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades is listed below in **Table 1**. GEN-2015-084/IFS-2015-002-22 is planned to interconnect at the AEP-PSCO owned 138 kV bus located at existing Hollis 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 Hollis Interconnection Substation:</u></b><br/>Transmission Owner Interconnection Facilities<br/>Construct one (1) 138 kV line terminal, line switches, dead end structure, line relaying, communications, revenue metering, line arrester, control module, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer’s Generating Facility.</p> | \$750,000          | \$750,000      |
| <p><b><u>AEP-PSCO Hollis Interconnection Substation - Non-Shared Network Upgrades:</u></b> Construct new ring bus configuration, three (3) 138 kV 2000 continuous ampacity breakers, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.</p>   | \$7,250,528        | \$7,250,528    |
| <p><b><u>AEP-PSCO Hollis Tap Substation - Non-Shared Network Upgrades:</u></b> Construct three(3) line terminals, ring bus configuration, three (3) 138 kV 2000 continuous ampacity breakers, control panels, line relaying, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.</p>  | \$7,250,528        | \$7,250,528    |
| <b>Total:</b>  | \$15,251,056       | \$15,251,056   |

**Figure 1: Interconnection Configuration for GEN-2015-084**



**\*Remote end work is required at Sharmack and Childress substations for the addition of GEN-2015-084**

**2.1. Interconnection Customer Facilities** – The Interconnection Customer will be responsible for its Generating Facility and its one (1) 138/34.5 kV transformers that connect to the solar inverters 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 \$15,251,056.