

# Interconnection Facilities Study Report

## Generation Interconnection Requests GI-1401

### 1.0 Background:

The Upper Great Plains Region (UGPR) of the Western Area Power Administration (Western) received Large Generator Interconnection Request GI-1401 (Request) from the Interconnection Customer requesting to interconnect a total of 103 MW of wind generation (Project). The requested Point of Interconnection will result in a new switchyard (Sulphur) on Western's existing Maurine-Newell 115-kV Transmission Line in Butte County, South Dakota.

The wind farm collector station is located approximately 100 feet northwest of Western's Maurine-Newell 115-kV Transmission Line. The collector substation will consist of two (2) 115/34.5-kV transformers and multiple 34.5-kV deliveries to interconnect the individual wind turbines. The Interconnection Customer will construct, own, and maintain approximately 100 feet of 115-kV transmission line between the collector substation and Western's new Sulphur 115-kV Switchyard. The 115-kV Point of Interconnection will be at the 115-kV ring bus at Western's new Sulphur 115-kV Switchyard, which will consist of a three (3) breaker ring bus configuration between structures 34/1 and 34/2 of the Maurine-Newell 115-kV line. The Point of Change of Ownership for the Interconnection Customer's radial 115-kV transmission line at Western's Sulphur 115-kV Switchyard will be the points at which the Interconnection Customer's conductors, jumpers, and insulators connect to Western's 115-kV take-off structure and the rigid bus underhung from the 115-kV take-off structure, as illustrated in Attachment C. The Point of Interconnection and Point of Change of Ownership are shown in Attachment B. The Transmission Owner's Interconnection Facilities, as defined in the SPP Open Access Transmission Tariff (SPP Tariff), are also illustrated in Attachment B.

The details of the Generator Interconnection Requests are as follows:

Generator Interconnection Requests:	GI-1401
Location of Generator:	Butte County, SD
Requested in-service Date:	December 2017
Generation size:	103 MW total
New Load:	None

Western UGPR provides administration of the Integrated System (IS) utilizing Western's Open Access Transmission Tariff (Western's Tariff) on behalf of the IS partners, Basin Electric Power Cooperative and Heartland Consumers Power District. Effective October 1, 2015, Western UGPR (also referred to as Western-UGP) joined the Southwest Power Pool (SPP) as a Transmission Owner and transferred functional control of its eligible transmission facilities to SPP. The majority of Western UGPR's facilities are now subject to the SPP Tariff, including SPP's Generator Interconnection Procedures (GIP). Western's Maurine-Newell-Elk Creek-Rapid City 115-kV lines and terminal equipment at its Newell, Elk Creek, and Rapid City Substations associated with these lines have been transferred to the functional control of SPP.

This Facilities Study Report (Report) fulfills the requirements in Western's Tariff and the Large Generator Interconnection Procedures (LGIP) Section 8, Interconnection Facilities Study and the Facilities Study Agreement, Contract No. 15-UGPR-87, which was executed between Western and the Interconnection Customer prior to October 1, 2015. Pursuant to the *Transition of Integrated System (IS) Interconnection Request to SPP Tariff* posting on SPP's OASIS, issuance of this final Report shall cause the Request to be fully transitioned to the SPP GIP. Pursuant to its requirements under the SPP Tariff, SPP will initially tender a Generator Interconnection Agreement (GIA) or Interim Generator Interconnection Agreement (Interim GIA) in accordance with Sections 11 and 11A of the SPP GIP.

This Report does not address transmission service or any delivery component of transmission service; only the interconnection service component of the Generating Facility.

## **2.0 Status of Existing Studies applicable to Request:**

An Interconnection System Impact Study (ISIS) was performed under Contract No. 14-UGPR-01 and prepared by ABB Consulting in coordination with Western. The ISIS performed was an "interconnection only" study for the generator interconnection. The following is a summary of the study results:

The initial Request was for a 325 MW wind farm but was reduced by the Interconnection Customer to 103 MW. At the reduced level of 103 MW, the interconnection steady-state analysis study identified impacts on several local area transmission facilities. Injection constraints were observed for both near-term and out-year cases. Interconnection of 103 MW can be achieved by upgrading the rating of the Maurine-Newell-Elk Creek-Rapid City 115-kV lines to 134 MVA (normal and emergency), which requires structure replacements and also terminal equipment upgrades at the Newell, Elk Creek, and Rapid City Substations.

A short-circuit analysis of the project area was performed and the initial analysis of the fault currents to the minimum breaker capability of the existing breakers at the local substations indicates that there is adequate interrupting capability following the addition of the 103 MW wind farm.

A stability analysis was completed and the analysis indicated that the proposed 103 MW wind farm does not adversely impact local or regional transmission system performance.

Environmental Review studies have commenced under Contract No. 14-UGPR-108 between Western and the Interconnection Customer.

## **3.0 Study Requirements:**

Western has performed this Interconnection Facilities Study to determine a good faith estimate of (i) the costs of Direct Assignment Facilities to be charged to the Interconnection Customer, (ii), the Interconnection Customer's appropriate share of the cost of any required upgrades, and (iii) the time required to complete such construction to accommodate the interconnection.

This Interconnection Facilities Study includes an evaluation of the following:

- 3.1 Review of applicable contractual agreements.
- 3.2 Prepare/develop a substation layout, perform a preliminary bus design, and determine all electrical equipment requirements to accommodate the Request. Develop/compile cost estimates for all Western labor, overheads, equipment additions, modifications, etc. to accommodate the generator interconnection.
- 3.3 Review and document any other interconnection/control area requirements. Document these additional requirements (such as indication/metering, monitoring, control, relaying) and include these in the cost estimate.
- 3.4 Determination of need to develop an Operating Guide for Western's Dispatch to document the conditions under which the new Generating Facility must be operated to protect against unacceptable pre- or post-contingent transient voltage and loading conditions.
- 3.5 Develop an overall time schedule for completion of the necessary addition/modifications.

#### **4.0 Study Results:**

The following results document the analysis of the addition of the Generating Facility to Western UGPR's transmission system and fulfill the tasks outlined in Section 3.0 above:

##### **4.1 Required Facility Additions by Western Area Power Administration**

Western has determined that following additions and improvements are required to maintain a safe and reliable interconnection to Western UGPR's transmission system:

- Addition of a new Sulphur 115-kV Switchyard on the Maurine-Newell 115-kV Transmission Line,
- Replacement of thirty-five 115-kV structures on the Maurine-Newell-Elk Creek-Rapid City 115-kV Transmission Lines,
- Replacement of the strain bus, circuit switchers, and jumpers to the circuit switchers at the Newell Substation,
- Replacement of the strain bus and all jumpers as well as relay setting work at the Elk Creek Substation, and
- Replacement of the main and transfer bus, transfer bay, and Dry Creek transmission line bay, at the Rapid City Substation.

With the addition and replacements listed above the wind farm would be able to inject 103 MW under the requested Energy Resource Interconnection Service. Refer to Attachment B – GI-1401 Switching Diagram SUL T0001, which shows the proposed new Sulphur 115-kV Switchyard.

Construction of the Sulphur 115-kV Switchyard will require three (3) 115-kV power circuit breakers, four (4) 115-kV disconnect switches, three (3) 115-kV disconnect switches with ground blades, instrument transformers, associated control and protection equipment, a revenue meter, control building, high voltage bus, transmission line take-off-structures, and conductor.

Western's estimated cost for labor, overhead, equipment additions, modifications, replacements, and other miscellaneous costs are outlined in Attachment A. The total cost is estimated at \$15,855,732. This total cost estimate includes \$7,325,856 for the new Sulphur 115-kV Switchyard and \$8,529,876 for the other improvements/replacements identified.

##### **4.2 Contractual Agreements:**

Pursuant to the SPP Tariff, SPP and Western will need to execute a GIA (or initially an Interim GIA, if applicable, with a subsequent execution of a GIA) with the Interconnection Customer for the interconnection of the Generating Facility. The GIA and Interim GIA for use when Western-UGP is a Party to the GIA/Interim GIA, as the Transmission Owner, as in this case, are located in Appendix 13 and 14 respectively of Attachment V of the SPP Tariff. The GIA will address specific funding requirements and provide a payment schedule for facility additions and upgrades to avoid deficit spending by Western. The GIA, which discusses the construction and interconnection aspects of this project, will need to be developed and offered by SPP, pursuant to their obligations and procedures under the SPP Tariff, and forwarded to the Interconnection Customer for review and signature. A schedule for payment based on design, procurement, and construction activities will be included in the GIA consistent with the SPP Tariff provisions.

The Interconnection Customer shall be entitled to compensation for the cost of Network Upgrades eligible for transmission credits in accordance with the SPP Tariff including Attachment Z2. The Network Upgrades at the proposed Sulphur 115-kV Switchyard are described herein. The terminal equipment upgrades at Western's Newell, Elk Creek, and Rapid City Substations are also Network Upgrades. Upon completion of the installation and/or upgrades to the Network Upgrades, Western shall own such Network Upgrades and

other facility additions (e.g. the Transmission Owner's Interconnection Facilities) to its transmission system.

Equipment installed by Western for the sole purpose of this interconnection, such as the Transmission Owner's Interconnection Facilities, which includes equipment between of the Point of Interconnection and Point of Change of Ownership, metering, interrogation, and communication equipment, are direct assignment facilities and not subject to inclusion as Network Upgrades, thus not entitled to transmission service credits, pursuant to the provisions of the SPP Tariff. The direct assignment costs for such equipment are estimated at \$216,180 based upon Western's understanding of the SPP Tariff provisions and are included in the total cost estimate provided in Attachment A.

#### 4.3 Other Interconnection, Metering Requirements:

Basic indication, metering, monitoring, control, and relaying requirements due to a generator interconnection are included in the cost estimate. Western's generation metering requirements, as an SPP Transmission Owner, must be met in accordance with the *Western Area Power Administration Meter Policy* posted at:

<http://www.oasis.oati.com/woa/docs/WAPA/WAPAdocs/Western-OATT-BP-Meter-Policy-Version-2013-1122.pdf>. A list of specific needs will be provided by Western UGPR Operations and Western South Dakota Maintenance Offices once design has progressed.

Western's *General Requirements for Interconnection* must also be met in accordance with the *General Requirements for Interconnection* document posted at:

<http://www.oasis.oati.com/woa/docs/WAPA/WAPAdocs/WAPA-General-Req-for-Interconnection-Issued-2011-0714.pdf>

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

**4.5 Schedule:** Attachment A outlines Western's estimated schedule for planning, design and construction of the facilities required to accommodate the Interconnection Customer's Request. Based upon the proposed facility additions, Western anticipates the new Sulphur 115-kV Switchyard would be completed by the end of May 2018. Western also anticipates the upgrades and replacements to the above named 115-kV lines and terminals would be completed by the end of May 2018. This schedule is based on the GIA/Interim GIA being executed prior to May 1, 2016, and issuance of the NEPA Finding of No Significant Impact or Record of Decision by April 2017.

**4.6 Environmental Review:** The Environmental Review is performed at the Interconnection Customer's expense, and those costs are considered direct assigned costs and are ineligible for transmission service credits under the SPP GIA.

The Environmental Review for this project, as described in Attachment V, Sections 3.3.5, and 8.6.1, and any other applicable sections of the SPP Tariff, is being coordinated with Western under Contract No. 14-UGPR-108 with the Interconnection Customer.

**5.0 Facilities Study Cost:** Western will audit the Interconnection Facilities Study costs and provide a summary of costs once the study is completed or the interconnection request is withdrawn.

**ATTACHMENT A**

**SULPHUR 115-KV SWITCHYARD  
AND  
115-KV TRANSMISSION LINE AND TERMINAL IMPROVEMENTS**

<b>PROJECT ACTIVITY</b>	<b>ESTIMATED START DATE</b>	<b>ESTIMATED COST, MILESTONE PAYMENT DUE TO WESTERN</b>
Preconstruction activities – surveying, geological testing, project management, etc.	15 Business Days following execution of GIA	\$265,445
Provide staff and other resources to engineer, design, and plan construction	6/1/2016	\$1,158,460
Procure equipment, parts, and control and communication facilities necessary to construct	6/1/2016	\$6,234,150
Award Construction Contract(s)	5/1/2017	\$7,724,057
Commissioning, Energization, and construction supervision	12/31/2017	\$473,620
<b>TOTAL ESTIMATED COSTS</b>		<b>\$15,855,732</b>

**Note: This estimate is for both the 115-kV transmission line and terminal upgrades (\$8,529,876) and the Sulphur 115-kV Switchyard (\$7,325,856). The direct assignment costs of \$216,180 are also included in this estimate.**

**ATTACHMENT B**

Critical Energy Infrastructure Information Removed

**ATTACHMENT C**