



**Affected System Facility Study  
For  
Generator Interconnection  
Request  
ASGI-2013-006  
ASGI-2014-001**

***SPP Generator  
Interconnection Studies***

***(#ASGI-2013-006)  
(#ASGI-2014-001)***

**November 2014**

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## Revision History

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Date	Author	Change Description
11/14/2014	SPP	Facility Study Report Issued

## **Summary**

Xcel Energy Inc (Xcel), a subsidiary of Southwestern Public Service Company (SPS), performed a detailed Affected Facility Study at the request of Southwest Power Pool (SPP) for Affected System Interconnection request ASGI-2013-006 (2.0 MW/Wind) and ASGI-2014-001 (2.5 MW/ Wind) located in Lubbock County, Texas. The request is for interconnection to a substation of South Plains Electric Cooperative, a member of Golden Spread Electric Cooperative. Xcel has proposed a lead time of at least two months for completion of affected system Network Upgrades.

## **Interconnection Customer Affected System Interconnection Facilities**

The Interconnection Customer will be responsible for all of the transmission facilities connecting the customer owned substation to the Point of Interconnection (POI), at South Plains Electric Cooperative's (SPEC) Erskine 115kV Substation. Erskine 115kV Substation connected to Southwest Public Service Company (SPS) 115kV transmission lines from Indiana 115kV and Carlisle 115kV.

## **Transmission Owner Interconnection Affected System Facilities and Non-Shared Network Upgrades**

To allow interconnection the affected system Transmission Owner will need to construct revenue metering and SCADA communication equipment for acceptance of the Interconnection Customer's Interconnection Facilities. At this time ASGI-2013-006 is responsible for \$107,060 of Transmission Owner Affected System Interconnection Facilities and Non-Shared Network Upgrades. If ASGI-2013-006 request for interconnection is withdrawn and/or suspended, ASGI-2014-001 will be responsible for the \$107,060 of Transmission Owner Affected System Interconnection Facilities and Non-Shared Network Upgrades.

## **Affected System Previous Network Upgrades**

Certain Other Network Upgrades are currently not the cost responsibility of the Customer but will be required for full Interconnection Service. As this time, Other Network Upgrades are assigned to this Interconnection Customer.

Depending upon the status of higher or equally queued customers, the Interconnection Customer's in-service date is at risk of being delayed or their Interconnection Service is at risk of being reduced until the in-service date of these Other Network Upgrades. SPP has performed a Limited Operation Impact Study that has determined the Customer may operate until such time that either higher queued Interconnection Customers come into service or the required Network Upgrades are placed into service.

## **Conclusion**

The Interconnection Customer is responsible for \$107,060 of Transmission Owner Affect System Interconnection Facilities and Non-Shared Network Upgrades. After all Affect System Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 4.5 MW, as requested by ASGI-2013-006 and ASGI-2014-001 combined, can be allowed for the Affected System. At this time the total allocation of costs assigned to ASGI-2013-006 for Interconnection Service are estimated at \$107,060. If ASGI-2013-006 request for interconnection is withdrawn and/or suspended, ASGI-2014-001 will be responsible for the \$107,060 of Transmission Owner Affected System Interconnection Facilities and Non-Shared Network Upgrades.



**Facility Study For  
Southwest Power Pool (SPP)**

4.5 MW Wind Farm  
Lubbock County, Texas  
SPP # ASGI-2014-001  
GE 2.5 MW  
SPP # ASGI-2013-006  
Gamesa 2.0 MW

November 7, 2014

Transmission Planning South  
Xcel Energy Services

## Executive Summary

Omitted Text (“Interconnection Customer”) requested the interconnection of a wind generation facility to South Plains Electric Cooperative’s (SPEC) Erskine 115 kV substation (SPEC’s Point of Interconnection) located in Lubbock County, Lubbock, Texas. SPEC is a member of Golden Spread Electric Cooperative (GSEC). SPEC’s Erskine substation is served from Southwestern Public Service’s (SPS) 115 kV transmission line V-62 which is tapped off SPS’s 115 kV line from Indiana Substation to Carlisle Interchange. This facility has a capacity of 4.5 MW connecting one (1) GE wind turbines 2.5 MW at SPEC Erskine (ASGI-2014-001. Another 2 MW generator is being relocated to SPEC Erskine which is ASGI-2013-006 for Gamesa 2.0 MW. The Interconnection Customer’s desired commercial operation date is December 31, 2014. SPS is an affected system utility under SPP’s OATT, and the costs shown in table 2 will be included in the Affected Systems Interconnection Agreement between Interconnection Customer, Southwest Power Pool (SPP), and SPS. SPS is a New Mexico Corporation and wholly owned subsidiary of Xcel Energy Inc.

SPP originally evaluated the request to interconnect the generator facility to SPEC’s transmission system in a Definitive Interconnection System Impact Study DISIS-2014-001 for ASGI-2014-001, which was completed in July 2014 and DISIS-2013-002 for ASGI-2013-006 was completed in January 2014. The interconnection request was studied using one GE 2.5 MW wind turbine and one Gamesa 2.0 MW wind turbine for an aggregate power of 4.5 MW.

SPP requires that each generator shall implement Automatic Under Frequency Load Shedding (UFLS) according to the SPP UFLS Plan at the following link: [http://www.spp.org/publications/SPP%20UFLS%20Plan\\_Final.pdf](http://www.spp.org/publications/SPP%20UFLS%20Plan_Final.pdf). To fulfill this requirement, coordination with Xcel Energy is required during the under-frequency relay-setting phase for the generation. The Interconnection Customer is required to report their generation off-nominal frequency tripping relay settings to SPP and SPS. SPS specifies that generators shall not trip at frequencies above 58.5 Hz unless exceptions in the Transmission Provider Criteria are met. The Interconnection Customer agrees that the energy generating units installed at this interconnection will not be tripped for under-frequency conditions above 58.5 Hz in compliance with Transmission Provider criteria. This means that the generation subject to this Interconnection Agreement may not trip for under-frequency conditions on the transmission system until all under-frequency load shedding relays have operated. SPS will also require that the Interconnection Customer be in compliance with all applicable criteria, guidelines, standards, requirements, regulations, and procedures issued by the North American Electric Reliability Corporation (NERC), (SPP), and the Federal Energy Regulatory Commission (FERC) or their successor organizations.

The Interconnections Customer’s Expense for the Interconnection at SP-Erskine is \$107,060.

This facilities study addresses the requirements that the Interconnection Customer must meet to interconnect on a third party transmission system or distribution system and provide the appropriate information to the SPS/SPP transmission operator for reliability and operating purposes. This study may require upgrades to communications equipment, data monitoring equipment, transmission element protective equipment, and may also reflect any allocation of shared network upgrades as determined by SPP. This facilities study does not address any data requirements, communications requirements, or any other requirements for registration or operation in the SPP energy market. Those requirements are the sole responsibility of the generation developer and/or their energy purchaser.

The Interconnection Customer is responsible for the cost of the Interconnection Facilities, as designated in their interconnection agreement with SPEC.

## General Description of SPS Facilities<sup>1</sup>

1. **New Line Terminal:** See Appendix A, Figure A-1, for one-line diagram.

- 1.1. **Location:** Interconnection Customer will construct their generation facility and connect the wind transformer (0.6/12.47 kV) to the SPEC-Erskine 12.47 kV distribution, consistent with the interconnection agreement between SPEC and the Interconnection Customer. Appendix A shows a one-line diagram of the 115 kV line from Indiana Substation to Carlisle Interchange with tap to SPEC-Erskine-115/12.47 kV substation and the approximate location of the point of Interconnection of the wind farm.
- 1.2. **Relay and Protection Scheme:** The relaying on the 115 kV breakers (9925) at Indiana is our Standard SEL-421 and 311C relay. The relaying on the 115 kV breakers (6920) at Carlisle is our Standard SEL-421 and 311C relay.
- 1.3. **Revenue Metering:** The 115 kV transmission line from Indiana Substation to Carlisle (V-62) has a tap that serves SPEC-Erskine on the 115 kV. There two 115/12.47 kV transformers with existing billing meters on the 12.47 kV. The wind farms 4.5 MW are connected to the customers 12.47 distribution. An individual billing meter will be installed per ANSI C12.1 accuracy class 0.2 (3-PT's IEEE C57.13 accuracy class 0.3 and 3 CT's IEEE C57.13 accuracy class 0.15) for full 3-phase 4-wire metering on the 12.47 kV high side of the Interconnection Customer's Wind Farm. Pulses out of the billing meter will be sent via SCADA to the Transmission Owner's Control Center in Amarillo, Texas.
- 1.4. **SCADA Real Time Monitoring:** Real Time Data, MW, MVar output plus hourly accumulator data will be provided to the SPS System Control Center for monitoring by the SPS and SPP Energy Control Systems. The direct cost will be charged to the Interconnection Customer.
- 1.5. **Remote Terminal Unit ("RTU"):** A new RTU will replace the existing one to accommodate the new wind turbines at 12.47 kV on South Plains' distribution. SPS will install RTU cards for metering and telemetry as required by the latest Xcel Energy Interconnection Guidelines. The direct cost will be charged to the Interconnection Customer.

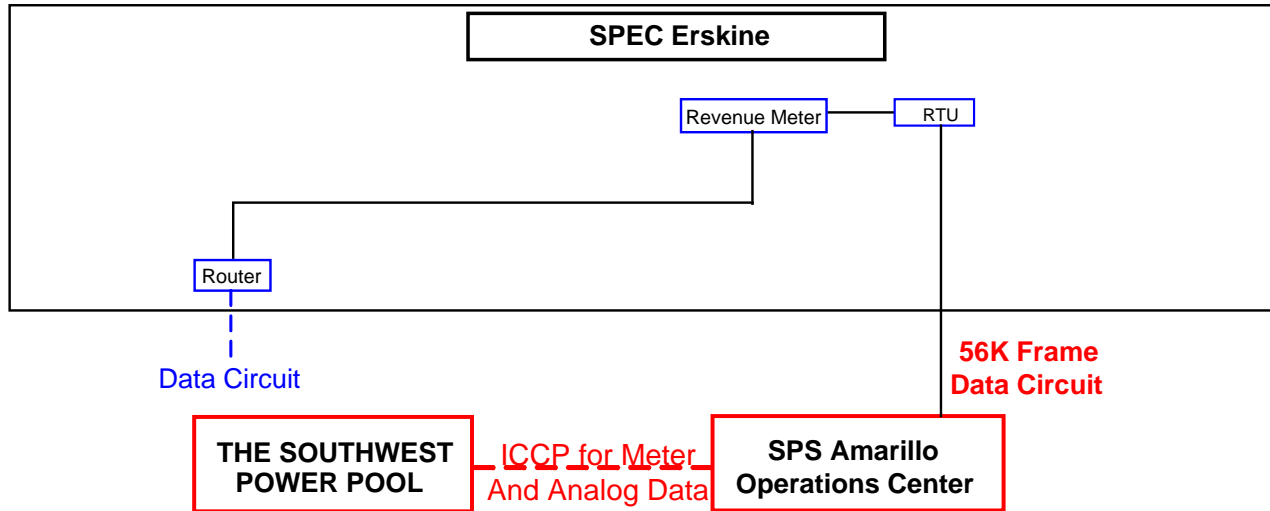
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<sup>1</sup> All modifications to SPS facilities will be owned, maintained and operated by SPS.

- 1.6. **Communications:** To meet its communications obligations, the Interconnection Customer or its host transmission or distribution system shall be responsible for making arrangements with appropriate communications providers to provide SCADA and accumulator data to the SPS Control Center.

The following communications schematic diagram, which includes communication equipment information for the Interconnection Customer, Transmission Provider (Southwest Power Pool) and Transmission Owner (Southwestern Public Service), is provided to assist the Parties.

A schematic outlining the proposed communications is provided below:



2. **Project and Operating Concerns:**

- 2.1 Close work between SPS personnel, the Interconnection Customer’s personnel, and SPEC will be imperative in order to meet any in-service date that has been established.

3. **Fault Current Study:** The available fault current at SPEC-Erskine is shown in Table 1 below.

**Table 1, - Available fault current at interconnection location**

Short Circuit Current Availability at South Plains Erskine without contribution from ASGI 2014-001				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3-Phase	Z <sup>+</sup>	Z <sup>0</sup>
115 kV @ SPEC Erskine	8,851	10,518	1.25+j6.19	1.96+j9.67

## Estimated Construction Costs

The projects required for the interconnection of this Wind Farm which is one GE wind turbine 2.5 MW prototype turbine and one Gamesa 2.0 MW wind turbine for a total of 4.5 MW. The facilities are summarized in the table below.

*Table 2, Required Interconnection Projects<sup>2</sup>*

<b>Project</b>	<b>Description</b>	<b>Estimate</b>
	<b>Interconnection Facilities (Interconnection Customer's Expense)</b>	
1	Communications Required <sup>3</sup> (Cost for new RTU)	\$ 101,160
2	SCADA data to SPS Control Center and Revenue metering at Wind Farm	\$ 5,900
3	No upgrade in relaying at SPS Indiana or Carlisle needed.	\$ 0
	<b>Subtotal:</b>	<b>\$ 107,060</b>
	<b>Total Cost:</b>	<b>\$ 107,060</b>

### Engineering and Construction:

An engineering and construction schedule for the installation of the SCADA monitoring equipment and software changes in the SPS Control Center are estimated at 2 Months. Other factors associated with clearances, equipment delays and work schedules could cause additional delays. The schedule is applicable after all required agreements are signed and internal approvals are granted.

All additional cost for work not identified in this study is the sole responsibility of the Interconnection Customer unless other arrangements are made.

<sup>2</sup> The cost estimates are 2014 dollars with an accuracy level of  $\pm 20\%$  except it does not include AFUDC.

<sup>3</sup> This cost is to provide new cards for RTU at Erskine Substation that will communicate with Interconnection Customer's facilities.



## Appendix A

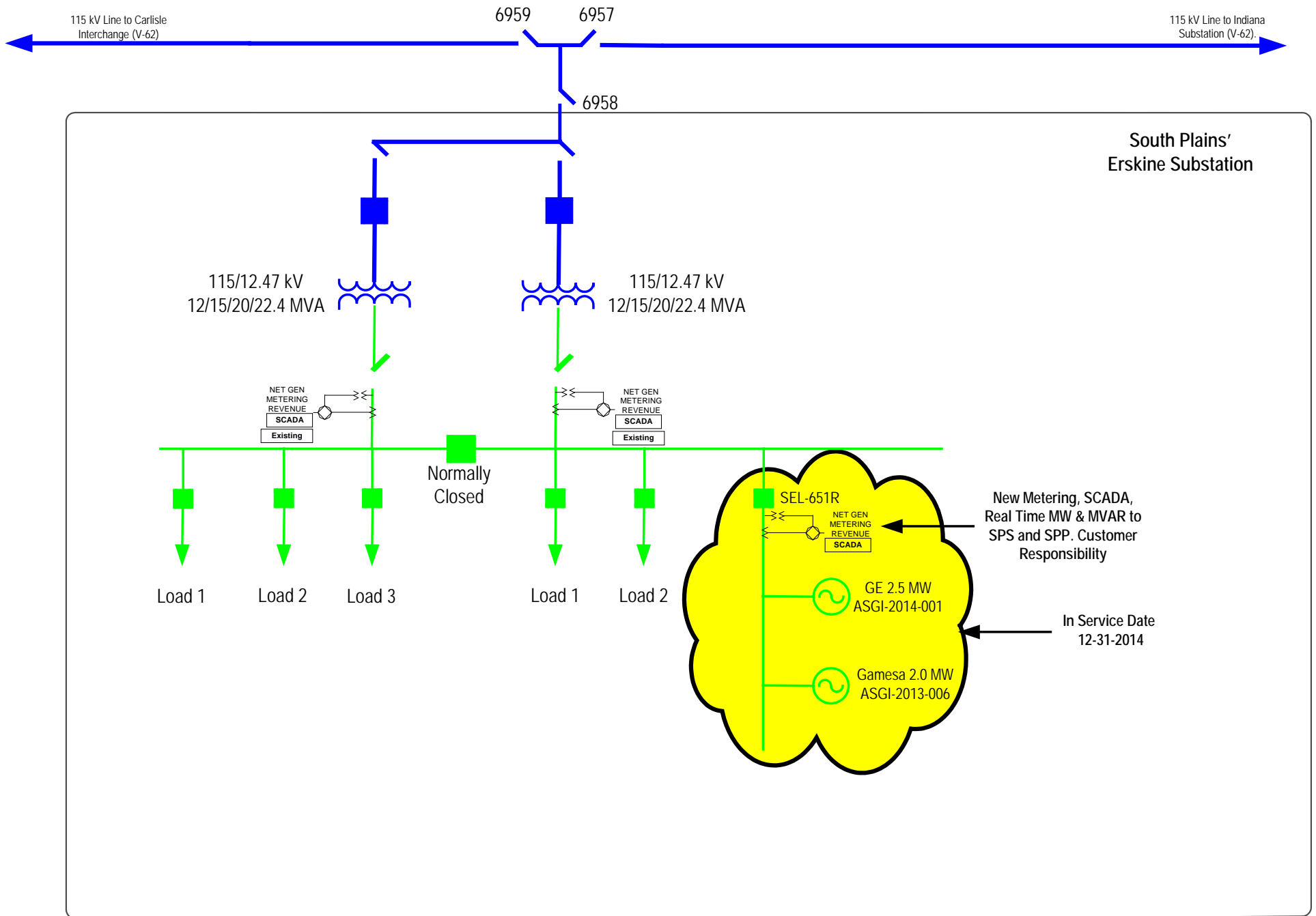


Figure 1. One-line diagram Indiana Substation to Carlisle Interchange with tap to SPEC-Erskine 115 kV.

*END OF REPORT –*