



**Affected System Facility Study
For
Generator Interconnection
Request
ASGI-2010-020**

***SPP Generator
Interconnection Studies***

(#ASGI-2010-020)

May 2015

Revision History

Date	Author	Change Description
05/06/2015	SPP	Facility Study Revision 0 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-2010-020 (30.0 MW/Wind) located in Lea County, New Mexico. The request is for interconnection to a substation of Lea County Electric Cooperative (LCEC). Xcel has proposed a lead time of at least two (2) month(s) for completion of Affected System Network Upgrades.

Interconnection Customer Affected System Interconnection Facilities

The Interconnection Customer's generation facility consists of twelve (2.5) Nordex 2.5MW wind turbines for a total generation capacity of 30.00 MW. The 34.5kV collector system for this wind farm is planned to be connect to one (1) 69/34.5kV transformer to the Point of Interconnection (POI). The POI will be a new station on the LCEC owned Crossroads – Tatum 69kV transmission circuit.

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

To allow interconnection the affected system Transmission Owner will need to upgrade revenue metering and SCADA communication equipment for acceptance of the Interconnection Customer's Interconnection Facilities. At this time ASGI-2010-020 is responsible for \$450 of Transmission Owner Affected System Interconnection Facilities and Non-Shared Network Upgrades.

Table 1: ASGI-2010-020 Affected System TOIF and Non-Shared Network Upgrades

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades Description	Allocated Cost (\$)	Allocated Percent (%)	Total Cost (\$)
Affected Interconnection Substation – Affected Transmission Owner Interconnection Facilities revenue metering and SCADA upgrades at North, Waits, and Plains Interchange	\$450	100%	\$450
Interconnection Substation - Network Upgrades	\$N/A	100%	\$ N/A
Total	\$450	100%	\$450

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, no other Network Upgrades are assigned to this Interconnection Customer.

Conclusion

The Interconnection Customer is responsible for \$450 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 30.0 MW, as requested by ASGI-2010-020 can be allowed for the Affected System. At this time the total allocation of costs assigned to ASGI-2010-020 for Interconnection Service are estimated at \$450.



**Facility Study For
Southwest Power Pool (SPP)**
30 MW Wind Farm
Lea County Electric Cooperative
Lea County, New Mexico
SPP # ASGI-2010-020

April 23, 2015

Transmission Planning South
Xcel Energy Services

Executive Summary

("Interconnection Customer") in 2010 requested the interconnection of wind generation facility located in Lea County, New Mexico to Lea County Electric Cooperative, Inc. (LCEC) 69 kV network. LCEC is served from Southwestern Public Service (SPS) 115 kV transmission line tapping the line between Cochran and Yoakum, also being served on the 115 kV from Denver City. This generator facility has a capacity of 30 MW. The Interconnection Customer's Facility will connect to LCEC's 69 kV system between Crossroads and Tatum. The customer's substation is located in Lea County, New Mexico approximately 20 miles west of Denver City, Texas. The Interconnection Customer's desired commercial operation date is 12/31/2015.

The purpose of this study is to evaluate the Customer's request to change the interconnection configurations to twelve (12) Nordex 2.5 MW wind generators. Southwest Power Pool (SPP) conducted two scenarios; a Limited Operation study and a re-study of DISIS-2011-002 to evaluate the change, which was completed in March 2012.

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.xcelenergy.com/Energy_Partners/Generation_Owners/Interconnections_for_Transmission. 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. SPP 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.

This facility 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 facility 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 their transmission or distribution host system.

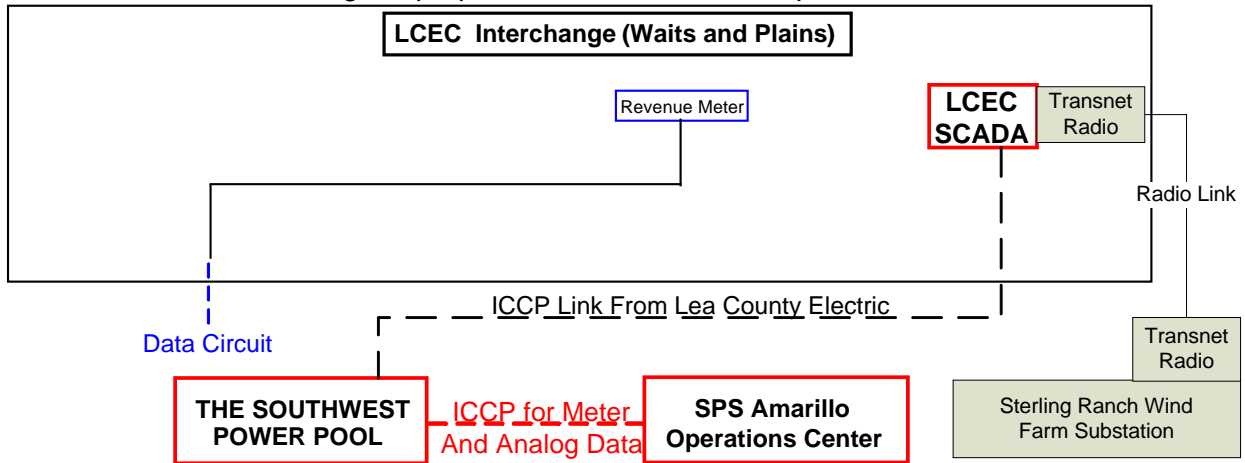
General Description of SPS Facilities ¹

1. **No Construction Required:** Customer connecting to Lea County Electric Cooperative 69 kV line from LCEC between Tatum and Crossroads on the 69 kV, which taps SPS's 115 kV line between Cochran to Yoakum and a 115 kV line from Denver City. See one-line diagram in Figure 1.
 - 1.1. **Location:** The Interconnect Customer will construct their generation facility and connect the wind transformer (34.5/69 kV) to LCEC's 69 kV network, consistent with any Interconnection Agreement between LCEC and the Interconnection Customer. Appendix A shows a one-line diagram of LCEC and the approximate location of the Point of Interconnection (POI) of the Interconnection Customer.
 - 1.2. **Relay and Protection Scheme:** There are not any 115 kV transmission relay upgrades required for these wind generation additions.
 - 1.3. **Revenue Metering at LCEC Waits and Plains Interchange:** The metering at LCEC Waits and Plains Interchange needs to be upgraded to bidirectional. An individual billing meter will be upgraded with a meter 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. SPS will install a meter utilizing either LCEC's or the Interconnection Customer's metering transformers at the ASGI-2010-020 to calculate the LCEC invoice. Interconnection Customer will provide analog and meter data to LCEC at LCEC Waits and Plains Interchange via radio link. LCEC will provide analog and meter data to SPP via ICCP. SPS will obtain the meter and analog data via ICCP and there is a RTU at LCEC Waits and Plains Interchange.
 - 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 All modifications to SPS facilities will be owned, maintained and operated by SPS.

1.5. **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 Interconnection Agreement customer is required to contact local transmission or distribution host for all communication details. 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 the Transmission group, the Interconnection Customer’s personnel, and Host Distribution Provider will be imperative in order to meet any in-service date that has been established.

3. **Fault Current Study:** The available fault current at the LCEC Waits and LCEC Plains Interchange on the 69 kV is shown in the Table below.

Short Circuit Current Availability at LCEC Waits Interchange without contribution from ASGI 2010-020				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3-Phase	Z^+	Z^0
69 kV Bus	858	1,331	$2.39+j9.45$	$6.14+j25.21$

Short Circuit Current Availability at LCEC Plains Interchange without contribution from ASGI 2010-020				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3-Phase	Z^+	Z^0
69 kV Bus	1,322	1,802	$2.60+j6.97$	$3.63+j14.87$

4. Estimated Construction Costs

- 4.1 The projects required for the interconnection of this Wind Farm which is 12 Nordex 2.5 MW wind turbines for a total of 30 MW facilities are summarized in the table below for ASGI-2010-020.

Table 1, Required Interconnection Projects²

Project	Description	Estimate
	Shared Network Upgrades:	
1		\$ 0
	Subtotal:	\$ 0
	SPS Transmission Network Upgrades:	
2	None	\$ 0
	Subtotal:	\$ 0
	Interconnection Facilities (Interconnection Customer's Expense)	
3	SCADA data to SPS Control Center ³	\$ See footnote
4	Revenue metering upgrade with SCADA. Meters need to be replaced with bi-directional at North, Waits and Plains Interchange. \$ 150 each.	\$ 450
	Subtotal:	\$ 450
Total Cost:		\$ 450

² The cost estimates are 2015 dollars with an accuracy level of $\pm 20\%$ except it does not include AFUDC.

³ It is the Requester's responsibility to provide both the data circuit and both dial-up telephone circuits, see Section 1.5

6. Engineering and Construction:

- 6.1 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.

Appendix A

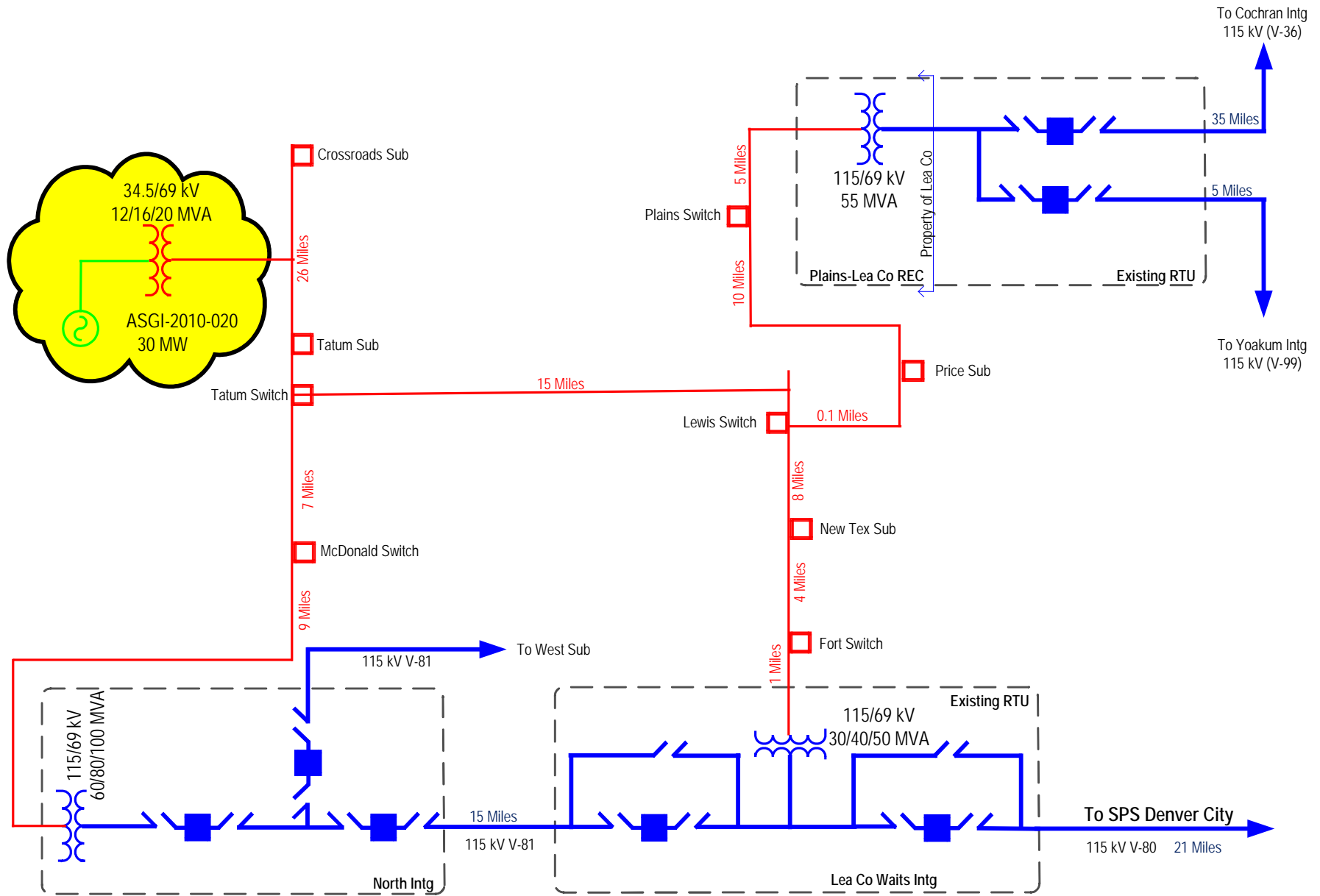


Figure 1. One-line diagram SPS LCEC Waits and Plains Interchange and ASGI-2010-020.

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