



SPP

*Southwest
Power Pool*

***Facility Study
For
Generation Interconnection
Request
GEN-2010-056***

***SPP Generation
Interconnection***

(#GEN-2010-056)

December 2011

Summary

KCP&L Greater Missouri Operations Company (GMO) performed a detailed Facility Study at the request of Southwest Power Pool (SPP) for Generation Interconnection request GEN-2010-056 (151 MW). The request for interconnection was placed with SPP in accordance with SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

Interconnection Customer Interconnection Facilities

The Interconnection Customer will be responsible for the 345kV transmission line from its wind farm Substation to the Point of Interconnection (POI), the new 345kV substation on the Cooper – St. Joseph 345kV line. In addition, 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 point of interconnection.

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades

Per the following Facility Study, the Interconnection Customer is responsible for **\$8,360,000** of Transmission Owner Interconnection Facilities and non-shared network upgrades.

Shared Network Upgrades

The interconnection customer was studied within the DISIS-2011-001 Impact Study. At this time, the Interconnection Customer is allocated \$0 for shared network upgrades.

If higher queued interconnection customers withdraw from the queue, suspend or terminate their GIA, restudies will have to be conducted to determine the Interconnection Customers' allocation of shared network upgrades. All studies have been conducted on the basis of higher queued interconnection requests and the upgrades associated with those higher queued interconnection requests being placed in service.

Other Network Upgrades

The interconnection request was studied with the following network upgrade as a Base Case upgrade facility. For the customer to go in service before the in service date of the following facility will require further study.

- Iatan – Nashua 345kV transmission line – in service date 6/1/2015



KCP&L Greater Missouri Operations Company
Facility Study for Southwest Power Pool
Generation Interconnection Request
GEN-2010-056

Prepared by: Kansas City Power & Light Transmission Planning
November 18, 2011

Executive Summary

Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (Tariff) and at the request of SPP, KCP&L Greater Missouri Operations Company (GMO) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer for SPP Generation Interconnection request Gen-2010-056. The request for interconnection was placed with SPP in accordance the Tariff, which covers new generation interconnections on SPP member's transmission system. The customer requests interconnection service for a 151-MW wind farm to tap the existing Cooper – St. Joseph 345kV transmission line. The customer has proposed a commercial operation date of June 1, 2015. The requirements for interconnection consist of construction a new 345kV substation on the Cooper – St. Joseph 345kV transmission line in Holt County, near Oregon, Missouri.

The total cost for GMO to construct the new 345kV substation, the interconnection facility, is estimated at \$8,360,000. This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual procurement and construction cannot be assured.

This Facility Study does not guarantee the availability of transmission service necessary to deliver the additional generation to any specific point inside or outside the SPP transmission system. The transmission network facilities may not be adequate to deliver the additional generation output to the transmission system. If the customer requests firm transmission service under the SPP Tariff at a future date, Network Upgrades or other new construction may be required to provide the service requested under the SPP Tariff.

Interconnection Facilities

The primary objective of this study is to identify the transmission owner network upgrades for interconnection facilities. The customer desires to interconnect a 151-MW wind farm using VESTA wind turbines to the existing Cooper – St. Joseph 345 kV transmission line near Oregon, Missouri. The proposed commercial operation date is June 1, 2015. In accordance with KCP&L Facility Connection Standards, the requirements for interconnection consist of adding a new 345kV substation on the Cooper – St. Joseph transmission line in Holt County Missouri. This 345kV substation shall be constructed, owned, and maintained by GMO. A one-line diagram of the proposed substation is shown in Figure 1 on page 6. The customer will be responsible to construct, own and maintain all facilities on the customer’s side of the point of interconnection. Because the Cooper – St. Joseph line is a tie line between GMO and Nebraska Public Power District (NPPD), it is necessary to coordinate this study and construction work with NPPD. The major components of the transmission owner network upgrades and their estimated costs are shown below.

GMO substation land	\$ 400,000
GMO substation	\$6,000,000
GMO transmission line cut-in	\$ 800,000
GMO microwave communications	\$ 100,000
GMO St. Joseph line relaying	\$ 500,000
NPPD Cooper line relaying	\$ 560,000 estimate by NPPD
Total	\$8,360,000

Description of transmission owner network upgrades

GMO substation land: GMO will require 7 acres for substation site next to Cooper – St. Joseph transmission line. Customer may opt to convey necessary land rights for substation site to GMO. Customer is responsible for acquiring the right of way required from the customer’s wind farm to the GMO substation.

GMO substation: GMO will grade site to level and construct 345kV ring bus substation with three 345kV breakers and three line terminal positions. Includes all bus work, line and disconnect switches, ground grid, security fence, control house, system protection relaying, communications equipment, and station power equipment. The substation shall have a 3000 amp continuous rating and have the capability of interrupting 40,000 amps of fault current. A disturbance monitoring device shall be installed that is capable of recording faults, frequency swings and other system disturbances. This device shall be equipped with a GPS time clock and shall be capable of using existing telephone systems. Substation construction includes approximately 3 miles of 3-phase 12kV distribution feeder for station auxiliary power.

GMO transmission line cut-in: GMO will install two new 345-kV transmission dead-end towers and conductor spans to substation bus work. Customer is

responsible for all facilities, including 345kV transmission elements, on the customer's side of the interconnection point.

GMO microwave communications: Engineering, licensing, radio and multiplex hardware, tower construction, and labor for microwave communications for system protection system, voice communications, and data telemetry.

GMO St. Joseph line relaying: New relays and relay panels at St. Joseph substation.

NPPD Cooper line relaying: New relays and relay panels at Cooper substation. NPPD will bill GMO for actual costs which will be included in GMO bill to customer.

Engineering, Procurement, and Construction Schedule: A nominal schedule for GMO to design, procure equipment and construct a 345kV substation of this type is approximately 18 months. According to good business practice, the GMO engineering and procurement process cannot begin until the parties have executed a mutually agreeable Generation Interconnection Agreement.

Short Circuit Fault Duty Evaluation

KCP&L engineering staff performed short circuit analysis for the proposed Holt County 345 kV substation to determine if the added generation would cause the available fault currents to exceed the interrupting capability of any existing GMO circuit breakers. This analysis was performed using ASPEN software program. The results are shown in Table 1 below:

Table 1: Short Circuit Results

Fault Location	Fault Current (Amps)			
	Study Type	Fault Current Line - Ground	Fault Current Three-Phase	Interrupting Capability Smallest Circuit Breaker
Wind Farm Switching Station Bus Number 560663 w/o Wind Farm Generation	ASPEN	10,665	13,097	40,000
Wind Farm Switching Station Bus Number 560663 w/ Wind Farm Generation	ASPEN	10,999	13,869	40,000

The fault currents as seen in Table 1 are within the circuit breaker interrupting capability with the addition of the Gen-2010-056 wind farm.

NPPD Fault Duty Evaluation

NPPD evaluated the addition of the proposed interconnection and wind farm and did not report any violations of its circuit breaker interrupting capability.

Other Required Interconnection Facilities

The Definitive Interconnection System Impact Study for Generation Interconnection Requests (DISIS-2011-001) dated July 2011, Group 13 on page 1 of the Executive Summary that the power factor analysis performed by SPP indicates that wind farm installation GEN-2010-056 has a power factor requirement of 0.8211 leading (absorbing MVARs from the transmission system) and a power factor requirement of 0.9416 power factor lagging (supplying MVARs to the transmission system). Customer will be responsible for providing necessary reactive resources to meet the 0.8211 leading power factor requirement. The 0.9416 power factor lagging requirement is within the acceptable range for KCP&L facility connection standards.

Figure 1: Preliminary One-Line Diagram Holt County 345kV Substation

