



***Facility Study for Generation
Interconnection Request
GEN-2007-017***

***SPP Tariff Studies
(#GEN-2007-017)***

July 2009

Summary

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Kansas City Power & Light Company (KCP&L) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer and SPP for SPP Generation Interconnection request Gen-2007-017. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

Customer Facilities

The customer requests interconnection service for a 100-MW wind farm that is tentatively located near Maryville 161 kV sub-station. This interconnection is planned to occur at the proposed switching station located between the existing Maryville 161 kV and Midway 161 kV sub-stations. To accommodate this wind farm and other previous queued customer's wind farms, a switching station shall be constructed using a six circuit breaker, ring bus configuration. Two other wind farms shall be connected to the switching station as described in Gen-2006-014 and Gen-2006-017. The wind farm generation amount using the projects as described by Gen-2006-014, Gen-2006-017 and Gen-2007-017 equates to 700 MW. If Gen-2006-017 or Gen-2006-014 suspends or terminates its intention to construct a 300 MW wind farm, then impact studies should be re-evaluated to determine the viability of moving the existing Maryville – Clarinda 161 kV to a proposed Switching Station – Clarinda 161 kV.



**Kansas City Power & Light Company
Facility Study for SPP
Generation Interconnection Request
GEN-2007-017**

Prepared by: KCP&L Transmission Planning
January 16, 2009

Executive Summary

The customer requests interconnection service for a 100-MW wind farm that is tentatively located near Maryville 161 kV sub-station. This interconnection is planned to occur at the proposed switching station located between the existing Maryville 161 kV and Midway 161 kV sub-stations.

The Gen-2007-017 wind farm has a peak capacity of 100 MW and is expected to be in service by November 30, 2009.

The Southwest Power Pool evaluated the request to interconnect the 100 MW of generation into the Maryville - Midway 161 kV. The Feasibility and System Impact Studies were complete in February and August 2008. In response to the Feasibility and System Impact Study, this facility study reports the results of a short circuit study conducted on the proposed Wind Farm Switching Station 161 kV bus.

There are three wind farm projects scheduled for the Maryville – Midway 161 kV area which would result in 700 MW of generation potential. Currently, there is not enough available transmission capacity in the Maryville – Midway 161 kV area to accommodate this amount of generation. **Therefore, transmission planning is performing numerous wind farm studies to determine the most cost effective solutions to upgrade the transmission capacity to insure robust transmission service. These results may include not transferring the existing Maryville – Clarinda 161 kV to the proposed switching station.** This facility study includes the wind farm generation projects Gen-2006-014 and Gen-2006-017 and the results from their combined generation. If generation projects Gen-2006-014 and Gen-2006-017 are removed from the queue, then the existing Maryville – Midway 161 kV transmission system can accommodate 100 MW of new generation.

Transmission planning studied two different wind mill manufacturing brands at the new substation location as described in the Gen-2007-017 Impact Study. These brands were General Electric and Clipper. The GEN-2007-017 project was studied with General Electric. This study attempts to differentiate these two brands by allowing the General Electric wind mill to have the ability to operate either lagging or leading while the Clipper brand only operates leading.

A switching station is required to connect the wind farms to the Maryville – Midway 161 kV. The proposed switching station shall consist of a six circuit breaker ring bus so that all three proposed wind farm projects have an interconnection point. The switching station cost estimate to accommodate these wind farm interconnections is \$8,700,000. However, to accommodate wind farm Gen-2007-017, the interconnection cost is \$700,000 estimated.

Discussion

General Description

The customer desires to interconnect a 100 MW wind farm generating facility to the existing Maryville – Midway 161 kV. To accommodate this wind farm and other proceeding customer's wind farms, a switching station shall be constructed using a six circuit breaker, ring bus configuration. Two other wind farms shall be connected to the switching station as described in Gen-2006-014 and Gen-2006-017. The wind farm generation amount using the projects as described by Gen-2006-014, Gen-2006-017 and Gen-2007-017 equates to 700 MW. If Gen-2006-017 or Gen-2006-014 suspends or terminates its intention to construct a 300 MW wind farm, then impact studies should be re-evaluated to determine the viability of moving the existing Maryville – Clarinda 161 kV to a proposed Switching Station – Clarinda 161 kV.

General Description of Modifications at Midway, Maryville or Wind Farm Switching Station.

1. Modifications at Wind Farm Switching Station: See Figure 1, page 5.

1.1 Location: The switching station location is between Maryville 161 kV and Midway 161 kV sub-stations. The existing Maryville – Midway 161 kV transmission shall be used as transmission paths for the wind farm switching station.

1.2 Bus Design: Proposed 161 kV bus design uses a six circuit breaker, ring bus configuration, with a minimum of three 161 kV transmission lines exiting the switching station. The switching station shall have a 2000 amp continuous rating and have the capability of interrupting 40,000 amps of fault current.

1.3 Transformer: A transformer is not required.

1.4 Controls: There are no planned changes.

1.5 Line Reactors: Line reactors are not required.

1.6 Security Fence: There are no planned changes.

1.7 Ground Grid: There are no planned changes.

1.8 Site Grading: There are no planned changes.

1.9 Station Power: There are no planned changes.

1.10 Relay and Protection Scheme: There are no planned changes.

1.11 Revenue Metering: There are no planned changes.

1.12 Disturbance Monitoring Device: 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.

- 2. Communications:** Communications equipment to transmit data from the switching station interconnection point, back to the wind farm generation, to the customer’s control center shall be the customer’s responsibility.
- 3. Transmission Line:** A 161 kV transmission line from Wind Farm Gen-2007-017 to the Maryville – Midway 161 kV switching station is required at customer’s expense.
- 4. Right of Way (ROW):** The customer is responsible for acquiring the right of way required from the customer’s wind farm to the switching station.
- 5. Engineering and Construction Schedule:** The proposed in-service date for Wind Farm Gen-2007-017 is November 30, 2009. However, an inter-connection agreement has not been established as of December 1, 2008. Therefore, the proposed in-service date of November 30, 2009 may have to be postponed.
- 6. Estimated Construction Costs:** The estimated interconnection construction costs for Gen-2007-017 is \$700,000. This cost includes circuit breakers, switches, control relaying, high speed communications, metering and other related equipment and structures. However, if projects Gen-2006-014 and Gen-2006-017 are removed from the queue, then the interconnection cost becomes \$3,500,000 estimated.
- 7. Short Circuit Study Results:** KCP&L personnel performed short circuit studies to determine if the added generation would cause the calculated fault currents using PSSE ANSI to exceed the interrupting capability of the smallest circuit breakers. The results are shown in Table 1 below:

Table 1: Short Circuit Results

Fault Location	Fault Current (Amps)				Impedance (Ohms)	
	Study Type	Fault Current Line - Ground	Fault Current Three-Phase	Interrupting Capability Smallest Circuit Breaker	Real	Reactive
Wind Farm Switching Station Bus Number 541382	ANSI	24,841	21,695	40,000	0.0006	0.0165

The fault currents as seen in Table 1 are within the circuit breaker interrupting capability with the addition of 100 MW contributed by Gen-2007-017.

**Figure 1: Preliminary One-Line Diagram Maryville Switching Station
161 kV**

