



***Facility Study
For
Generation Interconnection
Request
GEN-2006-021***

SPP Tariff Studies

(#GEN-2006-021)

October 2007

Executive Summary

<OMITTED TEXT> (Customer) has requested a Facility Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting a 250 MW wind powered generation facility in Barber County, Kansas to the transmission system of Mid Kansas Power Company, LLC (MKEC) (formerly West Plains Electric). The wind powered generation facility studied was proposed to comprise of one-hundred (100) Clipper 2.5 MW wind turbines. The original requested in-service date for the facility is May 31, 2008. The wind powered generation facility will interconnect into a new ring bus substation to be constructed on the Medicine Lodge – Harper 138 kV transmission line.

The generation facility was studied to interconnect into the MKEC Medicine Lodge – Harper 138 kV transmission line. MKEC will construct a new 138 kV three breaker ring bus substation on the line. MKEC will also update protection schemes at Medicine Lodge substation to accommodate the interconnection. The total cost of the interconnection facilities and network upgrades for this interconnection request are approximately \$3,148,170.

The Customer will have certain facility requirements in their substation to interconnect the generation facility. The Customer will be required to install two (2) 34.5kV, 14 MVar capacitor banks and two (2) 34.5kV +/-50 Mvar Static Var Compensator Devices (SVC) in the Customer substation. These devices shall be placed on the 34.5kV bus of each substation transformer. The Customer has indicated Phase 1 of the wind farm will come on line initially at 100 MW operation. Stability studies have shown that at 100 MW, the wind farm can comply with FERC Order #661A low voltage ride through provisions without an SVC or STATCOM device. When the full 250 MW comes into operation, the SVCs will be necessary.

1. Introduction

<OMITTED TEXT> (Customer) has requested a Facility Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnecting a 250 MW wind powered generation facility in Barber County, Kansas to the transmission system of Mid Kansas Power Company, LLC (MKEC) (formerly West Plains Electric). The wind powered generation facility studied was proposed to comprise of one-hundred (100) Clipper 2.5 MW wind turbines. The original requested in-service date for the facility is May 31, 2008. The wind powered generation facility will interconnect into a new ring bus substation to be constructed on the Medicine Lodge – Harper 138 kV transmission line.

2. Interconnection Facilities

All required interconnection facilities are tabulated in Table 1 and are shown in Figure 1.

- 2.1. **MKEC 138 kV Substation** - The Customer will be interconnecting into a new 138kV three breaker ring bus substation to be constructed on the Medicine Lodge - Harper 138 kV line in Barber County. The substation is proposed to be constructed, owned, and maintained by MKEC. The substation will be constructed using applicable MKEC engineering and construction standards. The Customer will be responsible for the cost of this substation.

The costs for the substation work is estimated below

- Construct a 138kV ring bus substation. Substation to include three (3) 138kV circuit breakers, associated disconnect switches, structural steel, foundations, relaying, control house, station battery, arresters, line traps/line tuners, ground grid, conduit system, RTU, communication equipment, security fence, and crushed rock surfacing.

Subtotal \$ 2,707,800

- 2.2. **Medicine Lodge 138 kV Substation** – MKEC will need to modify the 138/115 kV autotransformer protection scheme at Medicine Lodge substation. A 138 kV circuit switcher will be installed for proper system coordination. The Customer will be responsible for this cost.

- Install one (1) 138kV circuit switcher, one (1) 138 kV three phase motor operated line disconnect switch, control panel revisions, control cable, galvanized steel self supporting switch pole (in transmission line) and crushed rock surfacing at Medicine Lodge substation

Subtotal \$ 436,100

2.3. Harper 138 kV Substation – MKEC will need to modify the carrier equipment and scheme at the Harper 138 kV substation. The Customer will be responsible for this cost.

- Labor to perform the required tuning/testing on the carrier equipment; internal labor to perform relay changes/testing and decommissioning of transfer trip scheme on the Medicine Lodge circuit

Subtotal \$ 4,270

Total Interconnection Facilities and Network Upgrades \$3,148,170

Table 1: Required Interconnection Facilities and Network Upgrades

Project	Description	Estimated Cost
1	138kV Ring-Bus Switching Station	\$ 2,707,800
2	Install 138kV Circuit Switcher at Medicine Lodge Substation	\$ 436,100
3	Line Tuner work at Harper	\$ 4,270
	Total:	\$ 3,148,170

2.4. Customer Facilities – The Customer will be responsible for its Generating Facility and its 138/34.5kV substation that will contain its 138/34.5kV transformer(s) and wind turbine collector feeders. In addition, the Customer will be required to install the following equipment in its facilities.

2.4.1. 34.5kV Capacitor Banks – In its responsibility in maintaining a unity power factor at the wind farm, the Customer will be required to install two (2) 34.5kV, 14 Mvar capacitor banks on each of the Customer’s 138/34.5kV transformer 34.5kV buses. Due to ratio of the Customer’s generation capability to the source impedance of the interconnect point, these capacitor banks alone cannot maintain a unity power factor while keeping voltages at an acceptable level.

2.4.2. SVC Devices – To maintain acceptable voltage regulation and to maintain system reliability and stability, the Customer will be required install two (2) 34.5kV +/-50Mvar Static Var Compensator Devices on each of its transformer 34.5kV buses at the Wind Farm substation

2.4.2.1. Phasing Considerations – Section 2.4.1 and 2.4.2 are the reactive compensation requirements for the entire 250MW wind farm. The Customer has requested an Impact Re-Study to evaluate the dynamic reactive needs if the Customer installs 100MW of wind turbines initially, with a second phase of 150MW to follow. That study has shown that initially no STATCOM or SVC device will be necessary for 100 MW operation as long as no operations problems for reactive power and voltage swings are observed by the Transmission Owner.

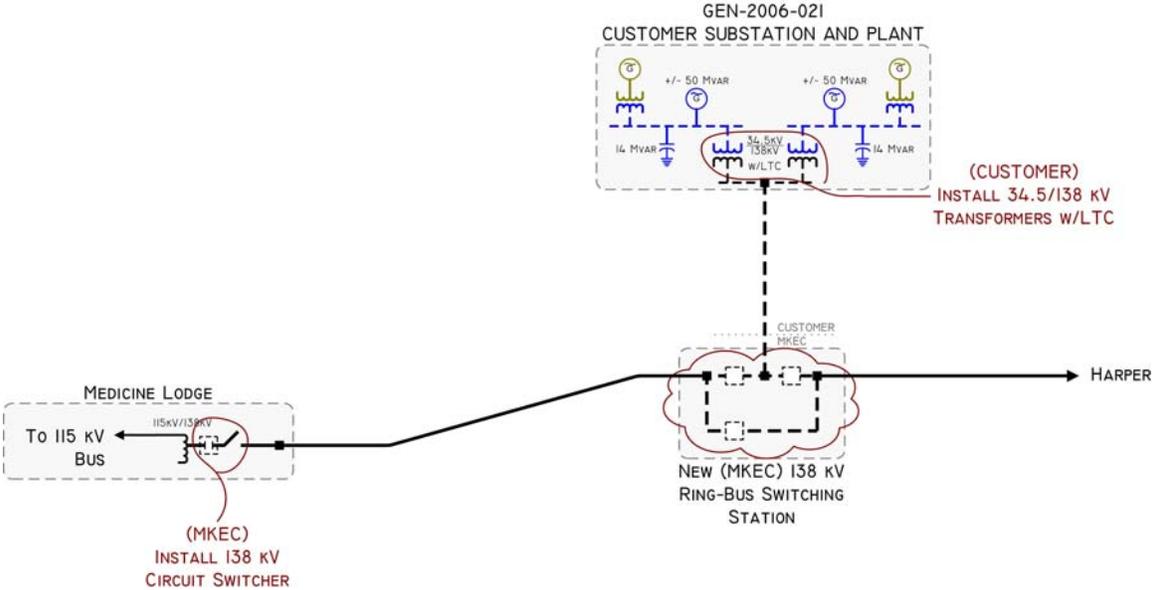


Figure 1. Interconnection Facilities for GEN-2006-021

3. Short Circuit Study

MKEC has indicated that no MKEC facilities will be affected due to short circuit contribution by the interconnection of GEN-2006-021.

4. Conclusion

The cost to interconnect the GEN-2006-021 generation interconnection request for 250MW is estimated by this Facility Study to cost approximately \$3,148,170. The Customer has certain facilities they are required in their substation as a requirement to the Interconnection Agreement.

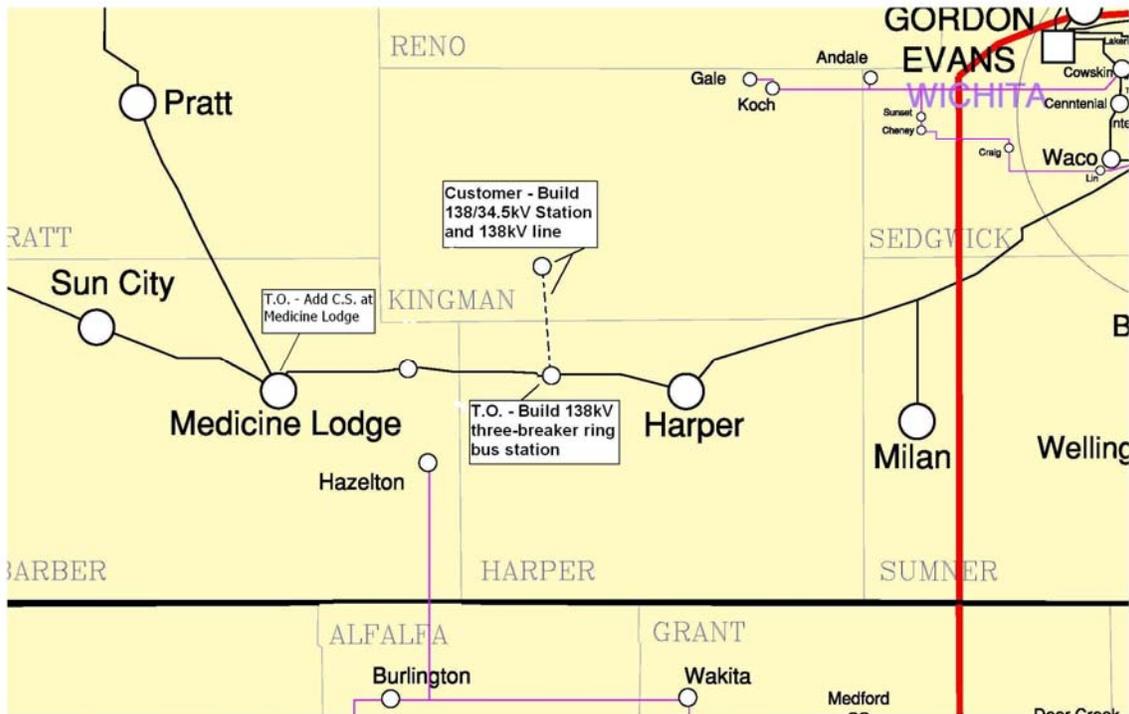


Figure 2. Map of the Local Area