Feasibility Study
For
Generation Interconnection Request
GEN-2007-015

SPP Tariff Studies
(#GEN-2007-015)

November, 2007

Executive Summary

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 130 MW of wind generation within the control area of Westar Energy (WERE) located in Nemaha County, Kansas. The proposed method of interconnection is a new 161 kV ring-bus switching station to be located on the existing Kelly (WERE) – Humboldt (Omaha Public Power District, OPPD) 161 kV transmission line, owned by WERE within the state of Kansas. The proposed in-service date is December 31, 2009.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 130 MW of generation with transmission system reinforcements within the local transmission system. In order to maintain acceptable reactive power compensation, the customer will be required to pay for the installation of a combined total of at least 21.6 Mvar of 34.5 kV capacitor bank(s) to be installed in the Customer's collector substation. Dynamic Stability studies performed as part of the System Impact Study will provide additional guidance as to whether the required reactive compensation can be static or a portion must be dynamic (such as a SVC).

The requirement to interconnect the 130 MW of wind generation on the existing Kelly (WERE) – Humboldt (OPPD) 161 kV transmission line consists of constructing a new 161 kV three-breaker ring-bus switching station. The new station will be constructed and maintained by WERE. The Customer did not propose a specific route for the 161 kV line extending to serve its 161/34.5 kV collection facilities. It is assumed that obtaining all necessary right-of-way for the new transmission line to serve its facilities will not be a significant expense.

The total minimum cost for building the required facilities for this 130 MW of generation is $5,875,000. These costs are shown in Tables 1 and 2. Network constraints in the Associated Electric Cooperatives, Inc. (AECI), Kansas City Power & Light (KCPL), Missouri Public Service (MIPU) and WERE transmission systems that were identified are shown in Table 3. These Network constraints will have to be verified with a Transmission Service Request (TSR) and associated studies. Network Constraints are in the local area of the new generation when this generation is sunk throughout the SPP footprint for the Energy Resource (ER) Interconnection request. With a defined source and sink in a Transmission Service Request, this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements. This cost does not include building the 161 kV line from the Customer 161/34.5 kV collector substation into the point of interconnection. This cost also does not include the Customer's 161/34.5 kV collector substation or the 34.5 kV, 21.6 Mvar capacitor bank(s).

In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer for future analyses including the determination of lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. If the loading of a facility is higher, the level of ATC will be lower.

There are several other proposed generation additions in the general area of the Customer's facility. It was assumed in this preliminary analysis that not all of these other projects within the Kansas City Power & Light (KCPL), West Plains (WEPL), and WERE control areas will be in service. Those previously queued

projects that have advanced to nearly complete phases were included in this Feasibility Study. In the event that another request for a generation interconnection with a higher priority withdraws, then this request may have to be re-evaluated to determine the local Network Constraints.

The required interconnection costs listed in Tables 1 and 2 and other upgrades associated with Network Constraints do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through Southwest Power Pool's OASIS.

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Introduction

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 130 MW of wind generation within the control area of Westar Energy (WERE) located in Nemaha County, Kansas. The proposed method of interconnection is a new 161 kV ring-bus switching station to be located on the existing Kelly (WERE) – Humboldt (Omaha Public Power District, OPPD) 161 kV transmission line, owned by WERE within the state of Kansas. The proposed in-service date is December 31, 2009.

Interconnection Facilities

The primary objective of this study is to identify the system problems associated with connecting the plant to the area transmission system. The Feasibility and other subsequent Interconnection Studies are designed to identify attachment facilities, Network Upgrades and other Direct Assignment Facilities needed to accept power into the grid at the interconnection receipt point.

The requirements for interconnection of the 130 MW consist of constructing a new 161 kV three-breaker ring-bus switching station on the existing Kelly (WERE) – Humboldt (OPPD) 161 kV transmission line, owned by WERE within the state of Kansas. This substation will be located within the Kansas state boundary and will be constructed and maintained by WERE. A preliminary one-line drawing of the interconnection facilities are shown in Figure 1. The Customer did not propose a specific route of its 161 kV line to serve its 161/34.5 kV collection system facilities. It is assumed that obtaining all necessary right-of-way for construction of the Customer 161 kV transmission line and the 161/34.5 kV collector substation will not be a significant expense.

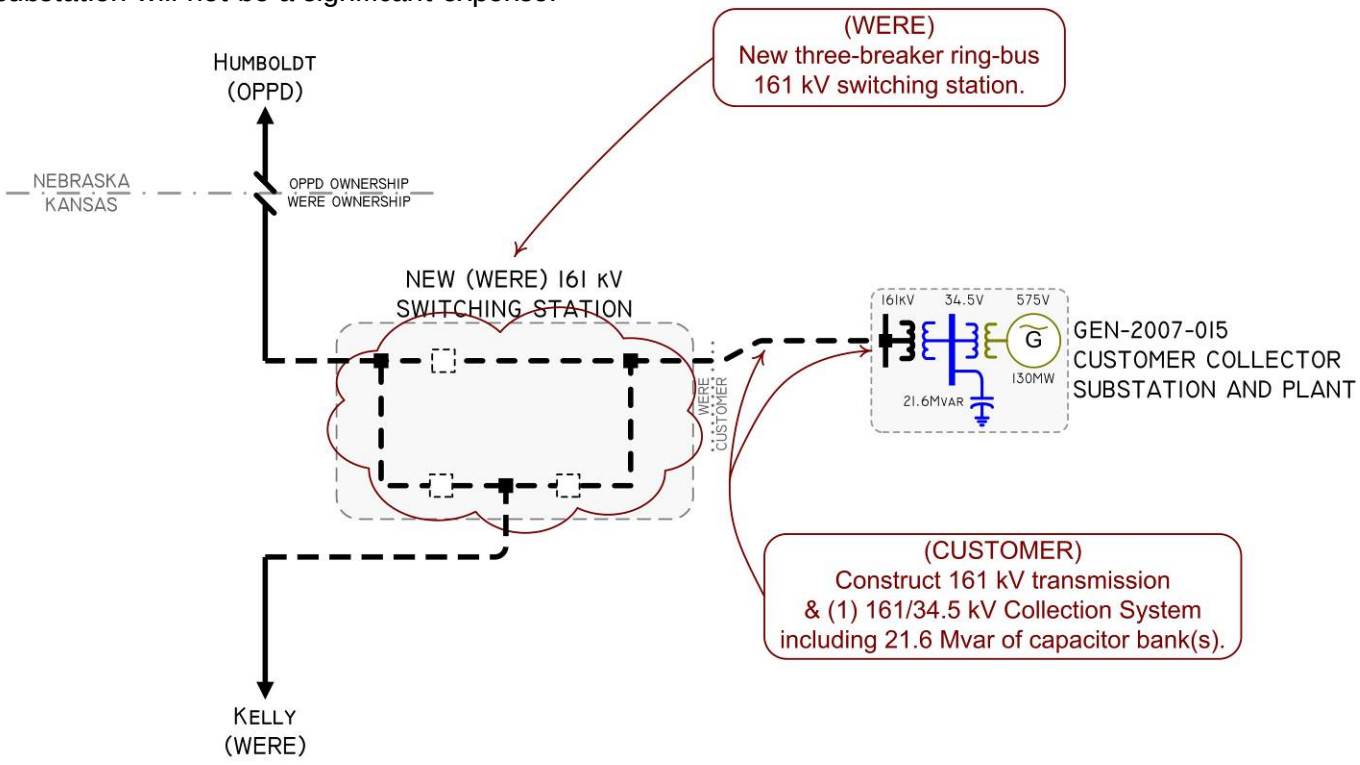

Figure 1: Proposed Method of Interconnection

(Final design to be determined)

Interconnection Estimated Costs

The minimum cost for adding a new breaker and terminating the transmission line serving GEN-2007-015 facilities is estimated at $5,875,000. These costs are listed in Tables 1 and 2. These estimates will be refined during the development of the System Impact Study based on the final designs. This cost does not include building the Customer's 161 kV transmission line extending from the point of interconnection to serve its 161/34.5 kV collection facilities. This cost also does not include the Customer's 161/34.5 kV collector substation or the 21.6 Mvar of capacitor bank(s), all of which should be determined by the Customer. The Customer is responsible for these 161 kV – 34.5 kV facilities up to the point of interconnection. Other Network Constraints in the Associated Electric Cooperatives, Inc. (AECI), Kansas City Power & Light (KCPL), Missouri Public Service (MIPU) and WERE transmission systems that were identified are shown in Table 3.

These costs do not include any cost that might be associated with short circuit study results or dynamic stability study results. These costs will be determined when and if a System Impact Study is conducted.

Table 1: Direct Assignment Facilities

FACILITY	ESTIMATED COST (2007 DOLLARS)
CUSTOMER – (1) 161 kV transmission line from Customer collector substation to the new three-breaker ring-bus station located on the Kelly (WERE) – Humboldt (OPPD) 161 kV transmission line.	*
WERE – Termination and interconnection of CUSTOMER 161 kV transmission line into the new 161 kV three-breaker ring bus.	$750,000
CUSTOMER – (1) 161/34.5 kV Customer collector substation facilities.	*
CUSTOMER – 34.5 kV, 21.6 Mvar capacitor bank(s) to be installed in the Customer 161/34.5 kV collector substation.	*
CUSTOMER – Right-of-Way for all Customer facilities.	
TOTAL	*****

* *Estimates of cost to be determined.*

Table 2: Required Interconnection Network Upgrade Facilities

FACILITY	ESTIMATED COST (2007 DOLLARS)
WERE – (1) 161 kV three-breaker ring-bus switching station for GEN-2007-015 located in Kansas on the Kelly (WERE) – Humboldt (OPPD) 161 kV transmission line. Station to include breakers, switches, control relaying, high speed communications, metering and related equipment and all related structures.	$5,125,000
TOTAL	*****

* *Estimates of cost to be determined.*

Powerflow Analysis

A powerflow analysis was conducted for the facility using modified versions of the 2009 winter peak model, the 2012 summer and winter peak models, and the 2017 summer peak model. The output of the Customer's facility was offset in each model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource (ER) Interconnection request. The proposed in-service date of the generation is December 31, 2009. The available seasonal models used were through the 2017 Summer Peak of which is the end of the current SPP planning horizon.

Following current practice, this analysis was conducted assuming that previous queued requests in the immediate area of this interconnect request were in service. The analysis of the Customer's project indicates that, given the requested generation level of 130 MW and location, additional criteria violations will occur on the existing MIPU and WERE transmission systems under steady state and contingency conditions in the peak seasons. Table 3 lists these overloaded facilities.

In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer to determine lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. When a facility is overloaded for more than one contingency, only the highest loading on the facility for each season is included in the table.

In order to maintain a zero reactive power flow exchanged at the point of interconnection, additional reactive compensation is required. The Customer will be required to install a combined total of 21.6 Mvar of capacitor bank(s) in the Customer's 161/34.5 kV collector substation on the 34.5 kV bus. Dynamic Stability studies performed as part of the System Impact Study will provide additional guidance as to whether the reactive compensation can be static or a portion must be dynamic (such as a SVC or STATCOM). It is possible that an SVC or STATCOM device will be required at the Customer facility because of FERC Order 661A Low Voltage Ride-Through Provisions (LVRT) which went into effect January 1, 2006. FERC Order 661A orders that wind farms stay on-line for 3-phase faults at the point of interconnection even if that requires the installation of a SVC or STATCOM device.

There are several other proposed generation additions in the general area of the Customer's facility. Some of the local projects that were previously queued were assumed to be in service in this Feasibility Study. Not all local projects that were previously queued and have advanced to nearly complete phases were included in this Feasibility Study.

Powerflow Analysis Methodology

The Southwest Power Pool (SPP) criteria states that: “The transmission system of the SPP region shall be planned and constructed so that the contingencies as set forth in the Criteria will meet the applicable NERC Planning Standards for System Adequacy and Security – Transmission System Table I hereafter referred to as NERC Table I) and its applicable standards and measurements”.

Using the created models and the ACCC function of PSS\E, single contingencies in portions or all of the modeled control areas of Sunflower Electric Power Corporation (SUNC), Missouri Public Service (MIPU), Westar Energy (WERE), Kansas City Power & Light (KCPL), West Plains (WEPL), Midwest Energy (MIDW), Oklahoma Gas and Electric OKGE, American Electric Power West (AEPW), Grand River Dam Authority (GRDA), Southwestern Public Service Company (SPS), Western Farmers Electric Cooperative (WFEC) and other control areas were applied and the resulting scenarios analyzed. This satisfies the ‘more probable’ contingency testing criteria mandated by NERC and the SPP criteria.

Powerflow Results

Table 3: Network Constraints

AREA	OVERLOADED ELEMENT
AECI/MIPU	MARYVILLE (AECI) - MARYVILLE (MIPU) 161KV CKT 1
KCPL/MIPU	IATAN (IATAN 11) 345/161/13.8KV TRANSFORMER CKT 1
MIPU	ALABAMA - LAKE ROAD 161KV CKT 1
WERE	ANZIO - FORT JUNCTION SWITCHING STATION 115KV CKT 1
WERE	AUBURN ROAD - JEFFREY ENERGY CENTER 230KV CKT 1
WERE	FORT JUNCTION SWITCHING STATION - MCDOWELL CREEK SWITCHING STATION 115KV CKT 2
WERE	KELLY - SOUTH SENECA 115KV CKT 1
AECI	Associated Electric Cooperative, Inc.
KCPL	Kansas City Power and Light
MIPU	Missouri Public Service
WERE	Westar Energy

Table 4: Contingency Analysis

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
09WP	AUBURN ROAD - JEFFREY ENERGY CENTER 230KV CKT 1	565	101	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12SP	ANZIO - FORT JUNCTION SWITCHING STATION 115KV CKT 1	92	155	0	WEST JUNCTION CITY - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 1
12SP	FORT JUNCTION SWITCHING STATION - MCDOWELL CREEK SWITCHING STATION 115KV CKT 2	92	116	0	FORT JUNCTION SWITCHING STATION - MCDOWELL CREEK SWITCHING STATION 115KV CKT 3
12SP	IATAN (IATAN 11) 345/161/13.8KV TRANSFORMER CKT 1	715	105	0	SPP-KCPL-02
12WP	MARYVILLE (AECI) - MARYVILLE (MIPU) 161KV CKT 1	200	145	0	SPP-KCPL-02
12WP	ALABAMA - LAKE ROAD 161KV CKT 1	153	107	0	HAWTHORN - ST JOE 345KV CKT 1
12WP	KELLY - SOUTH SENECA 115KV CKT 1	92	103	57	2003-6AT 230.00 - CONCORDIA 230KV CKT 1
17SP	None identified at this time.				

Note: When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. If the loading of a facility is higher, the level of ATC will be lower.

Conclusion

The minimum cost of interconnecting the Customer's interconnection request is estimated at $5,875,000 for Direct Assignment Facilities and Network Upgrades. At this time, the cost estimates for other Direct Assignment facilities including those in Tables 1 and 2 have not been defined by the Customer. In addition to the Customer's proposed interconnection facilities, the Customer will be responsible for installing a total of 21.6 Mvar of capacitor bank(s) in the Customer's substation for reactive support. As stated earlier, some but not all of the local projects that were previously queued are assumed to be in service in this Feasibility Study. These costs exclude upgrades of other transmission facilities that were listed in Table 3 of which are Network Constraints.

In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer to determine lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. When a facility is overloaded for more than one contingency, only the highest loading on the facility for each season is included in the table.

These interconnection costs do not include any cost that may be associated with short circuit or transient stability analysis. These studies will be performed if the Customer signs a System Impact Study Agreement. At the time of the System Impact Study, a better determination of the interconnection facilities may be available.

The required interconnection costs listed in Tables 1 and 2 and other upgrades associated with Network Constraints do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through Southwest Power Pool's OASIS.

Appendix A: Point of Interconnection Area Map

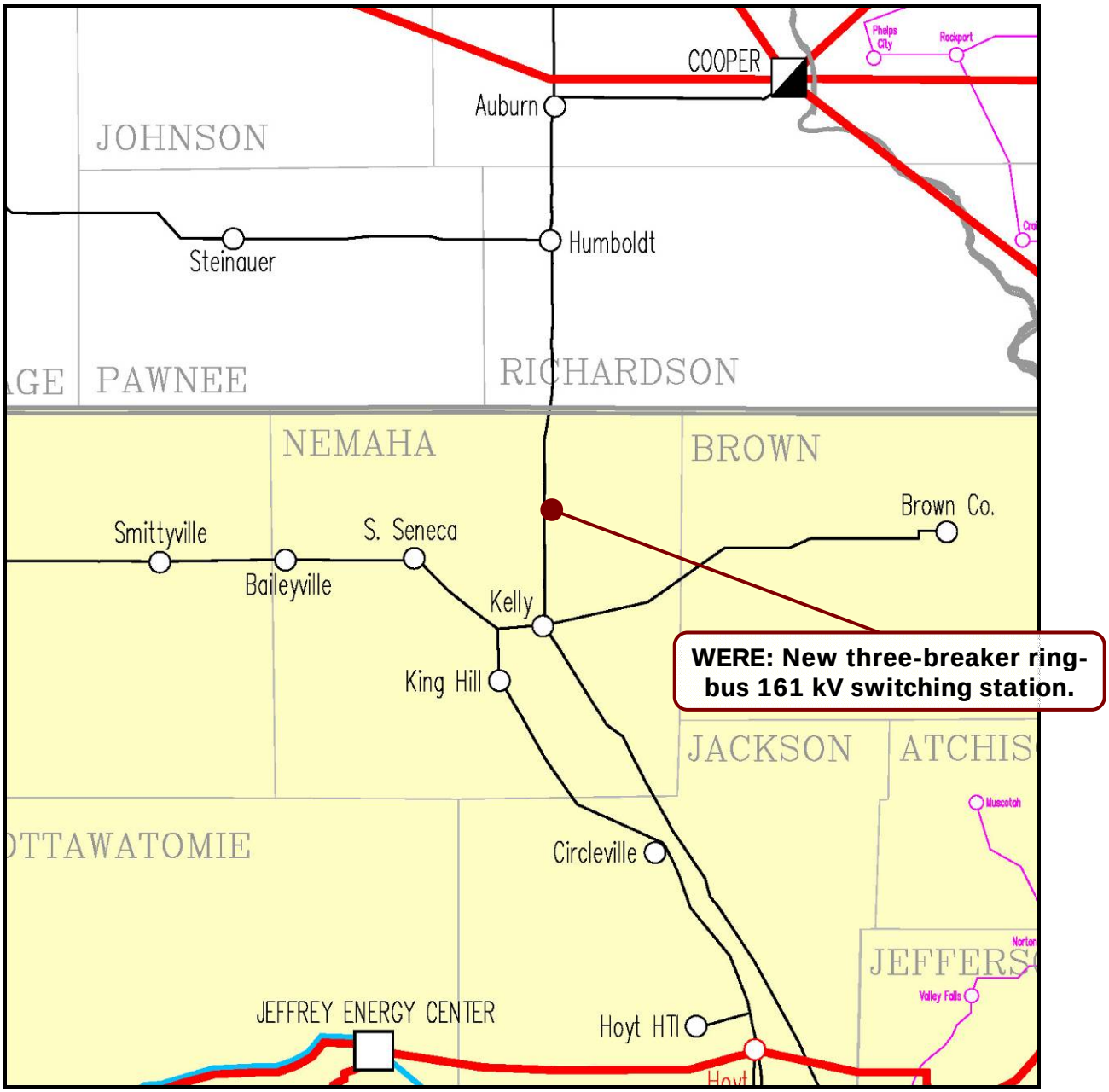

Figure 2: Point of Interconnection Area Map