SPP Southwest Power Pool

Feasibility Study For Generation Interconnection Request GEN-2006-048

SPP Tariff Studies
(#GEN-2006-048)

June, 2007

Executive Summary

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting 150 MW of wind generation within the control area of Southwestern Public Service (SPS) located in Eddy County, New Mexico. The proposed method and point of interconnection is to add an additional 115 kV line terminal at the existing Seven Rivers 230/115/69 kV Interchange, owned by SPS. The proposed in-service date is December 31, 2010.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 150 MW of generation with transmission system reinforcements within the local transmission system. In order to maintain acceptable reactive power compensation, the customer will need be required to pay for the installation of a combined total of at least 36 Mvar of 34.5 kV capacitor bank(s), of which 12 Mvar will need to be installed at the Seven Rivers Interchange on the 115 kV line terminal to the Customer Facility and the remaining 24 Mvar to be installed in the Customer's 115/34.5 kV collector substation on the Customer's 34.5 kV bus. 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 150 MW of wind generation consists of adding a new 115 kV line terminal into at the existing Seven Rivers Interchange which will include a 115 kV, 12 Mvar capacitor bank. The Customer did not propose a specific route for the 115 kV line extending to serve its 115/34.5 kV 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 150 MW of generation is $1,305,679. These costs are shown in Table 1. A 230 kV loop is proposed to be constructed from the SPS Seven Rivers substation to the SPS Potash Junction substation for 2009 completion. The completion of this 230 kV transmission is dependent upon New Mexico CCN approval. Network constraints in the local transmission systems that were identified with this loop in service are shown in Table 3. These Network constraints will have to be verified with a Transmission Service Request (TSR) and associated studies. These Network Constraints are identified 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 115 kV line from the Customer 115/34.5 kV collector substation into the Seven Rivers Interchange. This cost also does not include the Customer's 115/34.5 kV collector substation or the 34.5 kV, 24 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 SPS control area 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 Table 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.

Introduction

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting 150 MW of wind generation within the control area of Southwestern Public Service (SPS) located in Eddy County, New Mexico. The proposed method and point of interconnection is to add an additional 115 kV line terminal at the existing Seven Rivers 230/115/69 kV Interchange, owned by SPS. The proposed in-service date is December 31, 2010.

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 150 MW consist of adding a new 115 kV line terminal into the Seven Rivers 230/115/69 kV Interchange, owned by SPS. The Customer did not propose a specific route of its 115 kV line to serve its 115/34.5 kV collection system facilities. It is assumed that obtaining all necessary right-of-way for construction of the Customer 115 kV transmission line and the 115/34.5 kV collector substation will not be a significant expense.

The minimum cost for adding a 115 kV terminal to Seven Rivers is approximately $805,679. The additional cost to the Customer of installing a 115 kV, 12Mvar capacitor bank on the wind farm line terminal is approximately $500,000. 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 115 kV transmission line extending to serve its 115/34.5 kV collection facilities. This cost also does not include the Customer's 115/34.5 kV collector substations or the 34.5kV, 24 Mvar capacitor bank(s), all of which should be determined by the Customer. The Customer is responsible for these 115 – 34.5 kV facilities up to the point of interconnection. Other Network Constraints in the local 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.

A preliminary one-line drawing of the interconnection facilities is shown in Figure 1.

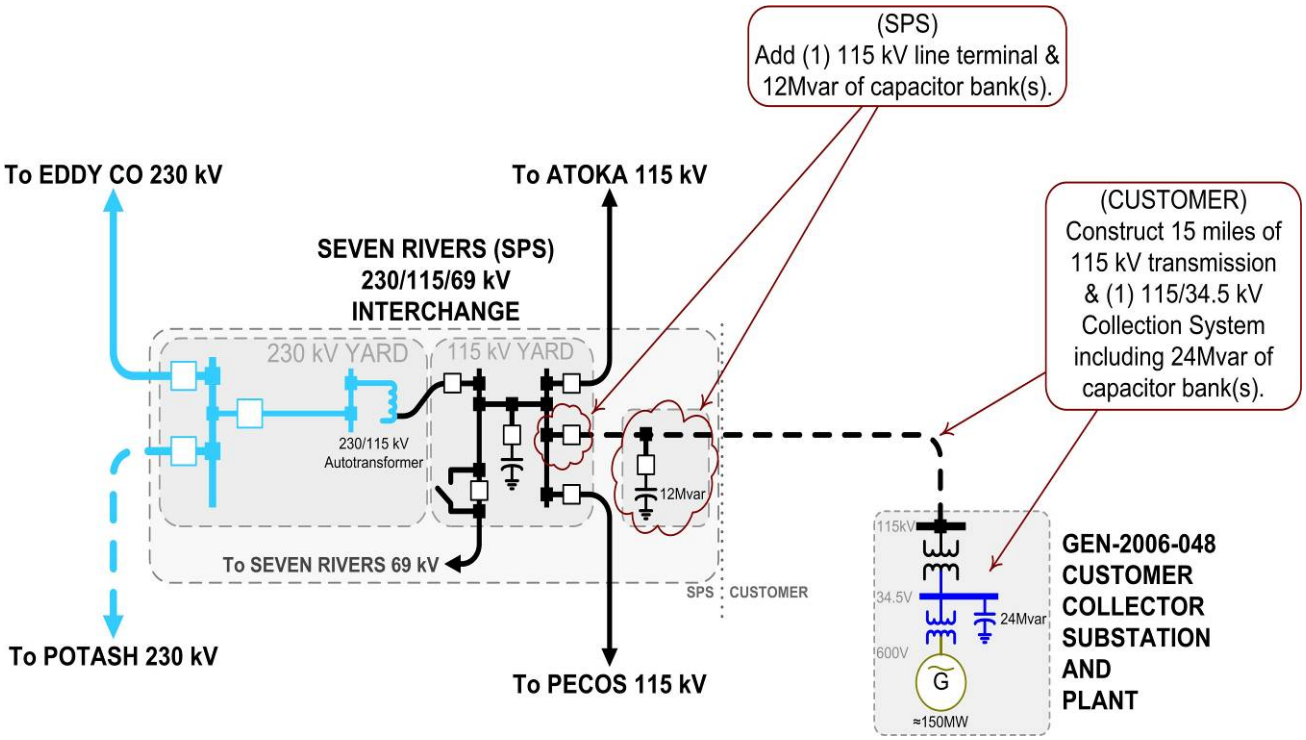

Figure 1: Proposed Method of Interconnection
(Final substation design to be determined)

Interconnection Estimated Costs

Table 1: Direct Assignment Facilities

FACILITY	ESTIMATED COST (2007 DOLLARS)
Customer – (1) 115/34.5 kV Customer collector substation facilities.	*
Customer – (1) 115 kV transmission line from Customer collector substation to the Seven Rivers Interchange.	*
Customer – 34.5 kV, 24 Mvar capacitor bank(s) to be installed in the Customer 115/34.5 kV collector substation.	*
Customer – Right-of-Way for all Customer facilities.	*
SPS – 115 kV, 12 Mvar capacitor bank(s) to be installed at the Seven Rivers Interchange on the 115 kV bus.	$500,000
SPS – Add (1) 115 kV line terminal to the Seven Rivers Interchange.	$805,679
TOTAL	*****

* *Estimates of cost to be determined.*

Table 2: Required Interconnection Network Upgrade Facilities

FACILITY	ESTIMATED COST (2007 DOLLARS)
None at this time	
TOTAL	

Powerflow Analysis

A powerflow analysis was conducted for the facility using modified versions of the 2012 summer and winter peak models, and 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, 2010. The available seasonal models used were through the 2017 Summer Peak of which is the end of the current SPP planning horizon.

SPS has plans to complete the 230 kV transmission loop in the eastern New Mexico in 2009. The proposed portion of the 230 kV transmission loop will extend from Seven Rivers substation to Potash Junction substation. The completion of this loop is contingent upon approval of a New Mexico Public Service Commission CCN. This loop has been included in the analysis of the Customer project. Also included in the analysis of the Customer project is the addition of a base load power plant in New Mexico. Given the assumptions for this study, the analysis of the Customer's project indicates that, given the requested generation level of 150 MW and location, no additional criteria violations will occur on the existing SPS transmission systems under steady state and contingency conditions in the peak seasons.

In order to maintain a zero reactive power flow exchanged at the point of interconnection, additional reactive compensation is required at the point of interconnection. The Customer will be required to install a combined total of 36 Mvar of capacitor bank(s), of which 12 Mvar will need to be installed at the Seven Rivers Interchange at 115 kV and the remaining 24 Mvar to be installed in the Customer's 115/34.5 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.

The required interconnection costs listed in Table 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.

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 (WESTAR), 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.

Table 3: Network Constraints

AREA	OVERLOADED ELEMENT
	None Identified

Table 4: Contingency Analysis

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
12SP	None Identified			150	
12WP	None Identified			150	
17SP	None Identified			150	

Conclusion

The minimum cost of interconnecting the Customer's interconnection request is estimated at $1,305,679 for Direct Assignment Facilities and Network Upgrades. At this time, the cost estimates for other Direct Assignment Facilities including those in Table 1 have not been defined by the Customer. In addition to the Customer's proposed interconnection facilities, the Customer will be responsible for installing a combined total of 36 Mvar of capacitor bank(s), of which 12 Mvar will be installed at the Seven Rivers Interchange and the remaining 24 Mvar 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 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 Table 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.

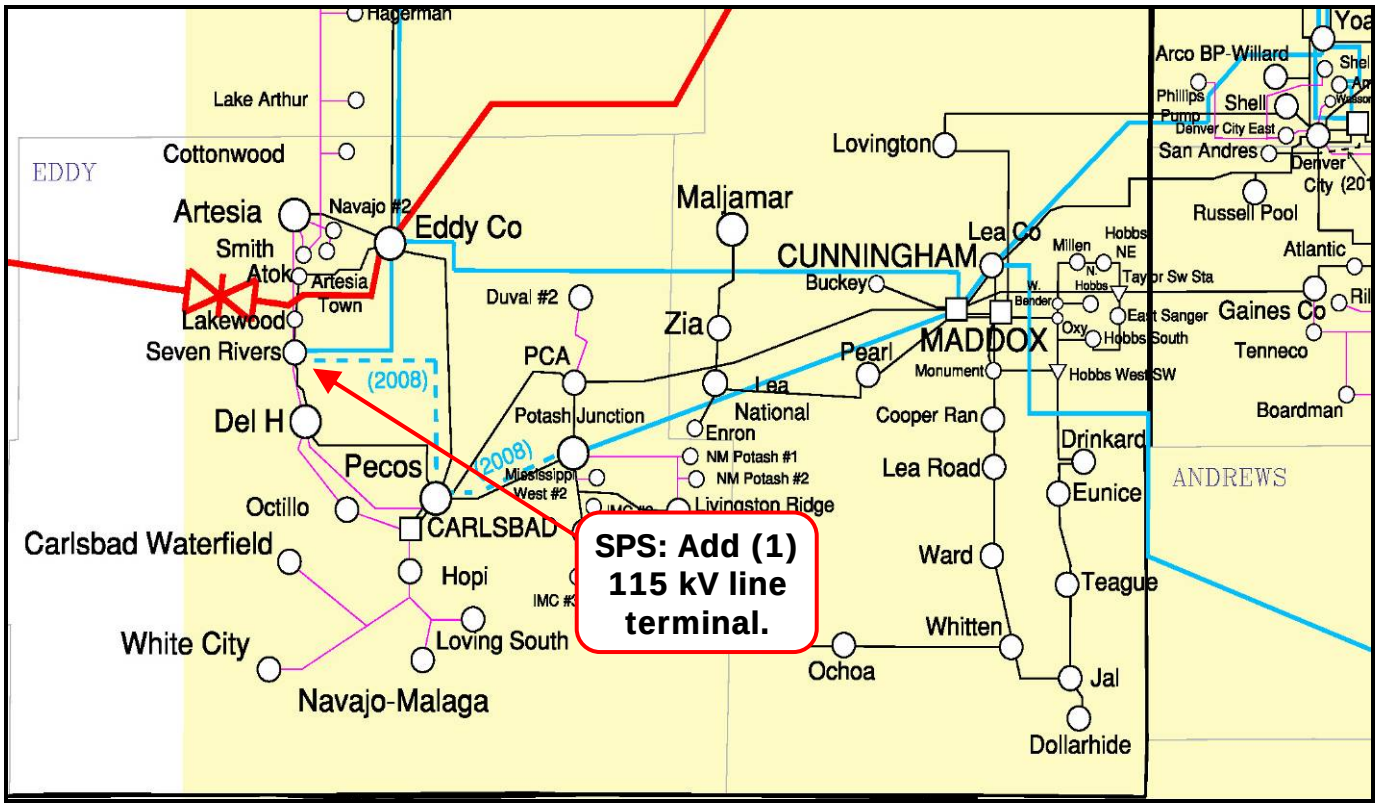

FIGURE 2. Point of Interconnection Area Map