



***Feasibility Study  
For  
Generation Interconnection  
Request  
GEN-2005-004***

***SPP Tariff Studies  
(#GEN-2005-004)***

**June 13, 2005**

## **Executive Summary**

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 250MW of wind generation within the service territory of Southwestern Public Service Company (SPS) (d/b/a Xcel Energy, Inc.) in Roosevelt County New Mexico. The proposed point of interconnection is in the existing Tolk – Eddy County 345kV line at a new switching station. This 345kV line is owned by SPS. The proposed in-service date is February 15, 2009.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 250MW of generation with transmission system reinforcements within the local transmission system. In order to maintain acceptable bus voltages in the local area, the Customer will not need to install additional reactive compensation. However, currently planned facilities including a staged capacitor bank at the location of GEN-2001-033 and a 50MVAR switched capacitor bank at the Chaves 230kV bus must be installed.

The requirements for interconnection consist of adding a new 345kV 3-breaker ring switching station with line reactors. This 345kV addition shall be constructed and maintained by SPS. The Customer did not propose a specific 345kV line extending to serve its 345-34.5kV facilities. It is assumed that obtaining all necessary right-of-way for the substation additions in the Tolk – Eddy County 345kV line will not be a significant expense.

The total cost for adding a new 345kV switching station, the required interconnection facility, is estimated at \$7,434,666 which is based on estimates provided by the SPS engineering department. Other Network Constraints in the SPS system that may be verified with a transmission service request and associated studies are listed in Table 3. These Network Constraints are in the local area of the new generation when this generation is sunk throughout the SPP footprint for the Energy Resource 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 345kV line from the Customer substation into a new SPS switching station. This cost does not include the Customer's 345-34.5kV substation.

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. When a facility is overloaded for more than 10 contingencies, then only the results with the 10 lowest values of ATC may be included in this table.

The cost and final sizing of reactors in the new interconnection facility will be determined by an Electromagnetic Transient Program (EMTP) study, at the Customer's expense, that will be conducted upon the signing of an Impact Study

Agreement. The 30 MVAR size and cost could change depending on the results of the EMTP study.

There are several other proposed generation additions in the general area of the Customer's facility. It was assumed in this preliminary analysis that these other projects within the SPS service territory 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.

### **Introduction**

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 250MW of wind generation within the service territory of SPS in Roosevelt County New Mexico. The existing Tolk – Eddy County 345kV line is owned by SPS, and the proposed generation interconnection is within SPS. The proposed point of interconnection is at a new 345kV switching station in this line. The proposed in-service date is February 15, 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 consist of adding a new 345kV switching station. This 345kV addition shall be constructed and maintained by SPS. The Customer did not propose a route of its 345kV line to serve its 345-34.5kV facilities. It is assumed that obtaining all necessary right-of-way for the new SPS 345kV switching station will not be a significant expense.

The total cost for SPS to add a new 345kV switching station with line reactors, the interconnection facility, in the Eddy County – Tolk 345kV line is estimated at \$7,434,666 which is based on estimates provided by the SPS engineering department. Other Network Constraints in the SPS system that were identified are listed in Table 3. These estimates will be refined during the development of the impact study based on the final designs. This cost does not include building 345kV line from the Customer substation into the new SPS switching station. The Customer is responsible for this 345kV line up to the point of interconnection. This cost does not include the Customer's 345-34.5kV substation and the cost estimate should be determined by the Customer.

The costs of interconnecting the facility to the SPS transmission system are listed in Table 2. **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 (2005 DOLLARS)
Customer - 345-34.5 kV Substation facilities.	*
Customer - 345kV line between Customer substation and new SPS 345kV switching station.	*
Customer - Right-of-Way for Customer Substation & Line.	*
<b>Total</b>	<b>*</b>

Note: \*Estimates of cost to be determined by Customer.

**Table 2: Required Interconnection Network Upgrade Facilities**

Facility	ESTIMATED COST (2005 DOLLARS)
SPS - New 345kV switching station in existing Eddy County – Tolk 345kV line.	\$3,837,900
SPS - Right-of-way for new SPS 345kV switching station.	47,000
SPS – 2 of 345kV 30MVAR line reactors in new 345kV switching station.	3,549,766
<b>Total</b>	<b>\$7,434,666</b>



**Table 4: Contingency Analysis Results**

Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
Eddy County Interchange 230-115kV	15SP, 52185-52293, SPS SPS-PECO, Eddy County Interchange - Seven Rivers Interchange 230kV	100.3	239	6/1/2015

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.

## **Powerflow Analysis**

A powerflow analysis was conducted for the facility using modified versions of the 2006 April, 2010 Summer and Winter Peak, and 2015 Summer Peak models. The output of the Customer's facility was offset in each model by a reduction in output of existing online SPP generation. The proposed in-service date of the generator is February 15, 2009. The available seasonal models used were through the 2015 Summer Peak of which is the end of the current SPP planning horizon.

The analysis of the Customer's project indicates that, given the requested generation level of 250MW and location, additional criteria violations will occur on the existing SPS facilities under steady state conditions in the peak seasons.

There are several other proposed generation additions in the general area of the Customer's facility. Local projects that were previously queued were assumed to be in service in this Feasibility Study. Those local projects that were previously queued and have advanced to nearly complete phases were included in this Feasibility Study.

In order to complete valid load flow solutions for various contingencies, additional reactive compensation is required in the SPS area. In order to maintain acceptable bus voltages in the local area, the Customer will not need to install additional reactive compensation. However, currently planned facilities including a staged capacitor bank at the location of GEN-2001-033 and a 50MVAR switched capacitor bank at the Chaves 230kV bus must be installed.

## **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 American Electric Power West, OG&E Electric Services, Southwestern Public Service Company and Western Farmers Electric Cooperative were applied and the resulting scenarios analyzed. This satisfies the 'more probable' contingency testing criteria mandated by NERC and the SPP criteria.

## **Conclusion**

The minimum cost of interconnecting the Customer project is estimated at \$7,434,666 for SPS's interconnection Network Upgrade facilities listed in Table 2 excluding upgrades of other transmission facilities by SPS listed in Table 3 of which are Network Constraints. At this time, the cost estimates for other Direct Assignment facilities including those in Table 1 have not been defined by the Customer. As stated earlier, local projects that were previously queued are assumed to be in service in this

Feasibility Study. At a minimum, currently planned facilities including a staged capacitor bank at the location of GEN-2001-033 and a 50MVAR switched capacitor bank at the Chaves 230kV bus must be installed.

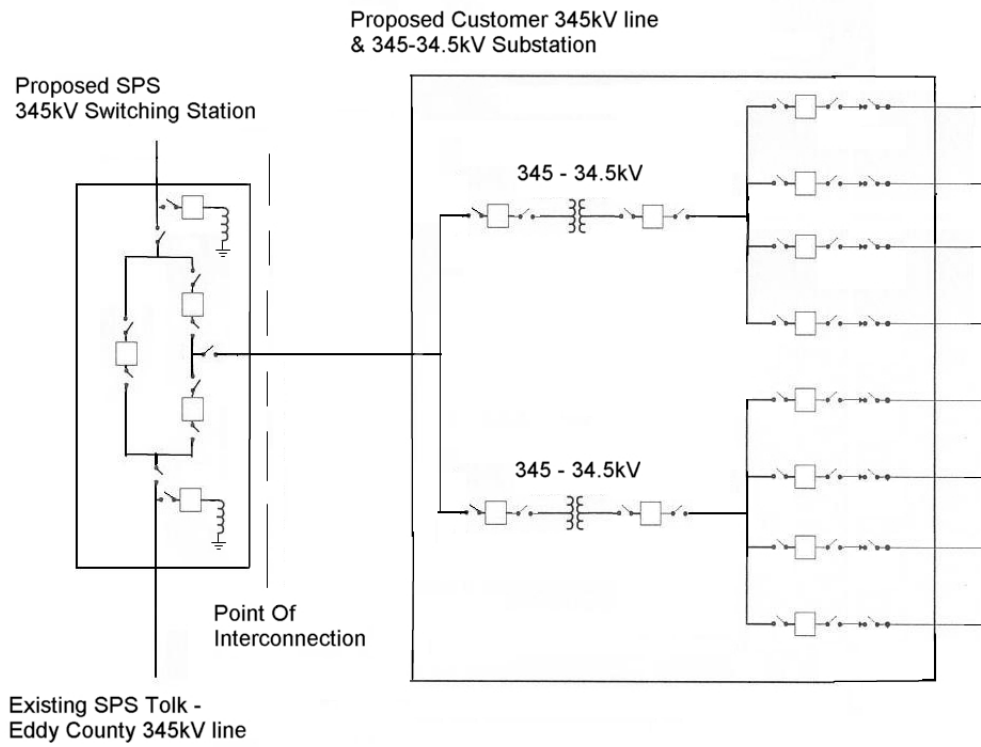
In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer to determine lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. When a facility is overloaded for more than 10 contingencies, then only the results with the 10 lowest values of ATC may be included in this table.

The cost and final sizing of the reactors in the new interconnection facility will be determined by an Electromagnetic Transient Program (EMTP) study, at the Customer's expense, that will be conducted upon the signing of an Impact Study Agreement. The 30 MVAR size and cost could change depending on the results of the EMTP study.

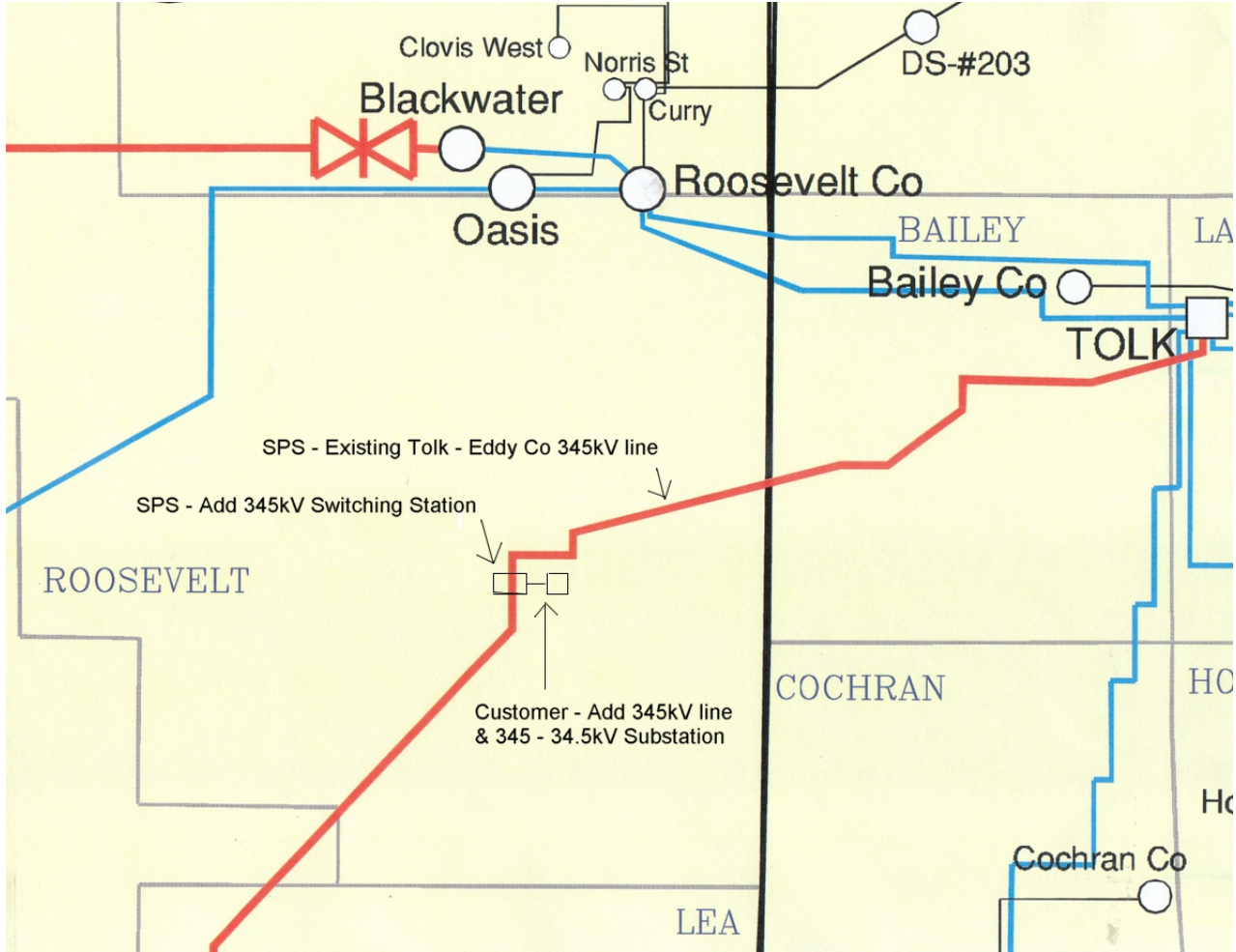
These interconnection costs do not include any cost that may be associated with short circuit or transient stability analysis. These studies will be performed if the Customer signs a System Impact Study Agreement.

The required interconnection costs listed in Table 2 and other upgrades associated with Network Constraints listed in Table 3 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 requests transmission service through Southwest Power Pool's OASIS.





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



**Figure 2: Map Of The Surrounding Area**