



***Feasibility Study  
For  
Generation Interconnection  
Request  
GEN-2003-018***

***SPP Tariff Studies  
(#GEN-2003-018)***

**May 21, 2004**

## **Executive Summary**

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting 298.5MW of wind generation in Chaves County, New Mexico within the service territory of Southwestern Public Service Company (SPS) (d/b/a Xcel Energy, Inc.). The proposed point of interconnection is in the existing Eddy County – Tolk 345kV line at a new switching station located about 55 miles east of Roswell and in Lea County near Caprock. The proposed in-service date is October 1, 2005.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 298.5MW of generation without significant transmission system reinforcements within the local SPS transmission system. In order to maintain acceptable bus voltage, the customer may need to install a switched capacitor bank on the generator substation. Dynamic Stability studies performed as part of the impact study will provide guidance as to how much reactive compensation may be needed and whether the reactive compensation can be static or must be dynamic (such as a SVC).

The requirements for interconnection consist of adding a 345kV switching station with line reactors. These 345kV additions shall be constructed and maintained by SPS. The Customer proposed a 345kV line extending west 10 miles to serve its 345-34.5kV facilities. It is assumed that obtaining all necessary right-of-way for the necessary substation additions in the SPS Eddy County – Tolk 345kV line will not be a significant expense.

The total cost for adding the 345kV switching station, the interconnection facility, is estimated at \$7,434,666 which is based on estimates provided by the SPS engineering department. In addition, a 7.2MVAR capacitor bank will be required as a Network Upgrade in SPS' Tucumcari Substation at an estimated cost of \$450,000. However, a budget item to add reactive power support at Tucumcari is being proposed in connection with another study. If that project does not materialize, the 7.2 MVAR capacitor bank will be required for this project. Therefore, the total estimated cost to the Customer is \$7,884,666. This cost does not include building 345kV line from the Customer substation into the new SPS switching station. This cost does not include the Customer's 345-34.5kV substation.

The cost and final sizing of reactors in the new interconnection facility will be determined by an EMTP study, at the customer's expense, that will be conducted upon the signing of a Facility 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 not all of these other projects will be in service. In the future when more information is available regarding the actual generation additions, then this analysis must be revised, potentially changing the requirements necessary for interconnecting this Customer's 298.5MW of generation. Those previously queued projects that have advanced to nearly complete phases were included in this feasibility study.

## Introduction

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting 298.5MW of wind generation in Chaves County, New Mexico within the service territory of Southwestern Public Service Company. The proposed point of interconnection is at a new 345kV switching station. The proposed in-service date is October 1, 2005.

## Interconnection Facilities

The primary objective of this study is to identify the system problems associated with connecting the plant to the area transmission system and estimated costs of system modifications needed to alleviate the system problems.

The Feasibility and other subsequent Interconnection Studies are designed to identify attachment facilities 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 345kV switching station with line reactors. These 345kV additions shall be constructed and maintained by SPS. The Customer proposed a 345kV line extending west 10 miles 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 the new 345kV switching station with line reactors, the interconnection facility, in the existing Eddy County – Tolk 345kV line is estimated at \$7,434,666 which is based on estimates provided by the SPS engineering department. In addition, a 7.2MVAR capacitor bank will be required as a Network Upgrade in SPS' Tucumcari Substation at an estimated cost of \$450,000. Therefore, the total estimated cost to the Customer is \$7,884,666. However, a budget item to add reactive power support at Tucumcari is being proposed in connection with another study. If that project does not materialize, the 7.2 MVAR capacitor bank will be required for this project. These estimates will be refined during the development of the impact study based on the final designs. This cost does not include building 345 kV 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 Tables 1 and 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: Network Upgrade Facilities**

| Facility   | ESTIMATED COST<br>(2004 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                        |
| SPS – New 7.2MVAR capacitor bank in an existing SPS Tucumcari substation.    | 450,000                          |
|  |                                  |
|  |                                  |
| <b>Total</b>   | <b>\$7,884,666</b>               |

**Table 2: Direct Assignment Facilities**

| Facility   | ESTIMATED COST<br>(2004 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.**

**Powerflow Analysis**

A powerflow analysis was conducted for the facility using modified versions of the 2005 April, 2005, 2007 and 2010 Summer and Winter Peak models. The output of the Customer’s facility was offset in each model by a reduction in output of existing online SPS generation. The proposed in-service date of the generator is October 1, 2005. The available seasonal models used were the 2005 April and 2005 through 2010 peak models. This is the end of the current SPP planning horizon.

The analysis of the Customer’s project indicates that, given the requested generation level of 298.5MW and location, additional criteria violations will not occur on the existing SPS facilities under steady state conditions in all seasons out to the end of SPP’s planning horizon with the exception of low voltage in the Tucumcari Substation. Therefore, a 7.2MVAR capacitor bank will be required as a Network Upgrade in SPS’ Tucumcari Substation.

There are several other proposed generation additions in the general area of the Customer's facility. Previously queued projects were not all assumed to be in service in this feasibility study. In the future when more information is available regarding the actual generation additions, then this preliminary analysis must be revised to determine the impacts of this Customer's project on other SPS transmission facilities with an appropriate amount of the customer's generation utilized in SPP with SPS generation on-line. Those previously queued projects that 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 the SPS control area were applied and the resulting scenarios analyzed. This satisfies the 'more probable' contingency testing criteria mandated by NERC and the SPP criteria.

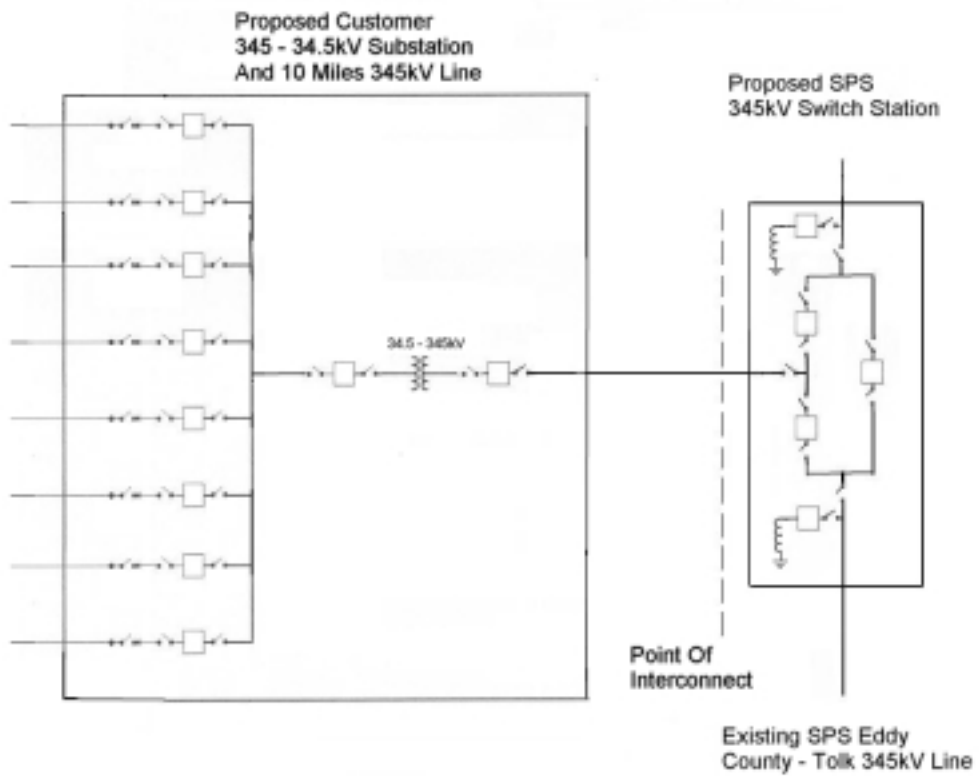
### **Conclusion**

The minimum cost of interconnecting the Customer project is estimated at \$7,884,666 for SPS' interconnection facilities and 1 additional capacitor bank at Tucumcari of which are Network Upgrades. At this time, the cost estimates for other Direct Assignment facilities have not been defined by the Customer. As stated earlier, previously queued projects were not all assumed to be in service in this feasibility study. In the future when more information is available regarding the actual generation additions, then this preliminary analysis must be revised to determine the impacts of this Customer's project on other SPS transmission facilities.

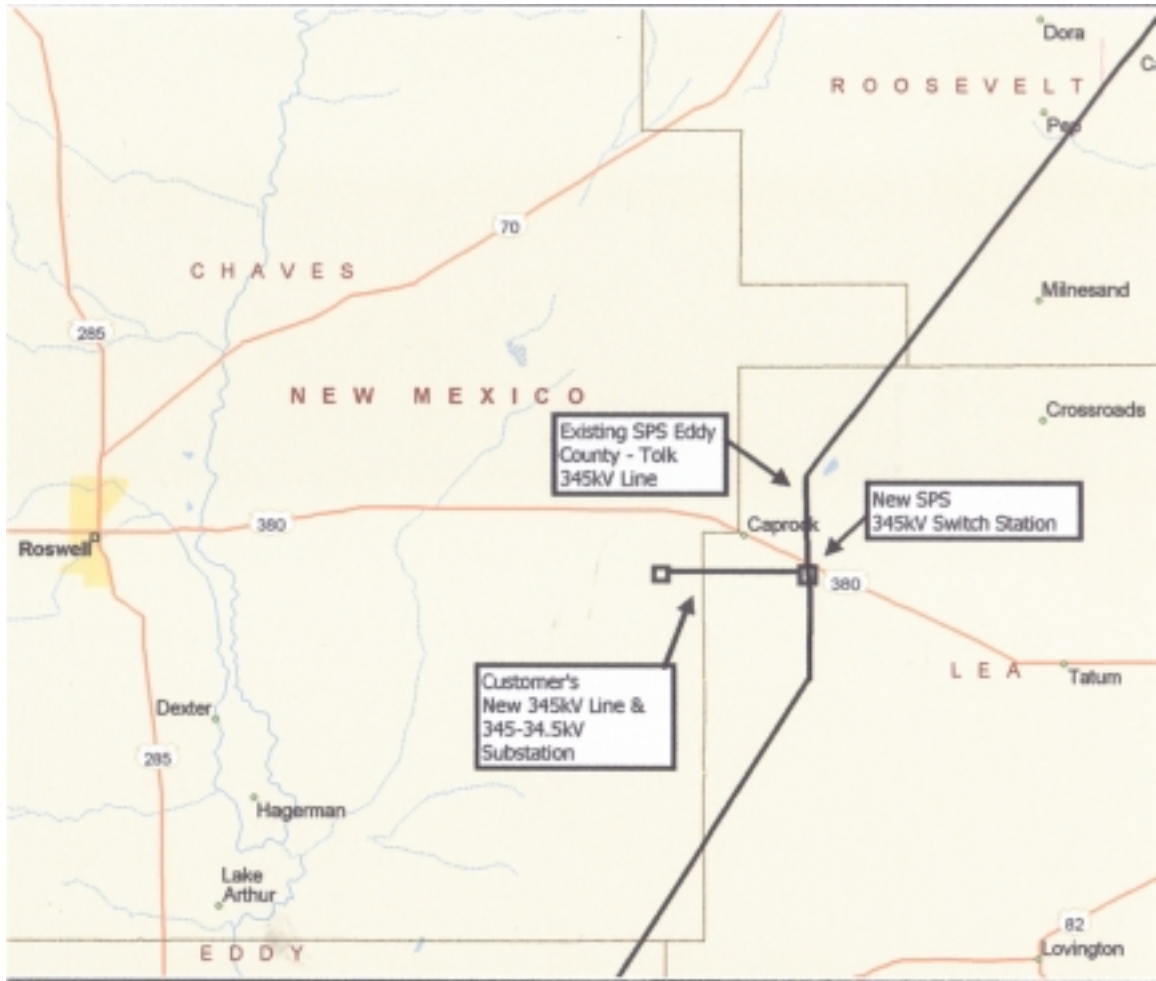
These interconnection costs do not include any cost that may be associated with short circuit or transient stability analysis. These studies will be performed if the Customer signs a system impact study agreement.

The cost and final sizing of the reactors in the new interconnection facility will be determined by an EMTP study, at the customer's expense, that will be conducted upon the signing of a Facility Study Agreement. The 30 MVAR size and cost could change depending on the results of the EMTP study.

The costs do not include any 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**