



***Feasibility Study for Generation
Interconnection Request
For
GEN-2004-009***

***SPP Tariff Studies
(#GEN-2004-009)***

January 2005

Executive Summary

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting up to 80 MW of wind generation located in Carson County, Texas within the service territory of Southwestern Public Service Company (SWPS). The proposed point of interconnection is at the Hutchinson 115kV substation (map provided in Figure 1). The proposed in-service date is May 2006.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the entire 80 MW wind farm at the Hutchinson 115kV substation with no significant transmission system reinforcements within the local Xcel Energy transmission system. An alternate point of interconnection was investigated to determine if the interconnection costs and direct assignment facilities could be reduced. The wind generation site is approximately 13 miles south of the Hutchinson 115kV substation. It was determined that an existing switch exists closer to the wind generation site that could be converted into a substation where the wind generation could interconnect. This new substation would be at the site of the existing Pomeroy switch.

It was found during the analysis that this alternate interconnection option resulted in several line overloads when the maximum wind farm output of 80 MW was placed online and contingencies were applied. To determine what generation level was possible without significant transmission system reinforcements, plant output was reduced incrementally to 12MW. At this generation level, no upgrades would be required if the interconnection is made at the new Pomeroy switch station. As this is a reduction in plant size of 85%, this interconnection option is considered undesirable at this time.

In order to maintain acceptable bus voltage, the Customer may need to install some type of reactive compensation on the wind farm collection system or in the Hutchinson 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 or other active device).

The requirements for interconnection at Hutchinson would consist of constructing an approximately 13 mile 115kV line from the wind generation site to the Hutchinson substation and connecting facilities at Hutchinson. The Customer's substation facility would be built farther than one mile from the Hutchinson substation, therefore a Certificate of Convenience and Necessity from the Public Utility Commission of Texas (PUCT) would be required. The estimated cost for the buswork and breaker bay at Hutchinson for this interconnection option is \$525,000 dollars. This estimate does not include the direct-assigned approximately 13 mile 115kV line to the wind generation site.

Introduction

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting up to 80 MW of wind generation located in Carson County, Texas within the service territory of Southwestern Public Service Company (SWPS). The proposed point of interconnection is at the Hutchinson 115kV substation (map provided in Figure 1). The proposed in-service date is May 2006.

Interconnection Point

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 proposed point of interconnection is at the Hutchinson 115kV substation, located 13 miles north of the wind generation facility site. This would require an approximately 13 mile 115kV line to interconnect the generation facility to the substation.

An alternate interconnection point relatively close to the generation facility site is located at the intersection of circuits V60 and V29. This simple switch is operated normally open, but can be closed during certain operational situations. In order to reduce the length of the Customer's interconnection line, this switch could be converted into a full substation with a terminal for the wind facility. This option was studied as an alternate interconnection point. However, numerous local overloads at nearby 115/69kV transformers and on the 69kV and 115kV systems result in a determination that this option is undesirable.

The requirements for interconnection at Hutchinson would consist of constructing an approximately 13 mile 115kV line from the wind generation site to the Hutchinson substation and connecting facilities at Hutchinson. The Customer's substation facility would be built farther than one mile from the Hutchinson substation, therefore a Certificate of Convenience and Necessity from the Public Utility Commission of Texas (PUCT) would be required. The estimated cost for this interconnection option is \$525,000 dollars dollars.

The costs of interconnecting the facility to the SWPS transmission system are listed in Table 1. **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 and Facilities Study are conducted.

Table 1: Interconnection Facilities

Hutchinson 115kV Interconnection

Facility	ESTIMATED COST (2005 DOLLARS)
Buswork at Hutchinson 115kV substation to accept interconnection to the Customer's wind farm	\$525,000
13 mile 115kV line to the Customer's wind farm	\$*
Right-of-Way for 13 mile 115kV line	\$*
Total	\$525,000 +

**This facility cost would be borne solely by the Interconnection Customer and as such, the estimated costs are not included in this 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 SWPS and surrounding transmission systems were applied and the resulting scenarios analyzed. This satisfies the 'more probable' contingency testing criteria mandated by NERC and the SPP criteria.

Powerflow Analysis

A powerflow analysis was conducted for the facility using modified versions of the 2004 Series SPP seasonal models. The models used include: 2007 Summer Peak, 2007 Winter Peak, 2010 Summer Peak, and the 2010 Winter Peak. The output of the Customer's facility was offset in each model by a reduction in output of existing online SPP generation. The in-service date of the facility is proposed to be May 2006.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the entire 80 MW wind farm at the Hutchinson 115kV substation with no significant transmission system reinforcements within the local Xcel Energy transmission system.

The alternate point of interconnection at Pomeroy Switch was investigated to determine if the interconnection costs and direct assignment facilities could be reduced. It was found during the analysis that this interconnection option resulted in several local line and transformer overloads when the maximum wind farm output of 80 MW was placed online and contingencies were applied. To determine what generation level was possible without significant transmission system reinforcements, plant output was reduced incrementally to

12MW. At this generation level, no upgrades would be required if the interconnection is made at the new Pomeroy switch station.

In order to maintain acceptable bus voltage, the Customer may need to install some type of reactive compensation on the wind farm collection system or in the interconnection (Hutchinson or the new Pomeroy) 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 or other active device).

There are several other proposed wind generation additions in the general area of the Customer's facility. Per FERC Order 2003, LGIP section 6.2, it was assumed in the analysis that all of these other projects were in service at their full requested generation output.

Conclusion

The minimum cost of interconnecting the Customer project is estimated at \$525,000 dollars. This cost is for the interconnection at the Hutchinson 115kV substation. This cost does not include the approximately 13 mile 115kV line required from the generating facility to the Hutchinson substation.

As stated earlier, previously queued projects were assumed to be in service in this feasibility study. If any of those projects are withdrawn, then this feasibility study may have to be revisited to determine the impacts of the Customer's project on other SWPS 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 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.

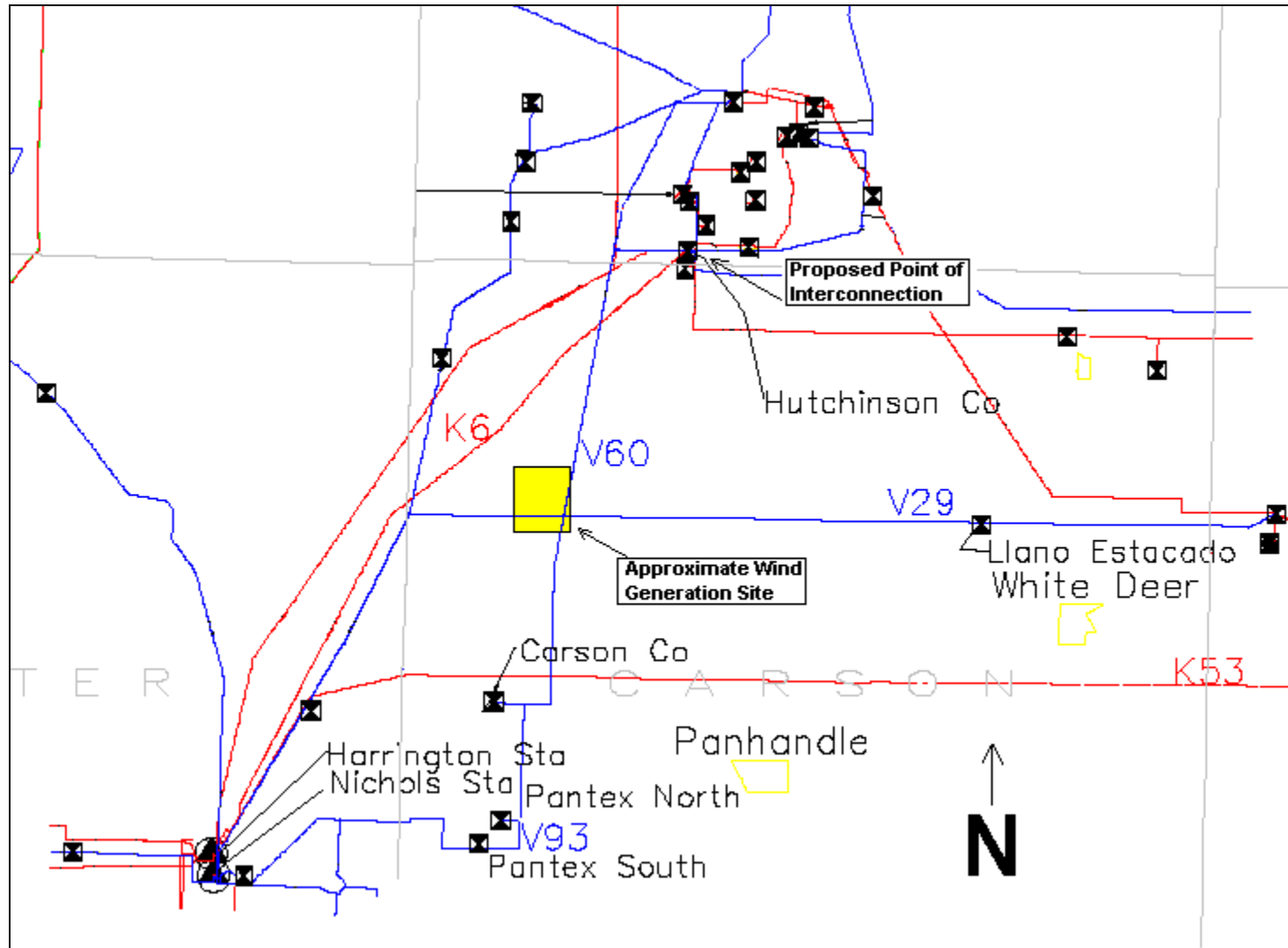


Figure 1: Map of the surrounding area