SPP Southwest Power Pool

Feasibility Study for Generation Interconnection Request For GEN-2003-013

SPP Coordinated Planning
(#GEN-2003-013)

October 2003

Executive Summary

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting 198MW of wind generation in Stevens County, Kansas within the service territory of Southwestern Public Service Company (SWPS). The proposed point of interconnection is on the 345 kV transmission line currently running between Finney substation in Kansas and Potter substation near Amarillo, Texas. The proposed in-service date is Fall 2004.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 198 MW wind farm without significant transmission system reinforcements within the local and neighboring transmission systems. In order to maintain acceptable bus voltage, the customer may need to install some type of reactive compensation near the interconnection point.

The requirements for interconnection consist of tapping the Xcel Energy 345 kV transmission circuit and building one 345 kV interconnection facility configured as a Ring-Bus. The facility will have three 345 kV line terminals. One terminal will lead to Potter County Interchange, Finney Switching Station and the Customer wind farm. To interconnect the wind farm to the proposed 345 kV interconnection facility, it is assumed that a new 345 kV transmission line may be required, with the interconnection point at the wind farm being located within one thousand feet of the new Xcel Energy 345 kV interconnection facility. A Certificate of Public Convenience from the Kansas Corporation Commission may be required.

The total cost for this 345 kV interconnection facility is estimated at $4.9 million dollars, which is based on estimates provided by the Southwestern Public Service Company engineering department. The cost includes building 345 kV from the customer substation facility into the new switch station, which was estimated at 1000 feet (this could vary once the customers substation is located) and the cost to construct the switch station including all breakers, and metering equipment. Dynamic Stability studies will provide guidance as to whether reactive compensation is necessary and whether it can be static or must be dynamic (such as a SVC). The reactive support is estimated at this time to be 50Mvar and have a cost of $1.9 million dollars. This estimate has not been included in the interconnection costs outlined in Table 1.

This feasibility study does not take into account static system reinforcements triggered by some other generation projects that are positioned ahead in the queue. In the event that these generation projects and the system reinforcements triggered by these projects are built, this feasibility study may have to be revisited, potentially changing the requirements necessary for interconnecting this customer's 198 MW wind farm.

Introduction

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting 198MW of wind generation in Stevens County, Kansas within the service territory of Southwestern Public Service Company (SWPS). The proposed point of interconnection is on the 345 kV transmission line currently running between Finney substation in Kansas and Potter substation near Amarillo, Texas. A map of the area, Figure 2, is provided at the end of this document. The proposed in-service date is Fall 2004.

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.

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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 is conducted.

Table 1: Interconnection Facilities

Facility	ESTIMATED COST (2003 DOLLARS)
New 345 kV interconnection facility[1]	$3,837,900
1000 feet of 345 kV line to the customer's wind farm[2]	$974,183
Right-of-Way	$85,000
Total	**$4,897,083**

Powerflow Analysis

A powerflow analysis was conducted for the facility using a modified version of the 2009 Summer Peak model. The output of the Customer's facility was offset in each model by a reduction in output of existing online SWPS generation. The in-service date of the facility is proposed to be Fall 2004. However, considering equipment purchase times and construction times for the substation, the Fall 2004 in-service date was considered non-feasible. The next available seasonal model for use was the 2009 Summer Peak. This is the end of the current SPP planning horizon.

The analysis of the customer's project shows that the proposed location can handle the entire 198MW of output under steady state conditions without transmission system reinforcements in all seasons out to the end of SPP's planning horizon.

There are several other proposed wind generation additions in the general area of the Customer's facility. It was assumed in the analysis that not all of these other projects were in service. 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 l hereafter referred to as NERC Table l) and its applicable standards and measurements.

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[2] The cost includes three (3) 345kV breaker line terminals, and associated equipment (control house, relays, metering, labor, etc.)

[3] Transmission line from the wind farm to the new switching station. The cost is estimated for 1000 feet of 345 kV transmission line assuming no corner structures (i.e. straight line) are required. Cost to be adjusted accordingly pending exact configuration and location of site.

Using the created models and the ACCC function of PSS\E, single contingencies in the SWPS control area were applied and the resulting scenarios analyzed. This satisfies the 'more probable' contingency testing criteria mandated by NERC and the SPP criteria. Due to the close proximity of the Customer's wind farm to the neighboring Sunflower Electric Power Corporation(SUNC), contingencies were performed and monitored in Sunflower's system as well as the local transmission system. Thus for this study, the local transmission system was defined as the SWPS system and the SUNC system.

The proposed interconnection point for the Customer's wind farm is on a tie-line between Southwestern Public Service Company and Sunflower Electric Power Corporation. Because of this particular scenario, close coordination will be required between SUNC, SWPS, and SPP in studying this generation interconnection request.

Conclusion

The minimum cost of interconnecting the Customer project is estimated at $4.9 million dollars. However, as stated earlier, some previously queued projects were assumed to not be in service in this feasibility study. If any of those projects are constructed, then this feasibility study may have to be revisited to determine the impacts of this 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. Dynamic Stability studies will provide guidance as to whether reactive compensation is necessary and whether it can be static or must be dynamic (such as a SVC). The reactive support is estimated at this time to be 50Mvar and have a cost of $1.9 million dollars.

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.

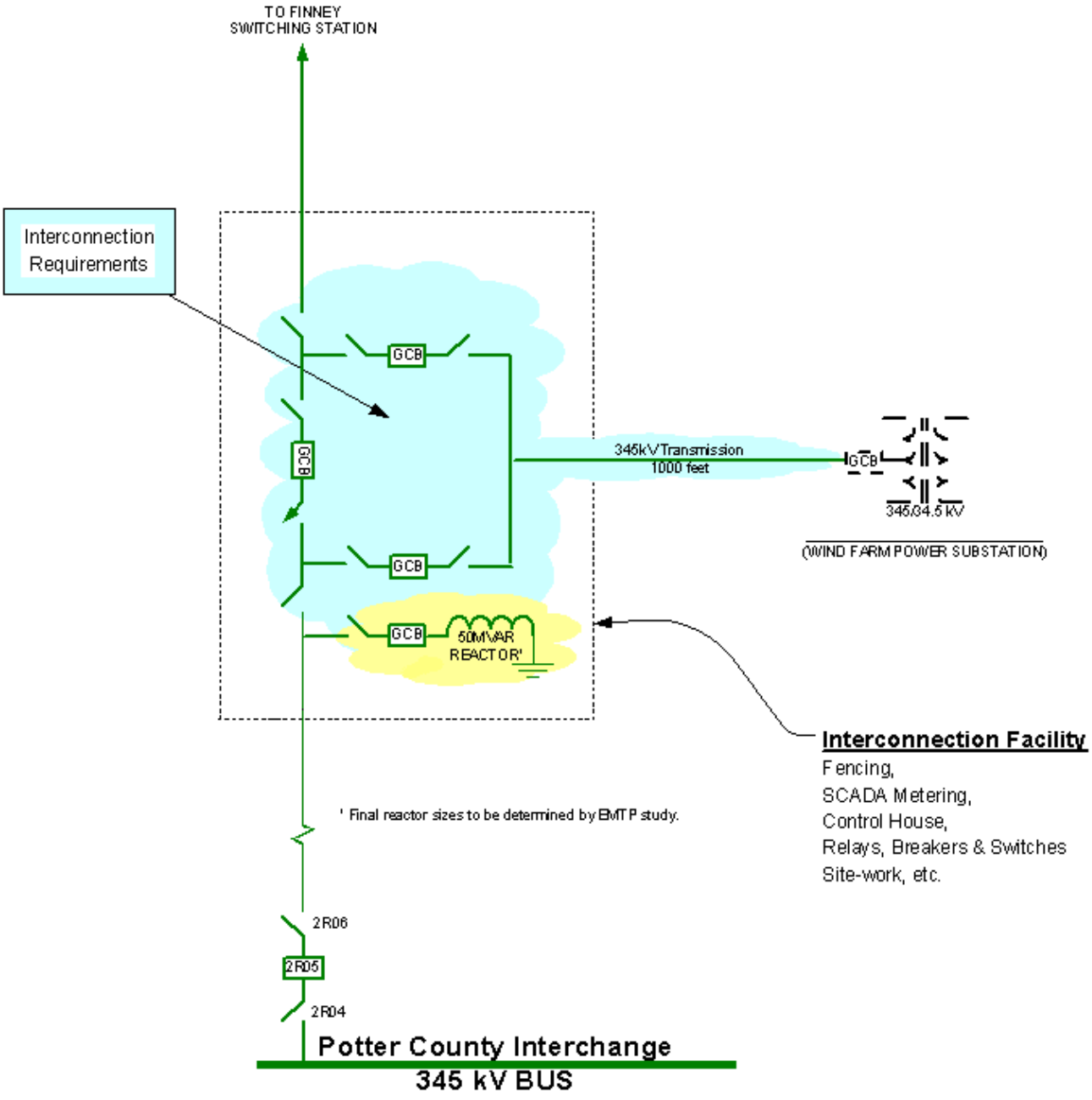

Figure 1: Proposed Interconnection

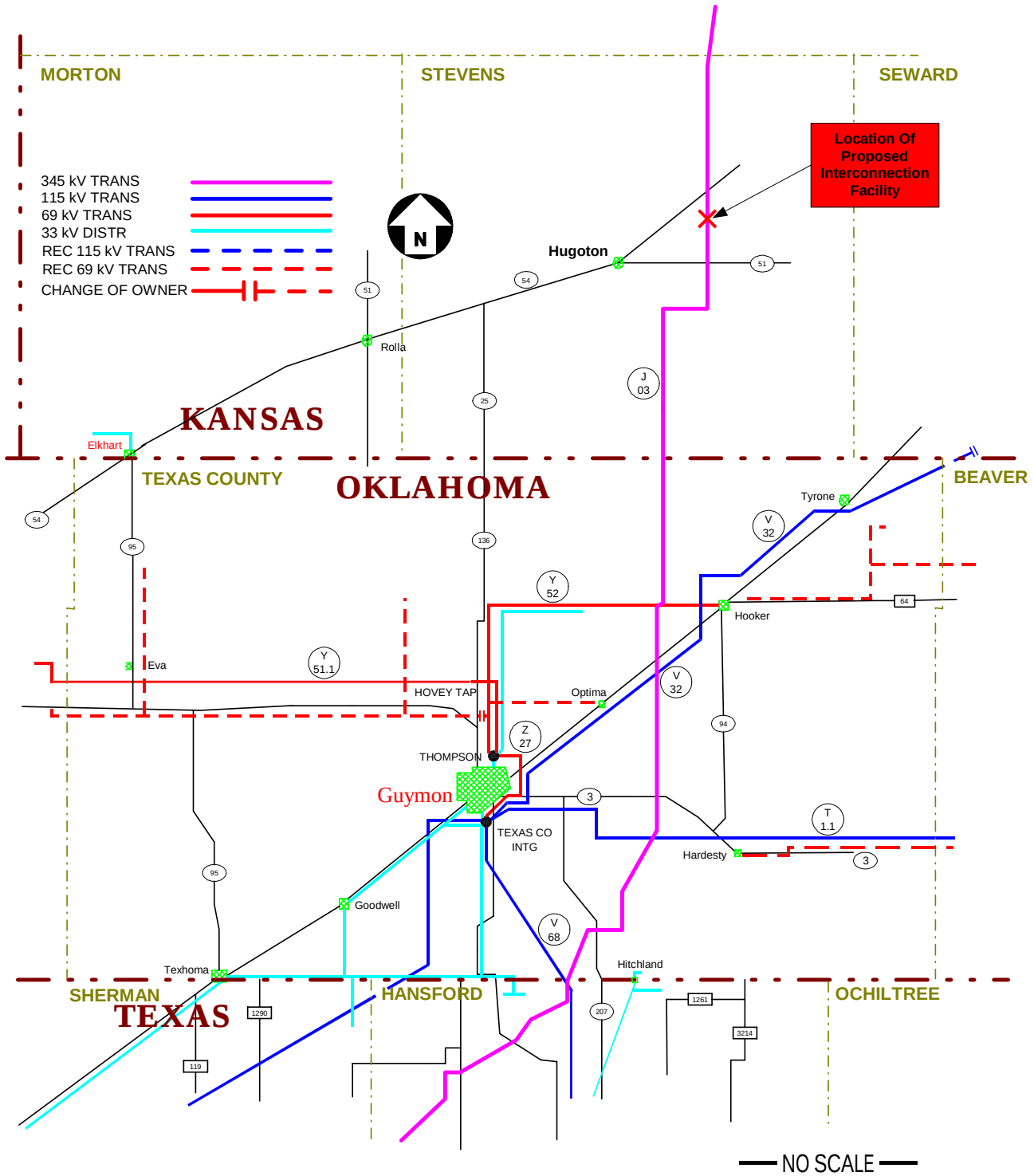

Figure 2: Map of the surrounding area