SPP Southwest Power Pool

Feasibility Study for Generation Interconnection Request For GEN-2003-015

SPP Coordinated Planning
(#GEN-2003-015)

October 2003

Executive Summary

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting up to 240 MW of wind generation in Carson County, Texas within the service territory of Southwestern Public Service Company (SWPS). The proposed point of interconnection is at the Conway distribution substation on circuit T53 (map provided in Figure 2). The proposed in-service date is August 2004.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the entire 240 MW wind farm only with significant transmission system reinforcements within the local Xcel Energy transmission system. Several line overloads were observed when the maximum wind farm output of 240 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. At 180 MW maximum wind farm output, all line overloads were eliminated.

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 Conway 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 consist of re-constructing the existing Conway substation tap as a regular bus on circuit T53. Currently, the Conway substation is a simple tap on circuit T53. The new bus substation would route circuit T53 into the substation and then out of the substation. A separate breaker terminal would be added to the new bus to accommodate the wind farm. One terminal of the new substation would lead to Kirby substation to the east, another terminal would lead to the Yarnell substation to the west, a third terminal would lead to the distribution transformer at Conway and the last breaker would lead to the Customer facility. If the Customer's substation facility will be built close to the new switch station (less than one mile), a Certificate of Convenience and Necessity from the Public Utility Commission of Texas will not be required.

The total cost for this 115kV interconnection facility is estimated at $2.26 million dollars, which is based on estimates provided by the Southwestern Public Service Company engineering department. The cost includes building 115kV from the Customer substation facility into the Conway substation, which was estimated at 1000 feet (this could vary once the Customers substation is located) and the cost to expand the Conway substation including all breakers and metering equipment.

This feasibility study does not take into account static system reinforcements triggered by 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 wind farm.

Introduction

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting up to 240 MW of wind generation in Carson County, Texas within the service territory of Southwestern Public Service Company (SWPS). The proposed point of interconnection is at the Conway substation on circuit T53 (map provided in Figure 2). The proposed in-service date is August 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)
Rebuild Conway 115kV substation to accept interconnection to the Customer's wind farm	$1,875,004
1000 feet of 115kV line to the Customer's wind farm	$342,469
Right-of-Way	$50,000
Total	**$2,267,473**

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 August 2004. However, considering equipment purchase times and construction times for the substation, the August 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 only 180 MW 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.

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.

[2] The cost includes 115kV 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 115 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.

Conclusion

The minimum cost of interconnecting the Customer project is estimated at $2.26 million dollars. However, as stated earlier, 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 the Customer's project on other SWPS transmission facilities.

In order to avoid significant transmission upgrade costs, the plant output must be limited to 180MW. At 180MW, no overloads occurred during system contingencies in the 2009 summer peak planning model.

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.

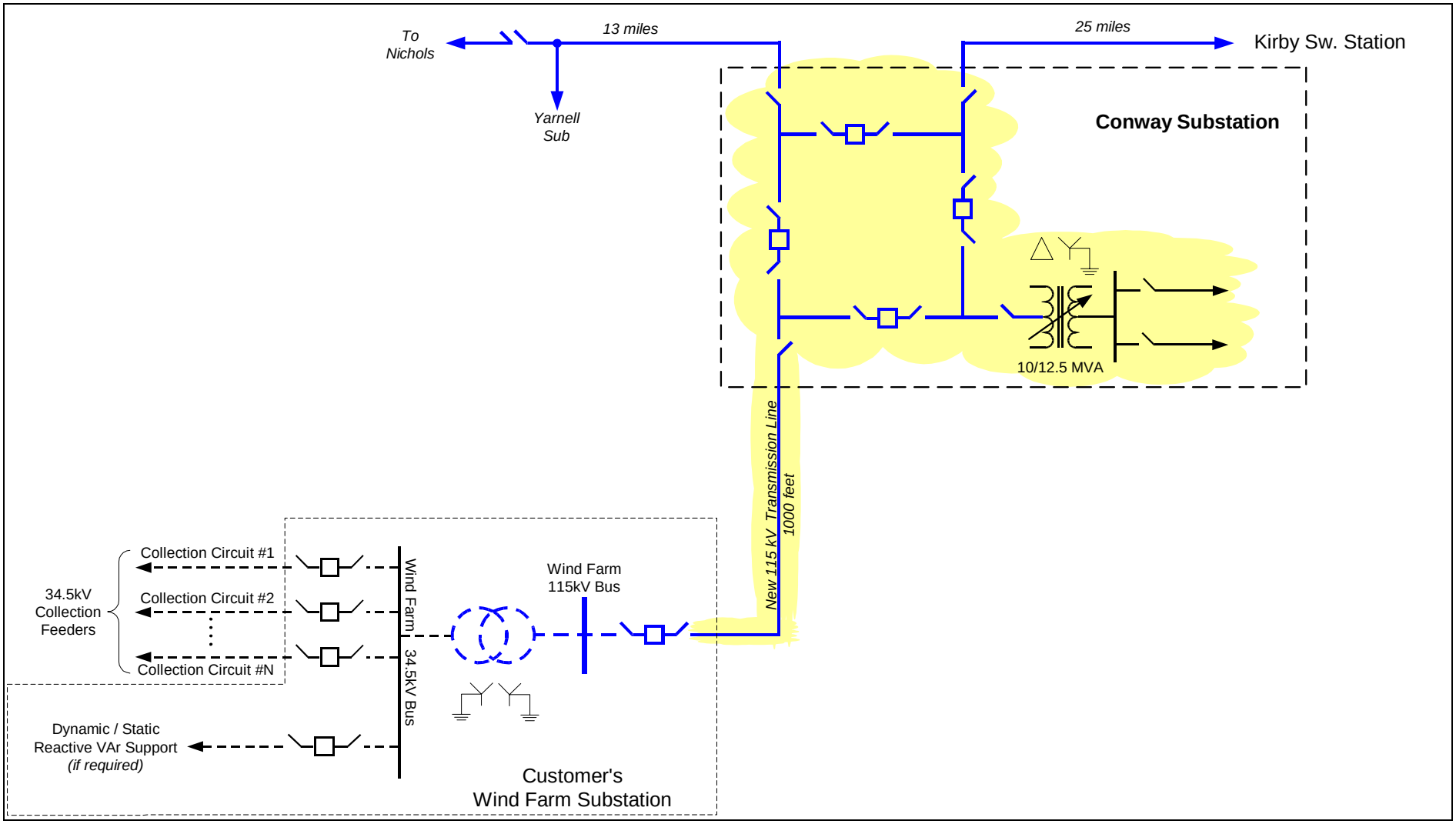

Figure 1: Proposed New Conway Substation

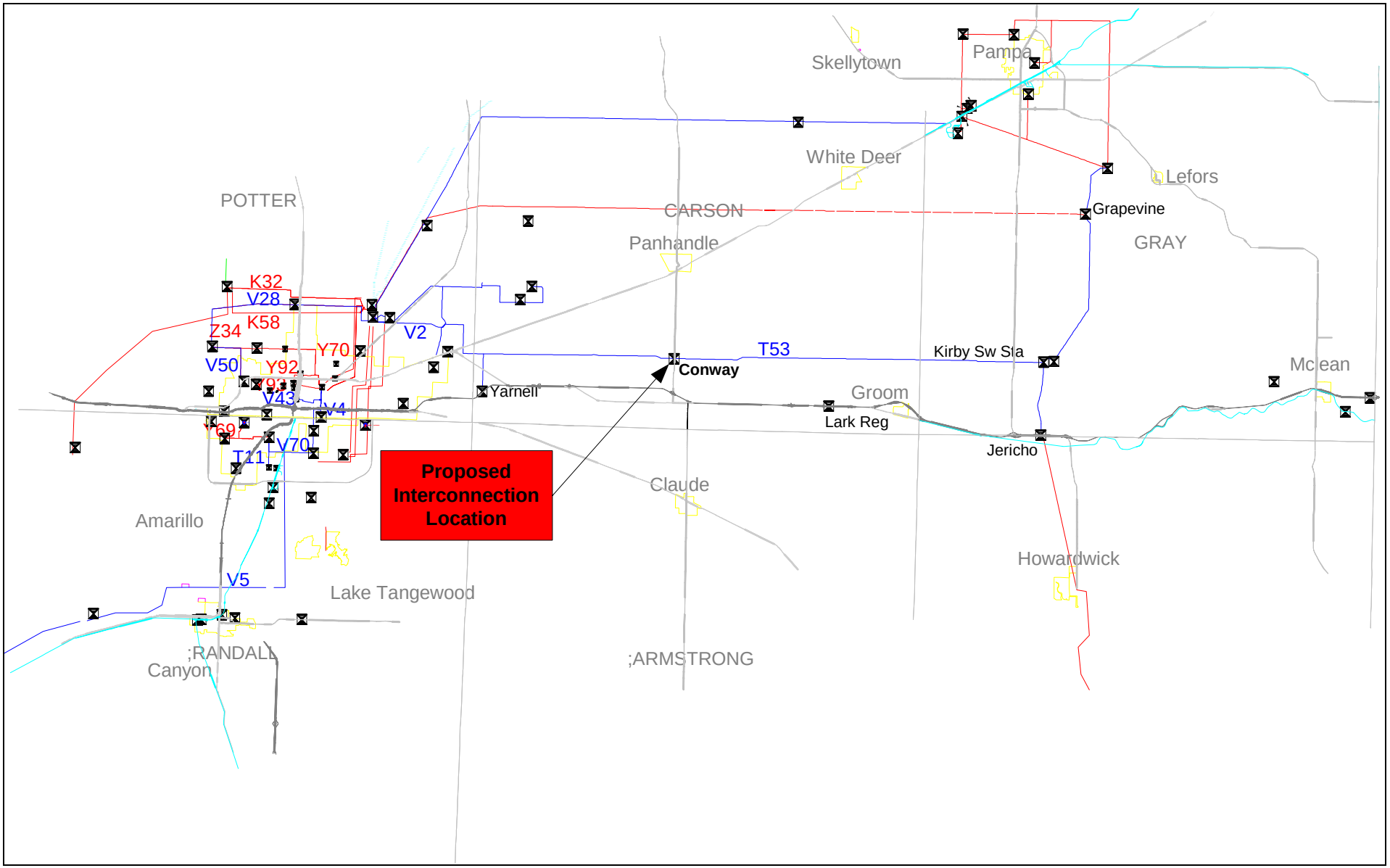

Figure 2: Map of the surrounding area