Feasibility Study for Generation Interconnection Request For >Text Omitted<

SPP Coordinated Planning
(#GEN-2002-017)

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Introduction

>Text Omitted< (Customer) has requested a Feasibility Study for interconnection of a 99MW wind generation facility in northwestern Oklahoma in Roger Mills County. The requested point of interconnection is approximately 6 miles north of the Western Farmers Electric Cooperative (WFEC) Moorewood 138kV substation, on the Moorewood – Mooreland 138 kV line. The projected in-service date of the facility is December 2003.

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 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 Customer proposed that they build a 138/34kV substation on the Mooreland - Moorewood 138kV line. The station shall be interconnected into the WFEC 138kV transmission line via a three breaker switching station to be constructed, owned, and maintained by WFEC. It is assumed the switching station will be located adjacent to the Customer's proposed substation and also that the Customer will provide the land.

The costs of interconnecting the facility to the Southwest Power Pool 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.

Powerflow Analysis

A powerflow analysis was conducted for the facility. The output of the Customer's facility was offset by a reduction in output of WFEC generation. A modified version of the 02 Series Southwest Power Pool 2003 winter peak base case was used for this study. The modified model includes transmission reservations that have been confirmed on Southwest Power Pool's OASIS since the release of the last model.

The analysis of the >Text Omitted< project shows that the proposed location cannot handle any of the 99MW of output under steady state conditions without system upgrades. There are several proposed generation additions in the general area of the Customer's facility. It was assumed in the analysis that these other projects were all in service. Upon connection of the Customer's generation project, the 138kV line from Red Hills – Elk City was immediately loaded to 155% of its normal rating. This line was loaded to 112% of its normal rating before the Customer's generation project was included. Mitigation of this overload is being researched in a previously queued impact study.

The results presented in Table 1 indicate the impact of the Customer's project on system performance in the event of single contingencies. As shown in the table, there are several potential overloads before the Customer's facility is added. These "overloads" would have to be addressed by system modifications. Due to these "overloads" and any system modifications required to address them, it is difficult to estimate what modifications (if any) would be required to permit connection of the Customer's facility. At a minimum, there would be the charges for interconnection facilities, as outlined in Table 2.

Table 1.: Overloaded Facilities under contingency

		Loading		
Critical Facility	Contingency	Pre Customer	Post Customer	% Loading*
>Omitted<-Elk City (138kV)	Taloga - Dewey (138kV)	not overloaded	228 MVA	145%
Elk City – Clinton (138kV)	O.K.U – L.E.S (345kV)	not overloaded	152 MVA	109%
Glass Mtn –>Omitted< (138kV)	Mooreland –>Omitted< (138kV)	161 MVA	161 MVA	130%
Knb Hill 138/69 Xfr	Glass Mtn – >Omitted< (138kV)	not overloaded	67.5 MVA	101%
Ft. Supply 138/69 Xfr	Ft. Supply – Iodine (138kV)	101 MVA	101 MVA	144%
Mreland – Cielo (138kV)	Glass Mtn – >Omitted< (138kV)	161 MVA	161 MVA	128%
Mreland – Knb Hill (138kV)	Glass Mtn – >Omitted<(138kV)	not overloaded	67 MVA	111%
Morewood 138/69 Xfr	Elk City –>Omitted< (138kV)	not overloaded	79 MVA	158%
Taloga – Dewey (138kV)	Elk City – >Omitted< (138kV)	not overloaded	128 MVA	105%

* % Loading based on seasonal emergency rating

Powerflow Analysis Methodology

The Southwest Power Pool (SPP) criteria states that the following conditions be met in order to maintain a reliable and stable system:

1) More probable contingency testing.... must conclude that

   a) All facility loadings are within their emergency ratings and all voltages are within their emergency limits (0.90-1.05 per unit) and
   b) Facility loadings can be returned to their normal limits within four hours

2) Less probable contingency testing ... shall conclude that

   a) Neither uncontrolled islanding, nor uncontrolled loss of large amounts of load will result.

More probable contingency testing is defined as losing any single piece of equipment or multi-circuit transmission lines. Less probable contingency testing involves the loss of any two critical pieces of equipment such as 345kV autotransformers and generating units or the loss of critical transmission lines in the same right-of-way.

The 02 Series Southwest Power Pool 2003 winter peak base case was used to model the transmission network and system loads

Using the created models and the ACCC function of PSS\E, single contingencies in the western Oklahoma zones of WFEC, Public Service Company of Oklahoma, and Oklahoma Gas & Electric were analyzed.

Table 2.: Interconnection Facilities

Facility	Transmission Owner	ESTIMATED COST (2002 DOLLARS)
Build three breaker 138kV switching station on the Mooreland – Moorewood line with terminals capable of feeding Mooreland, Moorewood, and Customer's facility	WFEC	**$1,200,000**

Conclusion

The minimum cost of interconnecting the Customer Facility is $1,200,000. The Customer's facility is not feasible as described due to constraints on the WFEC electric system. For the Customer Facility to be interconnected at its full power output of 99MW, additional interconnection facilities are required that were not priced out, but can be studied in an impact study if requested.

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.

Table 1: Impact of Customer Generation on System performance