SPP Southwest Power Pool

Feasibility Study for Interconnection of 280 MW in SPS's Control Area

SPP Transmission Planning
(#GEN-2000-003)

October, 2000

Executive Summary

A feasibility study was requested for interconnection of a merchant plant in Southwestern Public Service's control area. The plant will have a maximum output of 280 MW and the projected in service date is 2003.

The principal objective of this study is to identify the costs associated with connecting the plant to SPS's system and what system problems and potential system modifications might be necessary to facilitate the installation of the plant. For the purposes of this study, an export to Southwestern Public Service was studied. This export was accomplished by backing down a generating unit at Tolk Station by 280 MW.

Three different options of interconnection were modeled for this study. The Customer proposes to interconnect 280 MW by means of two different generating units. One is a Steam Turbine Generator (STG) modeled with a nominal output of 110 MW. The second unit is a Combustion Turbine Generator modeled with a nominal output of 170 MW.

The first option consisted of modeling the STG and CTG on separate GSUs attached to the SPS 115kV system. The second option consisted of modeling the CTG to the SPS 115kV system and the STG to the SPS 230kV system. The third option modeled both STG and CTG on the same GSU attached to a new bus tapping the SPS 345kV system. No ties were made to the SPS 230kV or 115kV systems in the third option.

The steady-state analysis considers the impact of an 280 MW transfer on transmission line loading for outages of single, double, and triple circuit transmission lines, autotransformers, and generators on the SPS and surrounding systems. The 00 Series Southwest Power Pool 2004 summer peak base case was used for this study.

The costs of interconnecting the generator to SPS's transmission system varied by option and are listed in the top sections of Tables 1-3. These costs do not include any cost that might be associated with short circuit study results or stability study results. These costs will be determined when and if a System Impact Study agreement is signed.

The analysis in this document shows that to accommodate a 280 MW transfer, transmission improvements will be required on the SPS transmission system. These improvements are listed as subsequent line items in Tables 1-3.

Study Methodology

The Southwest Power Pool (SPP) criteria state 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 00 Series Southwest Power Pool 2004 summer peak base case was used to model the transmission network and system loads. A base Southwest Power Pool Case for 2003 summer peak was not available at the time of this study.

Using the created models and the ACCC function of PSS\E, single contingencies in SPS, AEPW, OG&E, Western Resources, Sunflower Cooperative, and Midwest Energy control areas and select double contingency outages in the entire Southwest Power Pool system were analyzed.

Table 1.: Option #1: Both Generators connected to 115kV Bus

SYSTEM IMPROVEMENT	ESTIMATED COST (2000 DOLLARS)
Add 115kV terminal at existing SPS substation	$485,000
Build approx. 1 mile of 115kV transmission line	$304,000
Subtotal for interconnection	**$789,000**
Rebuild and Reconductor Georgia-Osage 115kV line	$1,920,000
Build new Randall-Osage 115kV line ckt. 2	$225,000
Add new 115kV terminal at Osage Substation and modify relay terminals at 3 other subs	$450,000
Subtotal for Transmission Service Improvements	**$2,595,000**
TOTAL	**$3,384,000**

Table 2.: Option #2 : STG connected to 230kV Bus: CTG connected to 115kV bus

SYSTEM IMPROVEMENT	ESTIMATED COST (2000 DOLLARS)
Add 115kV terminal at existing SPS substation	$485,000
Build approx. 1 mile of 115kV transmission line	$258,000
Add 230kV transmission line terminal and reconfigure existing SPS Substation	$1,630,000
Build approximately 1 mile of 230kV transmission line	$238,000
Subtotal for interconnection	**$2,611,000**
Rebuild and Reconductor Georgia-Osage 115kV line	$1,920,000
Build new Randall-Osage 115kV line ckt. 2	$225,000
Add new 115kV terminal at Osage Substation and modify relay terminals at 3 other subs	$450,000
Subtotal for Transmission Service Improvements	**$2,595,000**
TOTAL	**$5,206,000**

Table 3.: Both Generators Connected to 345kV Bus

SYSTEM IMPROVEMENT	ESTIMATED COST (2000 DOLLARS)
Construct new 345kV switching substation with reactors.	$3,600,000
Construct 4 miles of 345kV line	$1,150,000
Subtotal for interconnection	**$4,750,000**
Reconductor Plymell-Holcomb 115kV line	$2,100,000
Subtotal for Transmission Service Improvements	**$2,100,000**
TOTAL	**$6,850,000**