



***Feasibility Study  
For  
Generation Interconnection  
Request  
GEN-2007-005***

***SPP Tariff Studies  
(#GEN-2007-005)***

**August, 2007**

## **Executive Summary**

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 200 MW of wind generation within the control area of Southwestern Public Service (SPS) located in Hutchinson County, Texas. The proposed method and point of interconnection is to add a new 115 kV breaker and terminal at the existing Pringle Interchange, owned by SPS. The proposed in-service date is December 1, 2008.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 200 MW of generation with transmission system reinforcements within the local transmission system. In order to maintain acceptable reactive power compensation, the customer will be required to pay for the installation of a combined total of at least 34.5 Mvar of 34.5 kV capacitor bank(s) to be installed in the Customer's collector substation. Dynamic Stability studies performed as part of the System Impact Study will provide additional guidance as to whether the required reactive compensation can be static or a portion must be dynamic (such as a SVC).

The requirement to interconnect the 200 MW of wind generation into the existing Pringle Interchange consists of adding a new 115 kV breaker and terminal. The Customer did not propose a specific route for the 115 kV line extending to serve its 115/34.5 kV facilities. It is assumed that obtaining all necessary right-of-way for the new transmission line to serve its facilities will not be a significant expense.

The total minimum cost for building the required facilities for this 200 MW of generation is \$600,000. These costs are shown in Table 2. Network constraints in the American Electric Power West (AEPW), Midwest Energy (MIDW), SPS, West Plains (WEPL), and Western Farmers Electric Cooperative (WFEC) transmission systems that were identified are shown in Table 3. These Network constraints will have to be verified with a Transmission Service Request (TSR) and associated studies. Network Constraints are in the local area of the new generation when this generation is sunk throughout the SPP footprint for the Energy Resource (ER) Interconnection request. With a defined source and sink in a Transmission Service Request, this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements. This cost does not include building the 115 kV line from the Customer 115/34.5 kV collector substation into the point of interconnection. This cost also does not include the Customer's 115/34.5 kV collector substation or the 34.5 kV, 34.5 Mvar capacitor bank(s).

In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer for future analyses including the determination of lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. If the loading of a facility is higher, the level of ATC will be lower.

There are several other proposed generation additions in the general area of the Customer's facility. It was assumed in this preliminary analysis that not all of these other projects within the SPS control area will be in service. Those previously queued projects that have advanced to nearly complete phases were included in this Feasibility Study. In the event that another request for a generation interconnection with a higher priority withdraws, then this request may have to be re-evaluated to determine the local Network Constraints.

The required interconnection costs listed in Tables 1 and 2 and other upgrades associated with Network Constraints do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through Southwest Power Pool's OASIS.

## **Introduction**

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 200 MW of wind generation within the control area of Southwestern Public Service (SPS) located in Hutchinson County, Texas. The proposed method and point of interconnection is to add a new 115 kV breaker and terminal at the existing Pringle Interchange, owned by SPS. The proposed in-service date is December 1, 2008.

## **Interconnection Facilities**

The primary objective of this study is to identify the system problems associated with connecting the plant to the area transmission system. The Feasibility and other subsequent Interconnection Studies are designed to identify attachment facilities, Network Upgrades and other Direct Assignment Facilities needed to accept power into the grid at the interconnection receipt point.

The requirements for interconnection of the 200 MW consist of adding a new 115 kV breaker and terminal at the existing Pringle Interchange, owned by SPS. The Customer did not propose a specific route of its 115 kV line to serve its 115/34.5 kV collection system facilities. It is assumed that obtaining all necessary right-of-way for construction of the Customer 115 kV transmission line and the 115/34.5 kV collector substation will not be a significant expense.

The minimum cost for adding a new breaker and terminating the transmission line serving GEN-2007-005 facilities is estimated at \$600,000. These costs are listed in Tables 1 and 2. These estimates will be refined during the development of the System Impact Study based on the final designs. This cost does not include building the Customer's 115 kV transmission line extending from the point of interconnection to serve its 115/34.5 kV collection facilities. This cost also does not include the Customer's 115/34.5 kV collector substation or the 34.5 Mvar of capacitor bank(s), all of which should be determined by the Customer. The Customer is responsible for these 115 – 34.5 kV facilities up to the point of interconnection. Other Network Constraints in the American Electric Power West (AEPW), Midwest Energy (MIDW), SPS, West Plains (WEPL), and Western Farmers Electric Cooperative (WFEC) transmission systems that were identified are shown in Table 3.

**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.

A preliminary one-line drawing of the interconnection facilities are shown in Figure 1.

# Interconnection Estimated Costs

**TABLE 1: Direct Assignment Facilities**

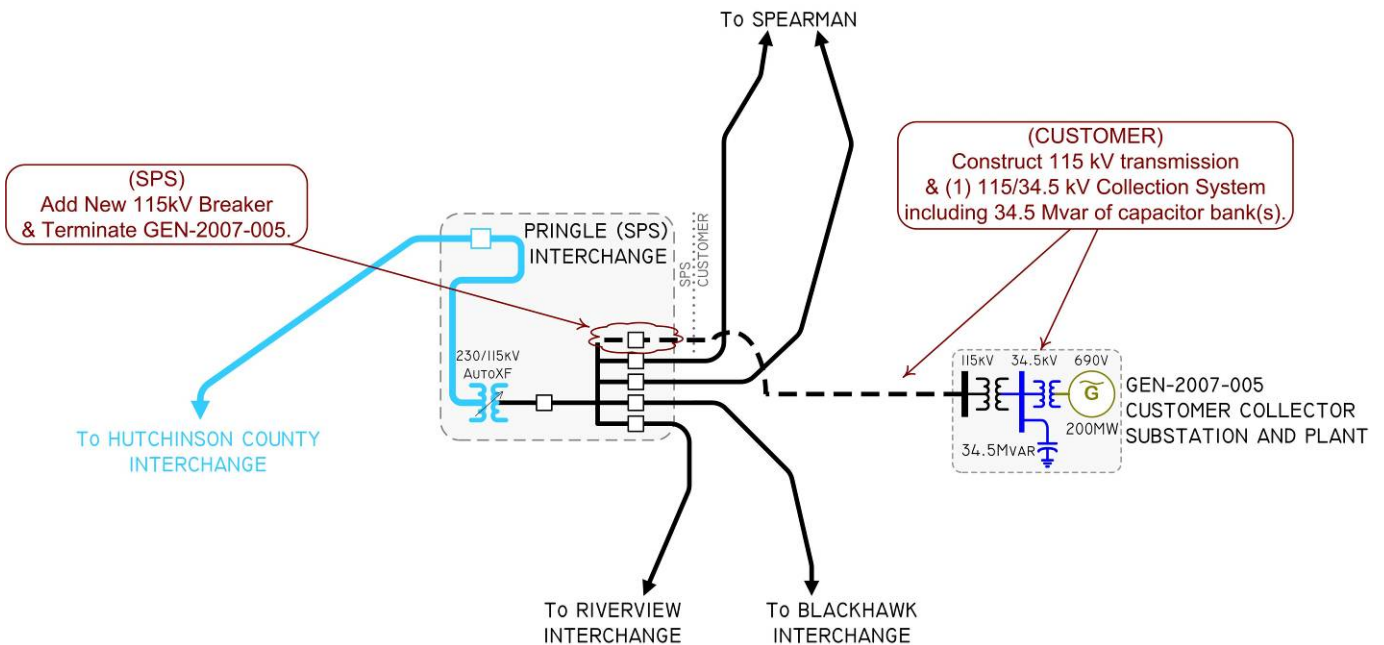
FACILITY	ESTIMATED COST (2007 DOLLARS)
Customer – (1) 115/34.5 kV Customer collector substation facilities.	*
Customer – (1) 115 kV transmission line from Customer collector substation to the Pringle Interchange.	*
Customer – 34.5 kV, 34.5 Mvar capacitor bank(s) to be installed in the Customer 115/34.5 kV collector substation.	*
Customer – Right-of-Way for all Customer facilities.	*
SPS – (1) 115 kV breaker and terminal for GEN-2007-005 at Pringle Interchange.	\$600,000
<b>TOTAL</b>	<b>*</b>

\* Estimates of cost to be determined.

**TABLE 2: Required Interconnection Network Upgrade Facilities**

FACILITY	ESTIMATED COST (2007 DOLLARS)
None identified at this time.	*
<b>TOTAL</b>	<b>*</b>

\* Estimates of cost to be determined.



**FIGURE 1: Proposed Method of Interconnection (Final design to be determined)**

## **Powerflow Analysis**

A powerflow analysis was conducted for the facility using modified versions of the 2008 winter peak model, the 2009 and 2012 summer and winter peak models, and the 2017 summer peak model. The output of the Customer's facility was offset in each model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource (ER) Interconnection request. The proposed in-service date of the generation is December 1, 2008. The available seasonal models used were through the 2017 Summer Peak of which is the end of the current SPP planning horizon.

The analysis of the Customer's project indicates that, given the requested generation level of 200 MW and location, additional criteria violations will occur on the existing AEPW, MIDW, SPS, WEPL, and WFEC transmission systems under steady state and contingency conditions in the peak seasons. Table 3 lists these overloaded facilities.

In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer to determine lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. When a facility is overloaded for more than one contingency, only the highest loading on the facility for each season is included in the table.

Numerous voltage violations for load serving buses within the SPP footprint were also observed for the some of the contingencies listed in Table 3. These voltage violations have not been listed in this report.

In order to maintain a zero reactive power flow exchanged at the point of interconnection, additional reactive compensation is required. The Customer will be required to install a combined total of 34.5 Mvar of capacitor bank(s) in the Customer's 115/34.5 kV collector substation on the 34.5 kV bus. Dynamic Stability studies performed as part of the System Impact Study will provide additional guidance as to whether the reactive compensation can be static or a portion must be dynamic (such as a SVC or STATCOM). It is possible that an SVC or STATCOM device will be required at the Customer facility because of FERC Order 661A Low Voltage Ride-Through Provisions (LVRT) which went into effect January 1, 2006. FERC Order 661A orders that wind farms stay on-line for 3-phase faults at the point of interconnection even if that requires the installation of a SVC or STATCOM device.

There are several other proposed generation additions in the general area of the Customer's facility. Some of the local projects that were previously queued were assumed to be in service in this Feasibility Study. Not all local projects that were previously queued and 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 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 portions or all of the modeled control areas of Sunflower Electric Power Corporation (SUNC), Missouri Public Service (MIPU), Westar (WESTAR), Kansas City Power & Light (KCPL), West Plains (WEPL), Midwest Energy (MIDW), Oklahoma Gas and Electric OKGE, American Electric Power West (AEPW), Grand River Dam Authority (GRDA), Southwestern Public Service Company (SPS), Western Farmers Electric Cooperative (WFEC) and other control areas were applied and the resulting scenarios analyzed. This satisfies the 'more probable' contingency testing criteria mandated by NERC and the SPP criteria.

## Powerflow Results

**TABLE 3: Network Constraints**

AREA	OVERLOADED ELEMENT
AEPW	CLINTON JUNCTION - ELK CITY 138KV CKT 1
AEPW	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
AEPW	SHAMROCK (SHAMRCK1) 115/69/14.4KV TRANSFORMER CKT 1
AEPW	SHAMROCK (SHAMRCK2) 138/69/14.4KV TRANSFORMER CKT 1
AEPW/SPS	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
AEPW/SPS	MCLEAN RURAL SUB - SHAMROCK 115KV CKT 1
AEPW/WFEC	ALTUS JCT TAP - RUSSELL 138KV CKT 1
AEPW/WFEC	LAKE PAULINE - RUSSELL 138KV CKT 1
SPS	2005-02 115.00 - RIVERVIEW INTERCHANGE 115KV CKT 1
SPS	CANYON EAST SUB - OSAGE SWITCHING STATION 115KV CKT 1
SPS	CHERRY SUB - NICHOLS STATION 115KV CKT 1
SPS	CHERRY SUB - NORTHWEST INTERCHANGE 115KV CKT 1
SPS	EAST PLANT INTERCHANGE - MANHATTAN SUB 115KV CKT 1
SPS	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1
SPS	EAST PLANT INTERCHANGE - WHITAKER SUB 115KV CKT 1
SPS	GRAPEVINE INTERCHANGE - KIRBY SWITCHING STATION 115KV CKT 1
SPS	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1
SPS	KIRBY SWITCHING STATION - MCCLELLAN SUB 115KV CKT 1
SPS	MANHATTAN SUB - MANHATTAN TAP 115KV CKT 1
SPS	MANHATTAN TAP - OSAGE SWITCHING STATION 115KV CKT 1
SPS	MCCLELLAN SUB - MCLEAN RURAL SUB 115KV CKT 1
SPS	NICHOLS STATION - WHITAKER SUB 115KV CKT 1
SPS	OSAGE SWITCHING STATION - PIERCE STREET TAP 115KV CKT 1
SPS	PALO DURO SUB - RANDALL COUNTY INTERCHANGE 115KV CKT 1
SPS	RANDALL COUNTY INTERCHANGE 230/115KV TRANSFORMER CKT 1
SPS	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1
SPS/WEPL	EAST LIBERAL - TEXAS COUNTY INTERCHANGE PHASE SHIFT TFMR 115KV CKT 1
AEPW	American Electric Power West
MIDW	Midwest Energy
SPS	Southwestern Public Service
WEPL	West Plains
WFEC	Western Farmers Electric Cooperative

**TABLE 4: Contingency Analysis**

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
08WP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	140	206	0	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
08WP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	160	0	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1
08WP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	112	156	0	BASE CASE
08WP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	153	0	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1
08WP	LAKE PAULINE - RUSSELL 138KV CKT 1	72	139	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
08WP	KIRBY SWITCHING STATION - MCCLELLAN SUB 115KV CKT 1	107	119	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
08WP	MCCLELLAN SUB - MCLEAN RURAL SUB 115KV CKT 1	107	118	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
08WP	MCLEAN RURAL SUB - SHAMROCK 115KV CKT 1	107	112	0	SPP-SWPS-02
08WP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	319	112	34	BASE CASE
08WP	CLINTON JUNCTION - ELK CITY 138KV CKT 1	143	121	43	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1
08WP	ALTUS JCT TAP - RUSSELL 138KV CKT 1	72	113	73	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
09SP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	128	197	0	CONWAY SUB - YARNELL SUB 115KV CKT 1
09SP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	144	0	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	112	135	0	BASE CASE
09SP	KIRBY SWITCHING STATION - MCCLELLAN SUB 115KV CKT 1	90	134	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
09SP	MCCLELLAN SUB - MCLEAN RURAL SUB 115KV CKT 1	90	133	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
09SP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	132	0	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	MCLEAN RURAL SUB - SHAMROCK 115KV CKT 1	90	123	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
09SP	SHAMROCK (SHAMRCK1) 115/69/14.4KV TRANSFORMER CKT 1	69	121	0	NORTH MEMPHIS REC - NW MEMPHIS 69KV CKT 1
09SP	PALO DURO SUB - RANDALL COUNTY INTERCHANGE 115KV CKT 1	99	120	0	AMARILLO SOUTH INTERCHANGE - SWISHER COUNTY INTERCHANGE 230KV CKT 1
09SP	LAKE PAULINE - RUSSELL 138KV CKT 1	72	117	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
09SP	SHAMROCK (SHAMRCK2) 138/69/14.4KV TRANSFORMER CKT 1	69	111	0	NORTH MEMPHIS REC - NW MEMPHIS 69KV CKT 1
09SP	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1	161	109	0	EAST PLANT INTERCHANGE - MANHATTAN SUB 115KV CKT 1
09SP	EAST PLANT INTERCHANGE - MANHATTAN SUB 115KV CKT 1	161	108	0	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1
09SP	CLINTON JUNCTION - ELK CITY 138KV CKT 1	143	113	50	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	MANHATTAN TAP - OSAGE SWITCHING STATION 115KV CKT 1	161	103	78	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1
09SP	NICHOLS STATION - WHITAKER SUB 115KV CKT 1	249	102	129	CHERRY SUB - NICHOLS STATION 115KV CKT 1
09SP	CHERRY SUB - NICHOLS STATION 115KV CKT 1	161	101	161	NICHOLS STATION - WHITAKER SUB 115KV CKT 1
09SP	CANYON EAST SUB - OSAGE SWITCHING STATION 115KV CKT 1	99	101	164	BUSHLAND INTERCHANGE - DEAF SMITH COUNTY INTERCHANGE 230KV CKT 1
09SP	2005-02 115.00 - RIVERVIEW INTERCHANGE 115KV CKT 1	161	111	166	PRINGLE INTERCHANGE 230/115KV TRANSFORMER CKT 1
09WP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	140	198	0	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
09WP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	161	0	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1
09WP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	152	0	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1
09WP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	112	151	0	BASE CASE

**TABLE 4: Contingency Analysis (continued)**

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
09WP	CLINTON JUNCTION - ELK CITY 138KV CKT 1	143	133	0	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1
09WP	LAKE PAULINE - RUSSELL 138KV CKT 1	72	130	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
09WP	KIRBY SWITCHING STATION - MCCLELLAN SUB 115KV CKT 1	107	128	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
09WP	MCCLELLAN SUB - MCLEAN RURAL SUB 115KV CKT 1	107	127	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
09WP	MCLEAN RURAL SUB - SHAMROCK 115KV CKT 1	107	105	84	JERICHO (JERIC2WT) 115/69/14.4KV TRANSFORMER CKT 1
09WP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	319	107	98	BASE CASE
09WP	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1	560	102	180	2002-08 345.00 - FINNEY SWITCHING STATION 345KV CKT 1
09WP	ALTUS JCT TAP - RUSSELL 138KV CKT 1	72	101	190	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
12SP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	128	188	0	CONWAY SUB - YARNELL SUB 115KV CKT 1
12SP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	144	0	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
12SP	KIRBY SWITCHING STATION - MCCLELLAN SUB 115KV CKT 1	90	143	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
12SP	MCCLELLAN SUB - MCLEAN RURAL SUB 115KV CKT 1	90	141	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
12SP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	133	0	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
12SP	MCLEAN RURAL SUB - SHAMROCK 115KV CKT 1	90	131	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
12SP	SHAMROCK (SHAMRCK1) 115/69/14.4KV TRANSFORMER CKT 1	69	128	0	NORTH MEMPHIS REC - NW MEMPHIS 69KV CKT 1
12SP	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1	161	106	0	EAST PLANT INTERCHANGE - MANHATTAN SUB 115KV CKT 1
12SP	EAST PLANT INTERCHANGE - MANHATTAN SUB 115KV CKT 1	161	106	0	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1
12SP	CLINTON JUNCTION - ELK CITY 138KV CKT 1	143	112	60	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
12SP	PALO DURO SUB - RANDALL COUNTY INTERCHANGE 115KV CKT 1	99	107	65	AMARILLO SOUTH INTERCHANGE - SWISHER COUNTY INTERCHANGE 230KV CKT 1
12SP	LAKE PAULINE - RUSSELL 138KV CKT 1	72	106	127	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
12SP	SHAMROCK (SHAMRCK2) 138/69/14.4KV TRANSFORMER CKT 1	69	102	153	NORTH MEMPHIS REC - NW MEMPHIS 69KV CKT 1
12SP	NICHOLS STATION - WHITAKER SUB 115KV CKT 1	249	101	163	EAST PLANT INTERCHANGE - HARRINGTON STATION 230KV CKT 1
12SP	2005-02 115.00 - RIVERVIEW INTERCHANGE 115KV CKT 1	161	108	174	PRINGLE INTERCHANGE 230/115KV TRANSFORMER CKT 1
12WP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	140	205	0	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
12WP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	159	0	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1
12WP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	149	0	TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1
12WP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	112	148	0	BASE CASE
12WP	LAKE PAULINE - RUSSELL 138KV CKT 1	72	134	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
12WP	KIRBY SWITCHING STATION - MCCLELLAN SUB 115KV CKT 1	107	133	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
12WP	MCCLELLAN SUB - MCLEAN RURAL SUB 115KV CKT 1	107	132	0	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
12WP	CLINTON JUNCTION - ELK CITY 138KV CKT 1	143	130	0	2002-08 345.00 - FINNEY SWITCHING STATION 345KV CKT 1
12WP	MCLEAN RURAL SUB - SHAMROCK 115KV CKT 1	107	109	0	JERICHO (JERIC2WT) 115/69/14.4KV TRANSFORMER CKT 1
12WP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	319	114	15	BASE CASE
12WP	GRAPEVINE INTERCHANGE - KIRBY SWITCHING STATION 115KV CKT 1	195	102	107	CONWAY SUB - YARNELL SUB 115KV CKT 1
12WP	ALTUS JCT TAP - RUSSELL 138KV CKT 1	72	106	145	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1
12WP	EAST LIBERAL - TEXAS COUNTY INTERCHANGE PHASE SHIFT TFMR 115KV CKT 1	119	101	196	2002-08 345.00 - FINNEY SWITCHING STATION 345KV CKT 1



**TABLE 4: Contingency Analysis (continued)**

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
17SP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	128	184	0	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
17SP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	147	0	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
17SP	KIRBY SWITCHING STATION - MCCLELLAN SUB 115KV CKT 1	90	145	0	SPP-SWPS-02: ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1, & ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
17SP	MCCLELLAN SUB - MCLEAN RURAL SUB 115KV CKT 1	90	143	0	SPP-SWPS-02: ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1, & ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
17SP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	137	0	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
17SP	MCLEAN RURAL SUB - SHAMROCK 115KV CKT 1	90	131	0	SPP-SWPS-02: ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1, & ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
17SP	SHAMROCK (SHAMRCK1) 115/69/14.4KV TRANSFORMER CKT 1	69	127	0	NORTH MEMPHIS REC - NW MEMPHIS 69KV CKT 1
17SP	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1	161	124	0	EAST PLANT INTERCHANGE - MANHATTAN SUB 115KV CKT 1
17SP	GRAPEVINE INTERCHANGE 230/115KV TRANSFORMER CKT 1	112	124	0	BASE CASE
17SP	EAST PLANT INTERCHANGE - MANHATTAN SUB 115KV CKT 1	161	124	0	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1
17SP	NICHOLS STATION - WHITAKER SUB 115KV CKT 1	249	121	0	CHERRY SUB - NICHOLS STATION 115KV CKT 1
17SP	PALO DURO SUB - RANDALL COUNTY INTERCHANGE 115KV CKT 1	99	121	0	AMARILLO SOUTH INTERCHANGE - SWISHER COUNTY INTERCHANGE 230KV CKT 1
17SP	CHERRY SUB - NICHOLS STATION 115KV CKT 1	161	120	0	NICHOLS STATION - WHITAKER SUB 115KV CKT 1
17SP	MANHATTAN TAP - OSAGE SWITCHING STATION 115KV CKT 1	161	118	0	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1
17SP	EAST PLANT INTERCHANGE - WHITAKER SUB 115KV CKT 1	249	113	0	CHERRY SUB - NICHOLS STATION 115KV CKT 1
17SP	OSAGE SWITCHING STATION - PIERCE STREET TAP 115KV CKT 1	161	111	0	EAST PLANT INTERCHANGE - MANHATTAN SUB 115KV CKT 1
17SP	CHERRY SUB - NORTHWEST INTERCHANGE 115KV CKT 1	161	110	0	NICHOLS STATION - WHITAKER SUB 115KV CKT 1
17SP	RANDALL COUNTY INTERCHANGE 230/115KV TRANSFORMER CKT 1	258	107	0	AMARILLO SOUTH INTERCHANGE - NICHOLS STATION 230KV CKT 1
17SP	MANHATTAN SUB - MANHATTAN TAP 115KV CKT 1	161	107	0	EAST PLANT INTERCHANGE - PIERCE STREET TAP 115KV CKT 1
17SP	CLINTON JUNCTION - ELK CITY 138KV CKT 1	143	115	31	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
17SP	NICHOLS STATION - WHITAKER SUB 115KV CKT 1	226	102	106	BASE CASE
17SP	LAKE PAULINE - RUSSELL 138KV CKT 1	72	102	170	SPP-SWPS-02: ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1, & ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
17SP	SHAMROCK (SHAMRCK2) 138/69/14.4KV TRANSFORMER CKT 1	69	101	186	NORTH MEMPHIS REC - NW MEMPHIS 69KV CKT 1
17SP	2005-02 115.00 - RIVERVIEW INTERCHANGE 115KV CKT 1	161	103	192	PRINGLE INTERCHANGE 230/115KV TRANSFORMER CKT 1

## Conclusion

The minimum cost of interconnecting the Customer's interconnection request is estimated at \$600,000 for Direct Assignment Facilities and Network Upgrades. At this time, the cost estimates for other Direct Assignment facilities including those in Tables 1 and 2 have not been defined by the Customer. In addition to the Customer's proposed interconnection facilities, the Customer will be responsible for installing a total of 34.5 Mvar of capacitor bank(s) in the Customer's substation for reactive support. As stated earlier, some but not all of the local projects that were previously queued are assumed to be in service in this Feasibility Study. These costs exclude upgrades of other transmission facilities that were listed in Table 3 of which are Network Constraints.

In Table 4, a value of Available Transfer Capability (ATC) associated with each overloaded facility is included. These values may be used by the Customer to determine lower generation capacity levels that may be installed. When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this table may be greater due to higher priority reservations. When a facility is overloaded for more than one contingency, only the highest loading on the facility for each season is included in the table.

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. At the time of the System Impact Study, a better determination of the interconnection facilities may be available.

The required interconnection costs listed in Tables 1 and 2 and other upgrades associated with Network Constraints do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through Southwest Power Pool's OASIS.

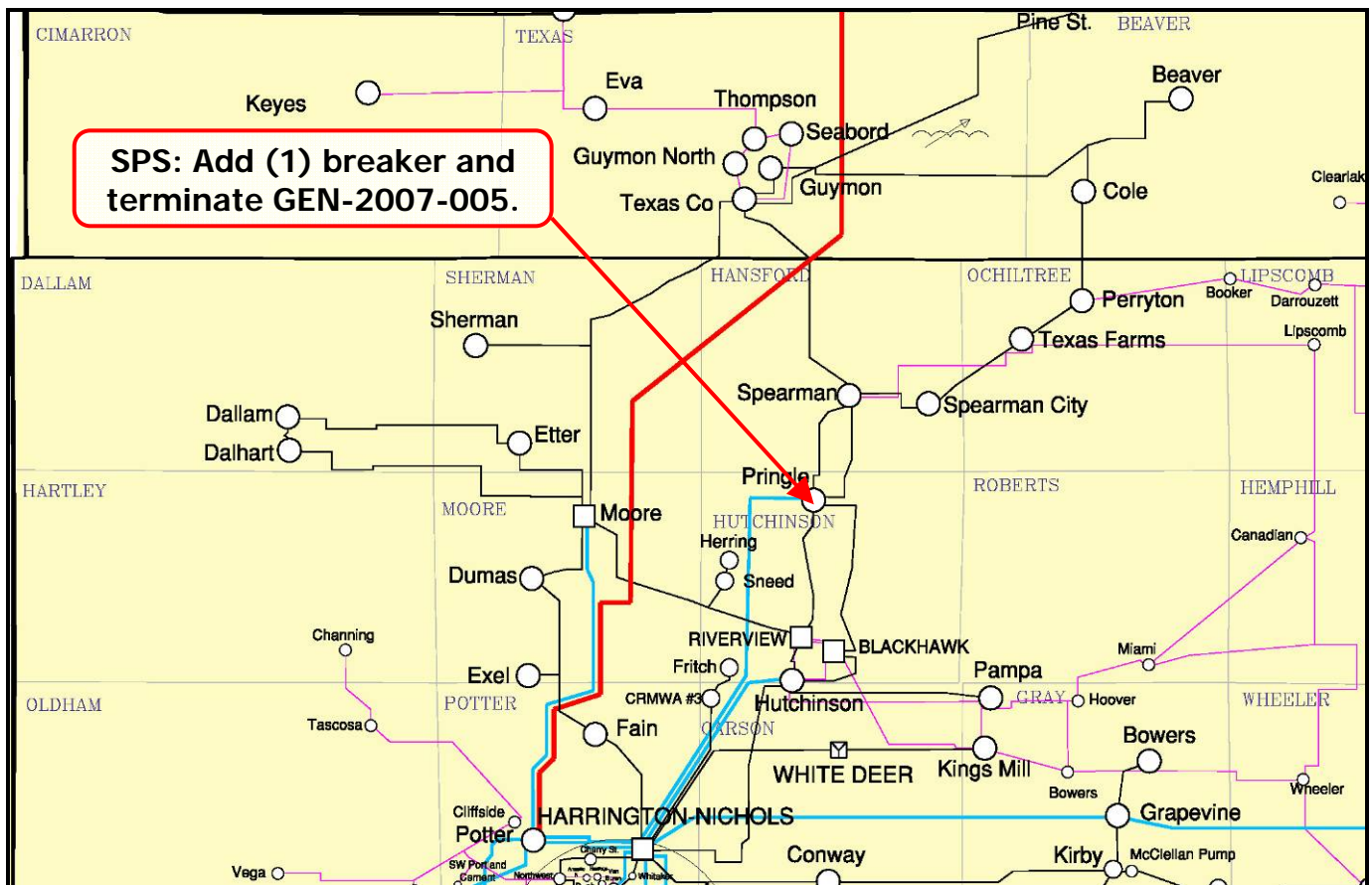


FIGURE 2. Point of Interconnection Area Map