Feasibility Study For Generation Interconnection Request GEN-2006-044

SPP Tariff Studies
(#GEN-2006-044)

June, 2007

Executive Summary

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 400 MW of wind generation within the control area of Southwestern Public Service (SPS) primarily located in Texas County, Oklahoma and partially located in Hansford County, Texas. The proposed method and point of interconnection is to add a fourth 345 kV line terminal to a previously proposed SPS 345/115 kV Interchange to be built on the existing Potter County – Finney Station 345 kV transmission line, owned by SPS. The proposed in-service date is October 1, 2010. This request is behind a prior queued request to interconnect into the same point. The prior queued request, GEN-2002-008, is for 240 MW.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 400 MW of generation with transmission system reinforcements within the local transmission system. In order to maintain acceptable reactive power compensation, the customer will need to install a combined total of at least 90 Mvar of 34.5 kV capacitor bank(s) in the Customer's three collector substations on the 34.5 kV busses. Dynamic stability studies performed as part of the 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). Powerflow analysis has indicated that additional dynamic compensation will be required.

The requirement to interconnect the 400 MW of generation on the existing Potter County – Finney Station 345 kV transmission line consists of adding a new 345 kV line terminal into a proposed SPS 345/115 kV Interchange to be built for generation interconnection request #GEN-2002-008. Customer did not propose a specific location of its 345/115 kV switching facilities or the 345 kV tie between these switching facilities and the proposed SPS 345/115 kV Interchange. Customer also did not propose specific routes for the three 115 kV lines extending from its switching station to serve its three 115/34.5 kV facilities. It is assumed that obtaining all necessary right-of-way for the 345/115 kV Customer switching station, the 345 kV tie, and the three new transmission lines to serve its facilities will not be a significant expense.

The total minimum cost for building the required facilities for this 400 MW of generation is $1,186,468. These costs are shown in Table 2. Other Network Constraints in the American Electric Power West (AEPW), Midwest Electric (MIDW), SPS, Sunflower Electric Cooperative (SUNC), and West Plains (WEPL) transmission systems that may be verified with a transmission service request and associated studies are listed in Table 4. These 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 (TSR), this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements. This cost does not include building the new Customer 345/115 kV switching station, the 345 kV tie to the proposed SPS 345/115 kV Interchange for #GEN-2002-008, or the three 115 kV lines extending from the Customer switching station to the three Customer collector substations. This cost also does not include the three 115/34.5 kV collector substations or the 34.5 kV, 90 Mvar (combined total) of capacitor bank(s).

In Table 5, 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.

Introduction

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 400 MW of wind generation within the control area of Southwestern Public Service (SPS) primarily located in Texas County, Oklahoma and partially located in Hansford County, Texas. The proposed method and point of interconnection is to add a fourth 345 kV line terminal to a previously proposed SPS 345/115 kV Interchange to be built on the existing Potter County – Finney Station 345 kV transmission line, which is owned by SPS. The proposed in-service date is October 1, 2010.

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 Study 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 400 MW consist of adding a new 345 kV line terminal into a previously proposed SPS 345 kV three-breaker ring-bus and 345/115 kV switching station on the existing Potter County – Finney Station 345 kV transmission line owned by SPS. This SPS 345/115 kV Interchange was first proposed to be built for generation interconnection request #GEN-2002-008. This substation shall be constructed and maintained by SPS. If #GEN-2002-008 withdraws from the queue, the Customer will be responsible for the cost of constructing the original three-breaker 345 kV ring-bus. The Customer did not propose a specific location of its 345/115 kV switching facilities or the 345 kV tie between these switching facilities and the proposed SPS 345/115 kV Interchange. Customer also did not propose specific routes for the three 115 kV lines extending from its switching station to serve its three 115/34.5 kV facilities. It is assumed that obtaining all necessary right-of-way for the 345/115 kV Customer switching station, the 345 kV tie, and the three new transmission lines to serve its facilities will not be a significant expense.

The total cost for adding a 345 kV line terminal to the proposed SPS 345 kV ring-bus is approximately $1,186,468. This cost is listed in Table 2. If #GEN-2002-008 withdraws from the queue, the Customer will be responsible for building a new 345 kV three-breaker ring-bus and 345/115 kV switching station, associated facilities, and the required interconnection facilities, which is estimated at $9,200,000 and is listed in Table 3. Other Network Constraints in the American Electric Power West (AEPW), Midwest Electric (MIDW), SPS, Sunflower Electric Cooperative (SUNC), and West Plains (WEPL) transmission systems that were identified are listed in Table 4. These estimates will be refined during the development of the impact study based on the final designs. This cost does not include building the Customer 345/115 kV switching facilities, the 345 kV tie between these facilities and the SPS 345/115 kV Interchange, or the three 115 kV transmission lines extending to serve its three 115/34.5 kV collection facilities. This cost also does not include the Customer's three 115/34.5 kV substations or the 90 Mvar (combined total) of capacitor bank(s), all of which should be determined by the Customer. The Customer is responsible for these 345 – 34.5 kV facilities up to the point of interconnection.

The costs of interconnecting the facility to the SPS transmission system are listed in Tables 1 & 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.

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

TABLE 1: Direct Assignment Facilities

FACILITY	ESTIMATED COST (2007 DOLLARS)
CUSTOMER – (3) 115/34.5 kV collector substation facilities.	*
CUSTOMER – (3) 115 kV transmission facilities between the three Customer 115/34.5 kV collector substation facilities and the Customer 345/115 kV switching station.	*
CUSTOMER – (2) 345/115 kV transformers and all related 345/115 kV switching equipment located at the Customer 345/115 kV switching station.	*
CUSTOMER – (1) 345 kV tie between Customer 345/115 kV switching station and the point of interconnection.	*
CUSTOMER – Right-of-Way for Customer facilities.	*
CUSTOMER – 34.5 kV, 90 Mvar (combined total) of capacitor bank(s) in three Customer substations.	*
TOTAL	*

*NOTES: * Estimates of cost to be determined by Customer.*

TABLE 2: Required Interconnection Network Upgrade Facilities

FACILITY	ESTIMATED COST (2007 DOLLARS)
SPS – Add (1) 345 kV terminal to the three-breaker ring-bus constructed for #GEN-2002-008.	**$1,186,468**
TOTAL	*

*NOTES: * Estimates of cost to be determined.*

TABLE 3: Required Interconnection Network Upgrade Facilities (If #GEN-2002-008 Withdraws from Queue)

FACILITY	ESTIMATED COST (2007 DOLLARS)
SPS – Build 345/115 kV switching station required for GEN-2002-008.	**$9,200,000**
TOTAL	*

*NOTES: * Estimates of cost to be determined.*

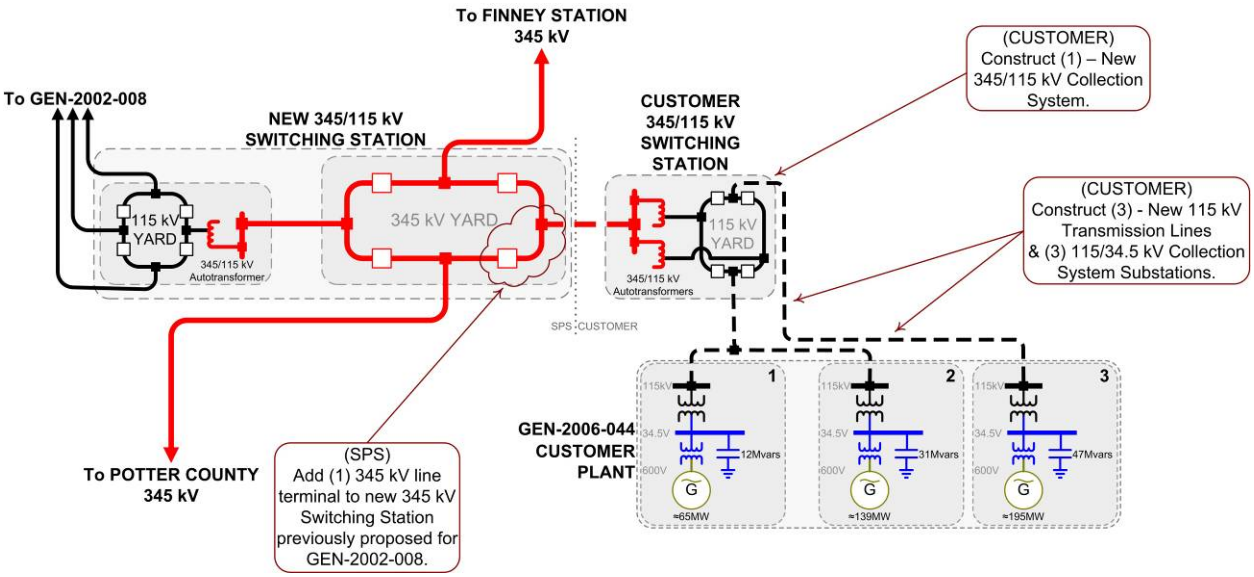

FIGURE 1: Proposed Interconnection
(Final design to be determined)

Powerflow Analysis

A powerflow analysis was conducted for the facility using modified versions of the 2009 and 2012 summer and winter peak, and 2017 summer peak models. 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 October 1, 2010. 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 400 MW and location, additional criteria violations will occur on the existing AEPW, MIDW, SPS, SUNC, and WEPL transmission systems under steady state and contingency conditions in the peak seasons.

In Table 5, 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 5. These voltage violations have not been listed in this report.

In order to maintain a zero reactive power flow exchange at the point of interconnection, additional reactive compensation is required at the point of interconnection. The Customer will be required to install a combined total of 90 Mvar of capacitor bank(s) on the 34.5 kV buses in the three Customer 115/34.5 kV collector substations. As shown in Figure 1, the approximate sizing of the minimum required capacitor bank(s) for each substation is as follows: 12 Mvars in

collection substation 1, 31 Mvars in collection substation 2, and 47 Mvars in collection substation 3. 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. Powerflow analysis has indicated that a large amount of dynamic compensation is necessary for contingencies near the point of interconnect.

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. Those 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 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 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 (SPS), Western Farmers Electric Cooperative (WFEC), Western Resources (WERE), 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.

Table 4: Network Constraints

AREA	ELEMENT
AEPW	CLINTON JUNCTION - ELK CITY 138KV CKT 1
AEPW	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
AEPW	JERICHO 115KV (JERIC2WT) 115/69/14.4KV 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
MIDW	ALEXANDER - NEKOMA 115KV CKT 1
MIDW	ALEXANDER - NESS CITY 115KV CKT 1
MIDW	COLBY - HOXIE 115KV CKT 1
MIDW	HEIZER 115/69KV TRANSFORMER CKT 2
MIDW/WEPL	MULLERGREN - S HAYS6 230.00 230KV CKT 1
SPS	CANYON EAST SUB - OSAGE SWITCHING STATION 115KV CKT 1
SPS	CUNNINGHAM STATION 230/115KV TRANSFORMER CKT 1
SPS	EXELL TAP - FAIN SUB 115KV CKT 1
SPS	FAIN SUB - NICHOLS STATION 115KV CKT 1
SPS	HAPPY INTERCHANGE - PALO DURO SUB 115KV CKT 1
SPS	HAPPY INTERCHANGE - TULIA TAP 115KV CKT 1
SPS	HERRING TAP - RITA BLANCA REC-SNEED 115KV CKT 1
SPS	HERRING TAP - RIVERVIEW INTERCHANGE 115KV CKT 1
SPS	KINGSMILL INTERCHANGE - MCCULLOUGH SUB 69KV CKT 1
SPS	KIRBY SWITCHING STATION - MCCLELLAN SUB 115KV CKT 1
SPS	LEA COUNTY INTERCHANGE 230/115KV TRANSFORMER CKT 1
SPS	MCCLELLAN SUB - MCLEAN RURAL SUB 115KV CKT 1
SPS	MOORE COUNTY INTERCHANGE W. - RITA BLANCA REC-SNEED 115KV CKT 1
SPS	PALO DURO SUB - RANDALL COUNTY INTERCHANGE 115KV CKT 1
SPS	POTTER COUNTY INTERCHANGE (POTTR CO) 345/230/13.2KV TRANSFORMER CKT 1
SPS	RANDALL COUNTY INTERCHANGE 230/115KV TRANSFORMER CKT 1
SUNC	BEELER - DIGHTON TAP 115KV CKT 1
SUNC	BEELER - NESS CITY 115KV CKT 1
SUNC	CTU SUBLETTE - PIONEER TAP 115KV CKT 1
SUNC	DIGHTON TAP - MANNING TAP 115KV CKT 1
SUNC	GARDEN CITY (GC-CITY) 115/69/13.8KV TRANSFORMER CKT 1
SUNC	HOLCOMB - PLYMELL 115KV CKT 1
SUNC	PIONEER TAP - PLYMELL 115KV CKT 1
SUNC/WEPL	CIMARRON RIVER PLANT - NORTH CIMARRON 115KV CKT 1
SUNC/WEPL	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
WEPL	CIMARRON RIVER PLANT - CIMARRON RIVER TAP 115KV CKT 1
WEPL	GREENSBURG - JUDSON LARGE 115KV CKT 1
WEPL	HARPER - MEDICINE LODGE 138KV CKT 1
WEPL	MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1
WEPL	MULLERGREN - SPEARVILLE 230KV CKT 1
WEPL	SEWARD - ST JOHN 115KV CKT 1
AEPW	American Electric Power West
MIDW	Midwest Electric
SPS	Southwestern Public Service
SUNC	Sunflower Electric Cooperative
WEPL	West Plains

TABLE 5: Contingency Analysis

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
09SP	POTTER COUNTY INTERCHANGE (POTTR CO) 345/230/13.2KV TRANSFORMER CKT 1	560	183	0	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	HOLCOMB - PLYMELL 115KV CKT 1	143	135	0	HOLCOMB - SPEARVILLE 345KV CKT 1
09SP	SEWARD - ST JOHN 115KV CKT 1	79	122	0	GREENSBURG - JUDSON LARGE 115KV CKT 1
09SP	PALO DURO SUB - RANDALL COUNTY INTERCHANGE 115KV CKT 1	99	121	0	AMARILLO SOUTH INTERCHANGE - SWISHER COUNTY INTERCHANGE 230KV CKT 1
09SP	HAPPY INTERCHANGE - PALO DURO SUB 115KV CKT 1	99	120	0	AMARILLO SOUTH INTERCHANGE - SWISHER COUNTY INTERCHANGE 230KV CKT 1
09SP	CANYON EAST SUB - OSAGE SWITCHING STATION 115KV CKT 1	99	113	0	BUSHLAND INTERCHANGE - DEAF SMITH COUNTY INTERCHANGE 230KV CKT 1
09SP	HEIZER 115/69KV TRANSFORMER CKT 2	40	104	0	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
09SP	HEIZER 115/69KV TRANSFORMER CKT 2	24	167	0	BASE CASE
09SP	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1	336	125	11	HOLCOMB - SETAB 345KV CKT 1
09SP	CIMARRON RIVER PLANT - NORTH CIMARRON 115KV CKT 1	143	123	15	HOLCOMB - SPEARVILLE 345KV CKT 1
09SP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	146	30	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	DIGHTON TAP - MANNING TAP 115KV CKT 1	98	117	99	MULLERGREN - SPEARVILLE 230KV CKT 1
09SP	ALEXANDER - NESS CITY 115KV CKT 1	101	117	129	HOLCOMB - SPEARVILLE 345KV CKT 1
09SP	SHAMROCK (SHAMRCK1) 115/69/14.4KV TRANSFORMER CKT 1	69	121	166	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	120	200	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	RANDALL COUNTY INTERCHANGE 230/115KV TRANSFORMER CKT 1	258	102	222	AMARILLO SOUTH INTERCHANGE - NICHOLS STATION 230KV CKT 1
09SP	BEELER - DIGHTON TAP 115KV CKT 1	98	110	231	MULLERGREN - SPEARVILLE 230KV CKT 1
09SP	ALEXANDER - NEKOMA 115KV CKT 1	101	110	235	MULLERGREN - SPEARVILLE 230KV CKT 1
09SP	MULLERGREN - SPEARVILLE 230KV CKT 1	355	113	243	HOLCOMB - SETAB 345KV CKT 1
09SP	COLBY - HOXIE 115KV CKT 1	101	107	269	MULLERGREN - SPEARVILLE 230KV CKT 1
09SP	GREENSBURG - JUDSON LARGE 115KV CKT 1	129	108	270	MULLERGREN - SPEARVILLE 230KV CKT 1
09SP	KINGSMILL INTERCHANGE - MCCULLOUGH SUB 69KV CKT 1	97	105	285	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
09SP	BEELER - NESS CITY 115KV CKT 1	98	105	305	MULLERGREN - SPEARVILLE 230KV CKT 1
09SP	KIRBY SWITCHING STATION - MCCLELLAN SUB 115KV CKT 1	90	106	325	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	HAPPY INTERCHANGE - TULIA TAP 115KV CKT 1	99	103	328	AMARILLO SOUTH INTERCHANGE - SWISHER COUNTY INTERCHANGE 230KV CKT 1
09SP	SHAMROCK (SHAMRCK2) 138/69/14.4KV TRANSFORMER CKT 1	69	105	337	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	JERICHO 115KV (JERIC2WT) 115/69/14.4KV TRANSFORMER CKT 1	46	103	353	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	MCCLELLAN SUB - MCLEAN RURAL SUB 115KV CKT 1	90	103	355	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09SP	MULLERGREN - S HAYS6 230.00 230KV CKT 1	147	104	358	CIRCLE - MULLERGREN 230KV CKT 1
09SP	CTU SUBLETTE - PIONEER TAP 115KV CKT 1	143	101	363	HOLCOMB - SPEARVILLE 345KV CKT 1
09SP	CIMARRON RIVER PLANT - CIMARRON RIVER TAP 115KV CKT 1	89	102	374	HOLCOMB - SPEARVILLE 345KV CKT 1
09WP	CUNNINGHAM STATION 230/115KV TRANSFORMER CKT 1	168	115	0	LEA COUNTY INTERCHANGE 230/115KV TRANSFORMER CKT 1
09WP	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1	336	126	74	G02-08 345.00 - POTTER COUNTY INTERCHANGE 345KV CKT 1
09WP	CIMARRON RIVER PLANT - NORTH CIMARRON 115KV CKT 1	143	117	87	HOLCOMB - SPEARVILLE 345KV CKT 1
09WP	LEA COUNTY INTERCHANGE 230/115KV TRANSFORMER CKT 1	168	117	93	CUNNINGHAM STATION 230/115KV TRANSFORMER CKT 1
09WP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	148	96	2003-13 345345.00 - FINNEY SWITCHING STATION 345KV CKT 1
09WP	POTTER COUNTY INTERCHANGE (POTTR CO) 345/230/13.2KV TRANSFORMER CKT 1	560	162	102	2003-13 345345.00 - FINNEY SWITCHING STATION 345KV CKT 1
09WP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	123	141	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1

TABLE 5: Contingency Analysis (continued)

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
09WP	SHAMROCK (SHAMRCK1) 115/69/14.4KV TRANSFORMER CKT 1	69	122	143	2003-13 345345.00 - FINNEY SWITCHING STATION 345KV CKT 1
09WP	ALEXANDER - NESS CITY 115KV CKT 1	101	114	183	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
09WP	ALEXANDER - NEKOMA 115KV CKT 1	101	108	279	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
09WP	SHAMROCK (SHAMRCK2) 138/69/14.4KV TRANSFORMER CKT 1	69	109	283	2003-13 345345.00 - FINNEY SWITCHING STATION 345KV CKT 1
09WP	DIGHTON TAP - MANNING TAP 115KV CKT 1	98	106	292	HOLCOMB - SPEARVILLE 345KV CKT 1
09WP	MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1	65	108	329	G02-08 345.00 - POTTER COUNTY INTERCHANGE 345KV CKT 1
09WP	HARPER - MEDICINE LODGE 138KV CKT 1	71	107	342	G02-08 345.00 - POTTER COUNTY INTERCHANGE 345KV CKT 1
09WP	CLINTON JUNCTION - ELK CITY 138KV CKT 1	143	105	345	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
09WP	SEWARD - ST JOHN 115KV CKT 1	79	100	392	GREENSBURG - JUDSON LARGE 115KV CKT 1
09WP	BEELER - DIGHTON TAP 115KV CKT 1	98	100	393	HOLCOMB - SPEARVILLE 345KV CKT 1
09WP	JERICHO 115KV (JERIC2WT) 115/69/14.4KV TRANSFORMER CKT 1	46	100	398	2003-13 345345.00 - FINNEY SWITCHING STATION 345KV CKT 1
12SP	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1	336	174	0	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
12SP	MULLERGREN - SPEARVILLE 230KV CKT 1	355	158	0	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
12SP	HOLCOMB - PLYMELL 115KV CKT 1	143	130	0	HOLCOMB - SPEARVILLE 345KV CKT 1
12SP	PIONEER TAP - PLYMELL 115KV CKT 1	143	126	0	HOLCOMB - SPEARVILLE 345KV CKT 1
12SP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	117	91	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
12SP	DIGHTON TAP - MANNING TAP 115KV CKT 1	98	114	142	MULLERGREN - SPEARVILLE 230KV CKT 1
12SP	HEIZER 115/69KV TRANSFORMER CKT 2	32	126	160	BASE CASE
12SP	CIMARRON RIVER PLANT - NORTH CIMARRON 115KV CKT 1	143	113	174	HOLCOMB - SPEARVILLE 345KV CKT 1
12SP	MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1	65	121	178	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
12SP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	124	187	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
12SP	ALEXANDER - NESS CITY 115KV CKT 1	101	111	206	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
12SP	POTTER COUNTY INTERCHANGE (POTTR CO) 345/230/13.2KV TRANSFORMER CKT 1	560	130	208	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
12SP	SHAMROCK (SHAMRCK1) 115/69/14.4KV TRANSFORMER CKT 1	69	113	215	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
12SP	SEWARD - ST JOHN 115KV CKT 1	79	106	251	MEDICINE LODGE - SUN CITY 115KV CKT 1
12SP	MULLERGREN - S HAYS6 230.00 230KV CKT 1	147	106	277	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
12SP	HARPER - MEDICINE LODGE 138KV CKT 1	72	110	285	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
12SP	BEELER - DIGHTON TAP 115KV CKT 1	98	106	290	MULLERGREN - SPEARVILLE 230KV CKT 1
12SP	ALEXANDER - NEKOMA 115KV CKT 1	101	104	324	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
12SP	GREENSBURG - JUDSON LARGE 115KV CKT 1	129	104	333	MULLERGREN - SPEARVILLE 230KV CKT 1
12SP	COLBY - HOXIE 115KV CKT 1	101	102	354	MULLERGREN - SPEARVILLE 230KV CKT 1
12SP	BEELER - NESS CITY 115KV CKT 1	98	101	372	MULLERGREN - SPEARVILLE 230KV CKT 1
12SP	CIMARRON RIVER PLANT - CIMARRON RIVER TAP 115KV CKT 1	89	101	390	HOLCOMB - SPEARVILLE 345KV CKT 1
12WP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	124	2	2003-13 345345.00 - FINNEY SWITCHING STATION 345KV CKT 1
12WP	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1	336	135	22	G02-08 345.00 - POTTER COUNTY INTERCHANGE 345KV CKT 1
12WP	CIMARRON RIVER PLANT - NORTH CIMARRON 115KV CKT 1	143	114	132	HOLCOMB - SPEARVILLE 345KV CKT 1
12WP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	130	146	2003-13 345345.00 - FINNEY SWITCHING STATION 345KV CKT 1
12WP	SHAMROCK (SHAMRCK1) 115/69/14.4KV TRANSFORMER CKT 1	69	117	180	2003-13 345345.00 - FINNEY SWITCHING STATION 345KV CKT 1
12WP	CUNNINGHAM STATION 230/115KV TRANSFORMER CKT 1	168	105	227	LEA COUNTY INTERCHANGE 230/115KV TRANSFORMER CKT 1

TABLE 5: Contingency Analysis (continued)

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
12WP	ALEXANDER - NESS CITY 115KV CKT 1	101	109	251	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
12WP	DIGHTON TAP - MANNING TAP 115KV CKT 1	98	103	340	HOLCOMB - SPEARVILLE 345KV CKT 1
12WP	ALEXANDER - NEKOMA 115KV CKT 1	101	103	351	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
12WP	SHAMROCK (SHAMRCK2) 138/69/14.4KV TRANSFORMER CKT 1	69	103	362	2003-13 345345.00 - FINNEY SWITCHING STATION 345KV CKT 1
12WP	MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1	65	103	377	G02-08 345.00 - POTTER COUNTY INTERCHANGE 345KV CKT 1
17SP	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1	336	155	0	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
17SP	HERRING TAP - RIVERVIEW INTERCHANGE 115KV CKT 1	180	131	0	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	HERRING TAP - RITA BLANCA REC-SNEED 115KV CKT 1	180	124	0	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	GARDEN CITY (GC-CITY) 115/69/13.8KV TRANSFORMER CKT 1	41	106	0	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
17SP	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1	287	136	55	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
17SP	MOORE COUNTY INTERCHANGE W. - RITA BLANCA REC-SNEED 115KV CKT 1	180	112	88	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	POTTER COUNTY INTERCHANGE (POTTR CO) 345/230/13.2KV TRANSFORMER CKT 1	56	134	174	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
17SP	FAIN SUB - NICHOLS STATION 115KV CKT 1	161	107	196	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	MULLERGREN - SPEARVILLE 230KV CKT 1	355	116	218	MINGO - SETAB 345KV CKT 1
17SP	SHAMROCK (SHAMRCK1) 115/69/14.4KV TRANSFORMER CKT 1	69	111	223	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
17SP	MULLERGREN - S HAYS6 230.00 230KV CKT 1	147	118	230	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
17SP	ELK CITY 230KV - GRAPEVINE INTERCHANGE 230KV CKT 1	351	111	268	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
17SP	DIGHTON TAP - MANNING TAP 115KV CKT 1	98	108	287	MINGO - SETAB 345KV CKT 1
17SP	EXELL TAP - FAIN SUB 115KV CKT 1	161	104	293	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
17SP	HOLCOMB - PLYMELL 115KV CKT 1	143	105	293	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1
17SP	PIONEER TAP - PLYMELL 115KV CKT 1	143	101	384	G02-08 345 - POTTER COUNTY INTERCHANGE 345KV CKT 1

Note: 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.

Conclusion

The minimum cost of interconnecting the Customer's interconnection request is estimated at $1,186,468 for Direct Assignment facilities and Network Upgrades listed in Tables 1 and 2. These costs exclude upgrades of other transmission facilities that were listed in Table 4 of which are Network Constraints. At this time, the cost estimates for other Direct Assignment facilities including those in Table 1 have not been defined by the Customer. In addition to the Customer's proposed interconnection facilities, the Customer will be responsible for installing a combined total of 90 Mvar of 34.5 kV capacitor bank(s) in the Customer's collector substations for reactive support. Dynamic stability analysis will determine if a portion of this should be dynamic (SVC). Powerflow analysis has indicated that dynamic compensation will be required. 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.

In Table 5, 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.

The required interconnection costs listed in Table 2 and other upgrades associated with Network Constraints listed in Table 4 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 requests transmission service through Southwest Power Pool's OASIS.

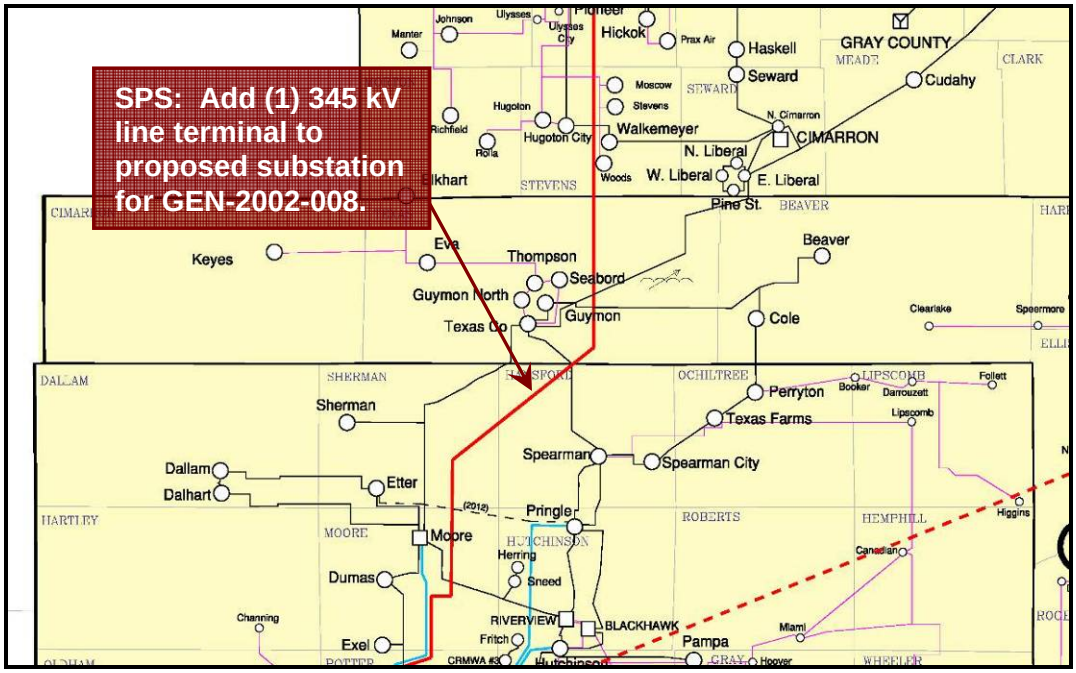

FIGURE 2. Point of Interconnection Area