



***Feasibility Study  
For  
Generation Interconnection  
Request  
GEN-2005-011***

***SPP Tariff Studies  
(#GEN-2005-011)***

**November 17, 2005**

## **Executive Summary**

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 160MW of wind generation within the service territory of Southwestern Public Service Company (SPS) (d/b/a Xcel Energy, Inc.) in Chaves County Texas. The proposed point of interconnection is in the existing Tolk – Eddy County 345kV line at a new switching station in Lea County. This 345kV line is owned by SPS. The proposed in-service date is December 31, 2006.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 160MW of generation with transmission system reinforcements within the local transmission system. In order to maintain acceptable bus voltages in the local area, the Customer will need to install 60MVAR of reactive compensation, one 30MVAR capacitor bank switched at each of the 34.5kV buses, in the Customer's substation. Dynamic Stability studies performed as part of the impact study will provide guidance as to whether the reactive compensation can be static or must be dynamic (such as a SVC). These requirements are in addition to the currently planned facilities including a staged capacitor bank at the location of GEN-2001-033 and a 50MVAR switched capacitor bank at the Chaves 230kV bus must be installed.

The requirements for interconnection consist of adding a new 345kV 3-breaker ring switching station. This 345kV addition shall be constructed and maintained by SPS. The Customer did not propose a specific 345kV line extending to serve its 345-34.5kV facilities. It is assumed that obtaining all necessary right-of-way for the substation additions in the Tolk – Eddy County 345kV line will not be a significant expense.

The total cost for adding a new 345kV switching station, the required interconnection facility, is estimated at \$7,434,666 which is based on estimates provided by the SPS engineering department. Other Network Constraints in the SPS system that may be verified with a transmission service request and associated studies are listed in Table 3. 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 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 345kV line from the Customer substation into a new SPS switching station. This cost does not include the Customer's 345-34.5kV substation.

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. When a facility is overloaded for more than 10 contingencies, then only the results with the 10 lowest values of ATC may be included in this table.

The cost and final sizing of reactors in the new interconnection facility will be determined by an Electromagnetic Transient Program (EMTP) study, at the Customer's expense, that will be conducted upon the signing of an Impact Study Agreement. The 30 MVAR size and cost could change depending on the results of the EMTP study.

There are several other proposed generation additions in the general area of the Customer's facility. It was assumed in this preliminary analysis that these other projects within the SPS service territory 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 160MW of wind generation within the service territory of SPS in Chaves County Texas. The existing Tolk – Eddy County 345kV line is owned by SPS, and the proposed generation interconnection is within SPS in Lea County. The proposed point of interconnection is at a new 345kV switching station in this line. The proposed in-service date is December 31, 2006.

## 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 consist of adding a new 345kV switching station. This 345kV addition shall be constructed and maintained by SPS. The Customer did not propose a route of its 345kV line to serve its 345-34.5kV facilities. It is assumed that obtaining all necessary right-of-way for the new SPS 345kV switching station will not be a significant expense.

The total cost for SPS to add a new 345kV switching station, the interconnection facility, in the Eddy County – Tolk 345kV line is estimated at \$7,434,666 which is based on estimates provided by the SPS engineering department. Other Network Constraints in the SPS system that were identified are listed in Table 3. These estimates will be refined during the development of the impact study based on the final designs. This cost does not include building 345kV line from the Customer substation into the new SPS switching station. The Customer is responsible for this 345kV line up to the point of interconnection. This cost does not include the Customer's 345-34.5kV substation and the cost estimate should be determined by the Customer.

The costs of interconnecting the facility to the SPS 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.

**Table 1: Direct Assignment Facilities**

Facility	ESTIMATED COST (2005 DOLLARS)
Customer – 345-34.5 kV Substation facilities including 2 of 30MVAR 34.5kV capacitor banks.	*
Customer - 345kV line between Customer substation and new SPS 345kV switching station.	*
Customer - Right-of-Way for Customer Substation & Line.	*
<b>Total</b>	*

Note: \*Estimates of cost to be determined by Customer.

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

Facility	ESTIMATED COST (2005 DOLLARS)
SPS - New 345kV switching station in existing Eddy County – Tolk 345kV line.	\$3,837,900
SPS - Right-of-way for new SPS 345kV switching station.	47,000
SPS – 2 of 345kV 30MVAR line reactors in new 345kV switching station.	3,549,766
<b>Total</b>	<b>\$7,434,666</b>

**Table 3: Network Constraints**

Facility
AEPW - AIRPORT 69kV, 54286
AEPW - AMOCO 69kV, 54288
AEPW - AMOCO TAP 69kV, 54287
WFEC - ARAPAHO 69kV, 55815
SPS - Bowers Interchange 115kV, 50820
WFEC - BRANTLEY 69kV, 55832
AEPW - CAREY 69kV, 54285
AEPW - CHILDRESS 138kV, 54290
AEPW - CHILDRESS 69kV, 54289
AEPW - CLARENDON 69kV, 54278
AEPW - CLARENDON REA 69kV, 54279
SPS - COX Interchange 115kV, 51360
WFEC - DURHAM 69kV, 55885
AEPW - ELK CITY 230kV, 54153
AEPW - ELK CITY 138-230kV, 54121 - WND 1, 54153 - WND 2
WFEC - ERICK 69kV, 55903
AEPW - ESTELENE 69kV, 54284
SPS - Grapevine Interchange 115kV, 50826
SPS - Grapevine Interchange 230kV, 50827
SPS - Grapevine Interchange - ELK CITY 230kV, 50827 - 54153
AEPW - Grapevine Interchange - ELK CITY 230kV, 50827 - 54153
AEPW - HEDLEY 69kV, 54280
SPS - HENDRIC 69kV, 51569
AEPW - HOBART 69kV, 54128
AEPW - HOLLIS 138kV, 54170
AEPW - HOLLIS TAP 138kV, 54291
AEPW - JERICHO 115kV, 54276
AEPW - JERICHO 69kV, 54277



**Table 4: Contingency Analysis Results**

Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
AIRPORT 69kV, 54286	15SP, 54287-54289, AEPW WTU , AMOCO TAP - CHILDRESS 69kV	Base case voltage is 0.9038 pu. Test case voltage is 0.8942 pu.	63	12/1/2007
AIRPORT 69kV, 54286	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9877 pu. Test case voltage is 0.8836 pu.	135	
AMOCO 69kV, 54288	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9868 pu. Test case voltage is 0.8829 pu.	134	12/1/2007
AMOCO TAP 69kV, 54287	15SP, 54287-54289, AEPW WTU , AMOCO TAP - CHILDRESS 69kV	Base case voltage is 0.9032 pu. Test case voltage is 0.8937 pu.	54	12/1/2007
AMOCO TAP 69kV, 54287	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9878 pu. Test case voltage is 0.884 pu.	135	
ARAPAHO 69kV, 55815	10SP, 56027-56088, WFEC AEP-CS , PINE RIDGE - WASHITA 69kV	Base case voltage is 0.9012 pu. Test case voltage is 0.8967 pu.	43	6/1/2010
Bowers Interchange 115kV, 50820	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9726 pu. Test case voltage is 0.8988 pu.	157	12/1/2007
BRANTLEY 69kV, 55832	07WP, 55832-56002, WFEC AEP-CS , BRANTLEY - MORWOOD 69kV	Base case voltage is 0.9004 pu. Test case voltage is 0.897 pu.	19	12/1/2007
CAREY 69kV, 54285	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9886 pu. Test case voltage is 0.8819 pu.	133	12/1/2007
CHILDRESS 138kV, 54290	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9591 pu. Test case voltage is 0.8711 pu.	107	12/31/2006
CHILDRESS 138kV, 54290	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9639 pu. Test case voltage is 0.8924 pu.	143	

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.



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Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
CHILDRESS 69kV, 54289	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9907 pu. Test case voltage is 0.8887 pu.	142	12/1/2007
CLARENDON 69kV, 54278	15SP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9058 pu. Test case voltage is 0.8874 pu.	50	12/1/2007
CLARENDON 69kV, 54278	15SP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9063 pu. Test case voltage is 0.8879 pu.	55	
CLARENDON 69kV, 54278	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9908 pu. Test case voltage is 0.8805 pu.	132	
CLARENDON REA 69kV, 54279	15SP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9062 pu. Test case voltage is 0.8879 pu.	54	12/1/2007
CLARENDON REA 69kV, 54279	15SP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9067 pu. Test case voltage is 0.8884 pu.	59	
CLARENDON REA 69kV, 54279	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9898 pu. Test case voltage is 0.8788 pu.	129	
COX Interchange 115kV, 51360	15SP, 51564-51688, SPS SPS-CNPL, Crosby Interchange - Lubbock East Interchange 115kV	Base case voltage is 0.9009 pu. Test case voltage is 0.897 pu.	37	6/1/2015
DURHAM 69kV, 55885	07WP, 55832-56002, WFEC AEP-CS , BRANTLEY - MORWOOD 69kV	Base case voltage is 0.9013 pu. Test case voltage is 0.8979 pu.	61	12/1/2007
DURHAM 69kV, 55885	10SP, 55846-55903, WFEC AEP-CS , CARTER JCT - ERICK 69kV	Base case voltage is 0.903 pu. Test case voltage is 0.8998 pu.	150	

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.

**Table 4: Contingency Analysis Results**

Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
ELK CITY 230kV, 54153	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9065 pu. Test case voltage is 0.8429 pu.	16	12/31/2006
ELK CITY 230kV, 54153	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9095 pu. Test case voltage is 0.8558 pu.	28	
ELK CITY 230kV, 54153	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9346 pu. Test case voltage is 0.8935 pu.	135	
ELK CITY 230kV, 54153	15SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9356 pu. Test case voltage is 0.8965 pu.	146	
ELK CITY - ELKCTY-6 138-( )kV, 54121 - WND 1	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	115.6	41	12/31/2006
ELK CITY - ELKCTY-6 138-( )kV, 54121 - WND 1	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	111.8	55	
ELK CITY - ELKCTY-6 138-( )kV, 54121 - WND 1	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	112.3	59	
ELK CITY - ELKCTY-6 230-( )kV, 54153 - WND 2	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	108.6	76	12/31/2006
ELK CITY - ELKCTY-6 230-( )kV, 54153 - WND 2	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	107.1	88	
ELK CITY - ELKCTY-6 230-( )kV, 54153 - WND 2	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	107.1	92	
ERICK 69kV, 55903	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9365 pu. Test case voltage is 0.8975 pu.	150	12/1/2007

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.

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Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
ESTELENE 69kV, 54284	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9893 pu. Test case voltage is 0.8797 pu.	130	12/1/2007
Grapevine Interchange 115kV, 50826	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9765 pu. Test case voltage is 0.8997 pu.	159	12/1/2007
Grapevine Interchange 230kV, 50827	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9101 pu. Test case voltage is 0.7631 pu.	11	12/31/2006
Grapevine Interchange 230kV, 50827	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.912 pu. Test case voltage is 0.8323 pu.	24	
Grapevine Interchange 230kV, 50827	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9093 pu. Test case voltage is 0.8522 pu.	26	
Grapevine Interchange 230kV, 50827	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.931 pu. Test case voltage is 0.8962 pu.	143	
Grapevine Interchange 230kV, 50827	15SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9302 pu. Test case voltage is 0.897 pu.	146	
Grapevine Interchange - ELK CITY 230kV, 50827 - 54153	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	112.2	90	12/31/2006
Grapevine Interchange - ELK CITY 230kV, 50827 - 54153	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	105.2	123	12/31/2006
Grapevine Interchange - ELK CITY 230kV, 50827 - 54153	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	103.5	133	

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.

**Table 4: Contingency Analysis Results**

Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
HEDLEY 69kV, 54280	15SP, 54277-54278, AEPW WTU , JERICHO - CLARENDON 69kV	Base case voltage is 0.9063 pu. Test case voltage is 0.8884 pu.	56	12/1/2007
HEDLEY 69kV, 54280	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9891 pu. Test case voltage is 0.8755 pu.	125	
HEDLEY 69kV, 54280	15SP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.915 pu. Test case voltage is 0.8972 pu.	135	
HEDLEY 69kV, 54280	15SP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9155 pu. Test case voltage is 0.8977 pu.	139	
HENDRIC 69kV, 51569	15SP, 51564-51688, SPS SPS-CNPL, Crosby Interchange - Lubbock East Interchange 115kV	Base case voltage is 0.9021 pu. Test case voltage is 0.8957 pu.	53	6/1/2015
HOBART 69kV, 54128	10SP, 54127-54128, AEPW WESTERN , HOBART JUNCTION - HOBART 69kV	Base case voltage is 0.9007 pu. Test case voltage is 0.8985 pu.	51	6/1/2010
HOLLIS 138kV, 54170	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9542 pu. Test case voltage is 0.8598 pu.	92	12/31/2006
HOLLIS 138kV, 54170	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9586 pu. Test case voltage is 0.8821 pu.	123	
HOLLIS TAP 138kV, 54291	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9552 pu. Test case voltage is 0.8611 pu.	94	12/31/2006
HOLLIS TAP 138kV, 54291	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9597 pu. Test case voltage is 0.8834 pu.	125	

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.

**Table 4: Contingency Analysis Results**

Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
JERICHO 115kV, 54276	07WP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9106 pu. Test case voltage is 0.8932 pu.	97	12/1/2007
JERICHO 115kV, 54276	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9641 pu. Test case voltage is 0.8827 pu.	126	
JERICHO 115kV, 54276	10SP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9136 pu. Test case voltage is 0.8964 pu.	127	
JERICHO 69kV, 54277	15SP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9065 pu. Test case voltage is 0.8881 pu.	57	6/1/2012
JERICHO 69kV, 54277	15SP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9069 pu. Test case voltage is 0.8886 pu.	60	
Kirby 115kV, 50932	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9695 pu. Test case voltage is 0.8908 pu.	141	12/1/2007
LAWTON RELIFT 69kV, 54190	15SP, 54187-54189, AEPW WESTERN , LAWTON DISPOSAL TAP - LAWTON RELIFT TAP 69kV	Base case voltage is 0.9007 pu. Test case voltage is 0.9 pu.	160	6/1/2015
LAWTON RELIFT TAP 69kV, 54189	15SP, 54187-54189, AEPW WESTERN , LAWTON DISPOSAL TAP - LAWTON RELIFT TAP 69kV	Base case voltage is 0.9007 pu. Test case voltage is 0.9 pu.	160	6/1/2015
LH-COX 115kV, 51366	15SP, 51564-51688, SPS SPS-CNPL, Crosby Interchange - Lubbock East Interchange 115kV	Base case voltage is 0.9012 pu. Test case voltage is 0.8973 pu.	49	6/1/2015
LH-CROS 69kV, 51567	15SP, 51564-51688, SPS SPS-CNPL, Crosby Interchange - Lubbock East Interchange 115kV	Base case voltage is 0.9023 pu. Test case voltage is 0.8958 pu.	57	6/1/2015

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.

**Table 4: Contingency Analysis Results**

Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
McLean Rural 115kV, 50840	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9282 pu. Test case voltage is 0.8524 pu.	60	12/31/2006
McLean Rural 115kV, 50840	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9198 pu. Test case voltage is 0.7406 pu.	18	
McLean Rural 115kV, 50840	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9268 pu. Test case voltage is 0.8289 pu.	44	
McLean Rural 115kV, 50840	15SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9401 pu. Test case voltage is 0.8892 pu.	126	
McLean Rural 115kV, 50840	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9434 pu. Test case voltage is 0.8889 pu.	127	
MCLELLN 115kV, 50838	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9679 pu. Test case voltage is 0.8886 pu.	137	12/1/2007
MEMPHIS 69kV, 54282	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9927 pu. Test case voltage is 0.8788 pu.	130	12/1/2007
NORTH MEMPHIS REA 69kV, 54281	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9913 pu. Test case voltage is 0.8772 pu.	128	12/1/2007
NORTH MEMPHIS REA 69kV, 54281	15SP, 54277-54278, AEPW WTU , JERICO - CLARENDON 69kV	Base case voltage is 0.9149 pu. Test case voltage is 0.8974 pu.	136	
NW Memphis 69kV, 54275	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9927 pu. Test case voltage is 0.8787 pu.	130	12/1/2007
RED RIVER ARSENAL 69kV, 54283	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9902 pu. Test case voltage is 0.8786 pu.	129	12/1/2007

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.

**Table 4: Contingency Analysis Results**

Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
SHAMROCK 115kV, 54295	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9008 pu. Test case voltage is 0.7918 pu.	1	12/31/2006
SHAMROCK 115kV, 54295	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9032 pu. Test case voltage is 0.8165 pu.	6	
SHAMROCK 115kV, 54295	15SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9174 pu. Test case voltage is 0.8577 pu.	47	
SHAMROCK 115kV, 54295	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9194 pu. Test case voltage is 0.8558 pu.	49	
SHAMROCK 115kV, 54295	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9269pu. Test case voltage is 0.8773pu.	87	
SHAMROCK 138kV, 54293	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9517 pu. Test case voltage is 0.8482 pu.	80	12/31/2006
SHAMROCK 138kV, 54293	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9554 pu. Test case voltage is 0.8723 pu.	107	

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.



**Table 4: Contingency Analysis Results**

Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
SHAMROCK 69kV, 54294	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9154 pu. Test case voltage is 0.8077 pu.	23	12/31/2006
SHAMROCK 69kV, 54294	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9185 pu. Test case voltage is 0.8323 pu.	34	
SHAMROCK 69kV, 54294	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9326 pu. Test case voltage is 0.8684 pu.	81	
SHAMROCK 69kV, 54294	15SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9308 pu. Test case voltage is 0.8708 pu.	82	
SHAMROCK 69kV, 54294	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9384pu. Test case voltage is 0.8902pu.	127	
SWEETWATER 69kV, 56060	07WP, 55846-55903, WFEC AEP-CS , CARTER JCT - ERICK 69kV	Base case voltage is 0.9015 pu. Test case voltage is 0.899 pu.	96	12/1/2007
SWEETWATER 69kV, 56060	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9338 pu. Test case voltage is 0.8954 pu.	141	
WELLINGTON 138kV, 54292	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9523 pu. Test case voltage is 0.8542 pu.	85	12/31/2006
WELLINGTON 138kV, 54292	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9566 pu. Test case voltage is 0.8772 pu.	114	

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.

### **Powerflow Analysis**

A powerflow analysis was conducted for the facility using modified versions of the 2006 April and Winter Peak, Summer and Winter Peak for 2007 and 2010, and 2015 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. The proposed in-service date of the generators is December 31, 2006. The available seasonal models used were through the 2015 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 160MW and location, additional criteria violations will occur on the existing SPS facilities under steady state conditions in the peak seasons.

There are several other proposed generation additions in the general area of the Customer's facility. 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.

In order to maintain acceptable bus voltages in the local area, the Customer will need to install additional reactive compensation in the SPS area. Currently planned facilities including a staged capacitor bank at the location of GEN-2001-033 and a 50MVAR switched capacitor bank at the Chaves 230kV bus must be installed. In addition, 60MVAR is required on this contingency basis to prevent excessive voltage decay. This Customer must install approximately 30MVAR in each of two capacitor banks switched at 34.5kV in the Customer's 345-34.5kV Substation. Dynamic Stability studies performed as part of the 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).

### **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 American Electric Power West, OG&E Electric Services, Southwestern Public Service Company and Western Farmers Electric Cooperative were applied and the resulting scenarios analyzed. This satisfies the 'more probable' contingency testing criteria mandated by NERC and the SPP criteria.

## **Conclusion**

The minimum cost of interconnecting the Customer project is estimated at \$7,434,666 for SPS' interconnection Network Upgrade facilities listed in Table 2 excluding upgrades of other transmission facilities by SPS listed in Table 3 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. As stated earlier, local projects that were previously queued are assumed to be in service in this Feasibility Study.

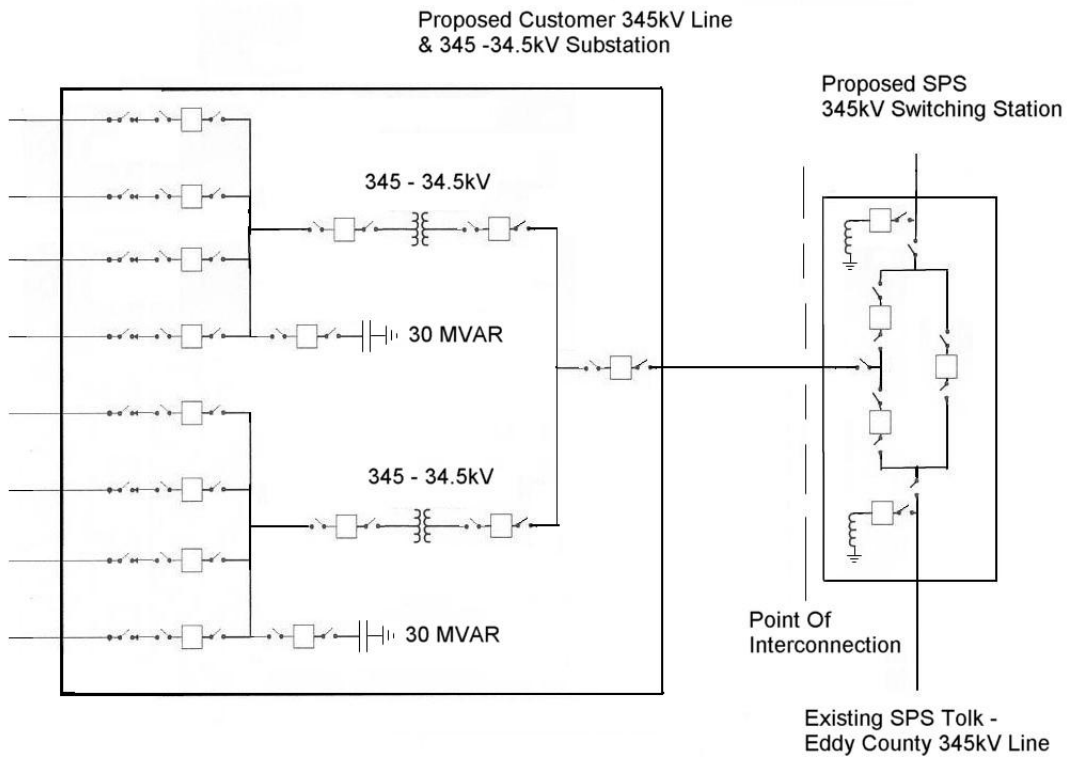
In order to aid in maintaining adequate voltages, the Customer will need to install 60MVAR of reactive compensation in its new substation. A switched 30MVAR capacitor bank may be installed at each of the two 34.5kV buses. Dynamic Stability studies performed as part of the impact study will provide guidance as to whether the reactive compensation can be static or must be dynamic (such as a SVC). These requirements are in addition to the currently planned facilities including a staged capacitor bank at the location of GEN-2001-033 and a 50MVAR switched capacitor bank at the Chaves 230kV bus must be installed.

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 10 contingencies, then only the results with the 10 lowest values of ATC may be included in this table.

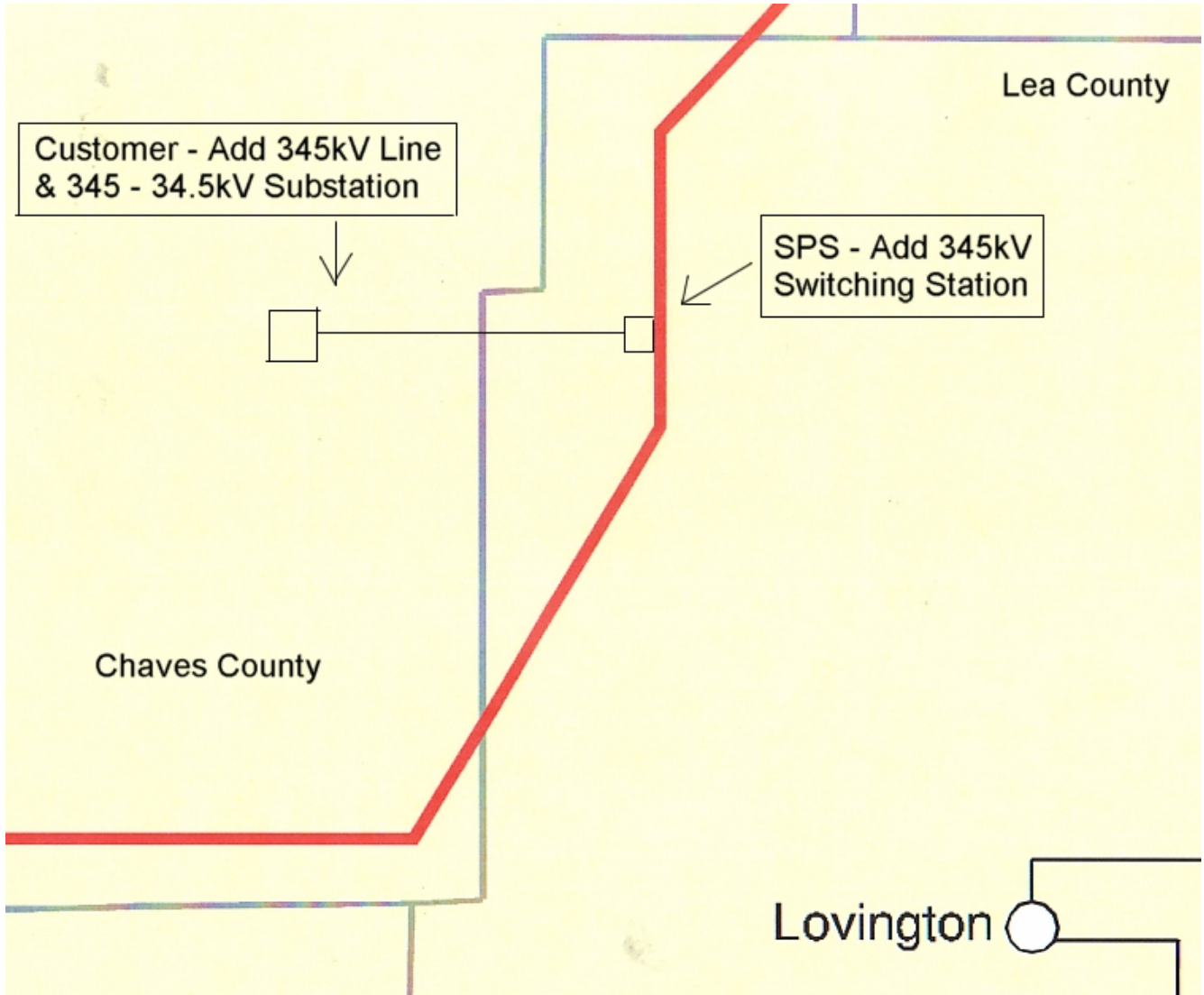
The cost and final sizing of the reactors in the new interconnection facility will be determined by an Electromagnetic Transient Program (EMTP) study, at the Customer's expense, that will be conducted upon the signing of an Impact Study Agreement. The 30 MVAR size and cost could change depending on the results of the EMTP study.

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 3 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 1: Proposed Interconnection  
(Final substation design to be determined)**



**Figure 2: Map Of The Surrounding Area**