Southwest Power Pool

Feasibility Study For Generation Interconnection Request GEN-2005-015

SPP Tariff Studies
(#GEN-2005-015)

December 16, 2005

Executive Summary

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 150MW of wind generation within the service territory of Southwestern Public Service Company (SPS) (d/b/a Xcel Energy, Inc.) in Motley County Texas. The proposed point of interconnection is in the existing Tuco – Oklaunion 345kV line at a new switching station in Motley 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 150MW of generation with transmission system reinforcements within the local transmission system. In order to maintain acceptable bus voltages near the Point of Interconnection, the Customer will not need to install additional reactive compensation in the Customer's substation. Dynamic Stability studies performed as part of the impact study will provide guidance as to whether additional reactive compensation is required and 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 Tuco – Oklaunion 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 American Electric Power West (AEPW), SPS and Western Farmers Electric Cooperative (WFEC) systems 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 150MW of wind generation within the service territory of SPS in Motley County Texas. The existing Tuco – Oklaunion 345kV line is owned by SPS, and the proposed generation interconnection is within SPS in Motley 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 Tuco – Oklaunion 345kV line is estimated at $7,434,666 which is based on estimates provided by the SPS engineering department. Other Network Constraints in the AEPW, SPS and WFEC systems 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.	*
Customer - 345kV line between Customer substation and new SPS 345kV switching station.	*
Customer - Right-of-Way for Customer Substation & Line.	*
Total	*****

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 Tuco – Oklaunion 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
Total	**$7,434,666**

Table 3: Network Constraints

Facility
AEPW - AIRPORT 69kV, 54286
AEPW - ALTUS JCT TAP 138kV, 54111
AEPW - ALTUS JUNCTION 138kV, 54103
AEPW - AMOCO 69kV, 54288
AEPW - AMOCO TAP 69kV, 54287
AEPW - CAREY 69kV, 54285
AEPW - CHILDRESS 138kV, 54290
AEPW - CHILDRESS 69kV, 54289
AEPW - CLARENDON 69kV, 54278
AEPW - CLARENDON REA 69kV, 54279
SPS - Crosby Interchange 69kV, 51563
AEPW - ELK CITY 138kV, 54121
AEPW - ELK CITY 230kV, 54153
AEPW - ELK CITY 69kV, 54122
WFEC - ELK CITY 69kV, 55897
AEPW - ELK CITY 230 - 138kV, 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
AEPW - HOLLIS 138kV, 54170
AEPW - HOLLIS TAP 138kV, 54291
AEPW - JERICHO 115kV, 54276
AEPW - JERICHO 69kV, 54277
SPS - Kirby 115kV, 50932

Table 3: Network Constraints

Facility
AEPW - LAKE PAULINE 138kV, 54296
AEPW - LAKE PAULINE 69kV, 54297
SPS - LE-TP51 69kV, 52487
SPS - McLean Rural 115kV, 50840
SPS - MCLELLN 115kV, 50838
AEPW - MEMPHIS 69kV, 54282
SPS - Moore County Interchange 230kV, 50669
AEPW - NORTH MEMPHIS REA 69kV, 54281
AEPW - NW Memphis 69kV, 54275
AEPW - RED RIVER ARSENAL 69kV, 54283
AEPW - SAYRE 138kV, 54167
AEPW - SHAMROCK 115kV, 54295
AEPW - SHAMROCK 138kV, 54293
AEPW - SHAMROCK 69kV, 54294
SPS - SP-CROS 69kV, 51561
WFEC - SWEETWATER 69kV, 56060
AEPW - TAMARAC TAP 138kV, 54158
AEPW - WALTERS 69kV, 54097
AEPW - WELLINGTON 138kV, 54292

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	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.937 pu. Test case voltage is 0.8527 pu.	66	6/1/2007
AIRPORT 69kV, 54286	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9601 pu. Test case voltage is 0.8755 pu.	107	
ALTUS JCT TAP 138kV, 54111	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9337 pu. Test case voltage is 0.8956 pu.	133	6/1/2010
ALTUS JUNCTION 138kV, 54103	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9328 pu. Test case voltage is 0.8951 pu.	131	6/1/2010
AMOCO 69kV, 54288	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9361 pu. Test case voltage is 0.8519 pu.	64	6/1/2007
AMOCO 69kV, 54288	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9591 pu. Test case voltage is 0.8745 pu.	105	
AMOCO TAP 69kV, 54287	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9372 pu. Test case voltage is 0.8531 pu.	66	6/1/2007
AMOCO TAP 69kV, 54287	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9602 pu. Test case voltage is 0.8757 pu.	107	
CAREY 69kV, 54285	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.937 pu. Test case voltage is 0.8517 pu.	65	6/1/2007
CAREY 69kV, 54285	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9606 pu. Test case voltage is 0.8753 pu.	107	
CHILDRESS 138kV, 54290	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9146 pu. Test case voltage is 0.8416 pu.	30	6/1/2007
CHILDRESS 138kV, 54290	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9346 pu. Test case voltage is 0.8608 pu.	70	

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)
CHILDRESS 69kV, 54289	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9408 pu. Test case voltage is 0.8577 pu.	74	6/1/2007
CHILDRESS 69kV, 54289	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9635 pu. Test case voltage is 0.8799 pu.	114	
CLARENDON 69kV, 54278	10WP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9011 pu. Test case voltage is 0.8886 pu.	13	6/1/2007
CLARENDON 69kV, 54278	10WP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9011 pu. Test case voltage is 0.8891 pu.	14	
CLARENDON 69kV, 54278	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.943 pu. Test case voltage is 0.8631 pu.	81	
CLARENDON 69kV, 54278	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9666 pu. Test case voltage is 0.8876 pu.	126	
CLARENDON 69kV, 54278	10SP, 54277-54278, AEPW WTU , JERICHO - CLARENDON 69kV	Base case voltage is 0.9125 pu. Test case voltage is 0.898 pu.	129	
CLARENDON REA 69kV, 54279	10WP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9015 pu. Test case voltage is 0.8891 pu.	18	6/1/2007
CLARENDON REA 69kV, 54279	10WP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9015 pu. Test case voltage is 0.8895 pu.	19	
CLARENDON REA 69kV, 54279	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9413 pu. Test case voltage is 0.8606 pu.	77	
CLARENDON REA 69kV, 54279	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9652 pu. Test case voltage is 0.8852 pu.	122	
CLARENDON REA 69kV, 54279	10SP, 54277-54278, AEPW WTU , JERICHO - CLARENDON 69kV	Base case voltage is 0.9131 pu. Test case voltage is 0.8987 pu.	136	

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)
CHILDRESS 69kV, 54289	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9408 pu. Test case voltage is 0.8577 pu.	74	6/1/2007
CHILDRESS 69kV, 54289	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9635 pu. Test case voltage is 0.8799 pu.	114	
CLARENDON 69kV, 54278	10WP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9011 pu. Test case voltage is 0.8886 pu.	13	6/1/2007
Crosby Interchange 69kV, 51563	15SP, 51564-51688, SPS SPS-CNPL, Crosby Interchange - Lubbock East Interchange 115kV	Base case voltage is 0.9025 pu. Test case voltage is 0.8999 pu.	144	6/1/2015
ELK CITY 138kV, 54121	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8721 pu. Test case voltage is 0.8356 pu.	0	12/31/2006
ELK CITY 138kV, 54121	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9028 pu. Test case voltage is 0.8137 pu.	5	
ELK CITY 138kV, 54121	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9219 pu. Test case voltage is 0.8333 pu.	37	
ELK CITY 230kV, 54153	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8609 pu. Test case voltage is 0.7561 pu.	0	12/31/2006
ELK CITY 230kV, 54153	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8396 pu. Test case voltage is 0.7278 pu.	0	
ELK CITY 230kV, 54153	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8934 pu. Test case voltage is 0.8418 pu.	0	
ELK CITY 230kV, 54153	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9068 pu. Test case voltage is 0.8527 pu.	19	

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 69kV, 54122	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8834 pu. Test case voltage is 0.8479 pu.	0	12/1/2007
ELK CITY 69kV, 55897	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9186 pu. Test case voltage is 0.8422 pu.	37	12/1/2007
ELK CITY - ELKCTY-6 138-( )kV, 54121 - WND 1	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	116.7	0	12/31/2006
ELK CITY - ELKCTY-6 138-( )kV, 54121 - WND 1	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	119.9	0	
ELK CITY - ELKCTY-6 138-( )kV, 54121 - WND 1	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	112.5	27	
ELK CITY - ELKCTY-6 138-( )kV, 54121 - WND 1	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	108.5	66	
ELK CITY - ELKCTY-6 138-( )kV, 54121 - WND 1	06AP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	100.3	147	
ELK CITY - ELKCTY-6 230-( )kV, 54153 - WND 2	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	109.3	0	6/1/2007
ELK CITY - ELKCTY-6 230-( )kV, 54153 - WND 2	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	107.7	63	
ELK CITY - ELKCTY-6 230-( )kV, 54153 - WND 2	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	104.4	101	

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)
ERICK 69kV, 55903	15SP, 55885-56060, WFEC AEP-CS , DURHAM - SWEETWATER 69kV	Base case voltage is 0.9011 pu. Test case voltage is 0.8988 pu.	72	6/1/2007
ERICK 69kV, 55903	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9111 pu. Test case voltage is 0.8904 pu.	80	
ERICK 69kV, 55903	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9233 pu. Test case voltage is 0.8818 pu.	84	
ERICK 69kV, 55903	10WP, 56000-56002, WFEC AEP-CS , MOREWOOD - MORWOOD 69kV	Base case voltage is 0.9037 pu. Test case voltage is 0.8998 pu.	142	
ESTELENE 69kV, 54284	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.937 pu. Test case voltage is 0.8506 pu.	64	6/1/2007
ESTELENE 69kV, 54284	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9611 pu. Test case voltage is 0.875 pu.	106	
Grapevine Interchange 115kV, 50826	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.896 pu. Test case voltage is 0.7369 pu.	0	12/31/2006
Grapevine Interchange 115kV, 50826	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8517 pu. Test case voltage is 0.7929 pu.	0	
Grapevine Interchange 115kV, 50826	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9215 pu. Test case voltage is 0.8033 pu.	27	

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)
Grapevine Interchange 230kV, 50827	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8273 pu. Test case voltage is 0.6785 pu.	0	6/1/2007
Grapevine Interchange 230kV, 50827	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.896 pu. Test case voltage is 0.8531 pu.	0	
Grapevine Interchange 230kV, 50827	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8129 pu. Test case voltage is 0.7544 pu.	0	
Grapevine Interchange 230kV, 50827	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9082 pu. Test case voltage is 0.8648 pu.	28	
Grapevine Interchange - ELK CITY 230kV, 50827 - 54153,	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	117.2	0	12/31/2006
Grapevine Interchange - ELK CITY 230kV, 50827 - 54153,	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	124.2	0	12/31/2006
Grapevine Interchange - ELK CITY 230kV, 50827 - 54153	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	109.4	0	
Grapevine Interchange - ELK CITY 230kV, 50827 - 54153	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	105.6	104	
Grapevine Interchange - ELK CITY 230kV, 50827 - 54153	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	101.0	142	

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	10WP, 54277-54278, AEPW WTU , JERICHO - CLARENDON 69kV	Base case voltage is 0.9006 pu. Test case voltage is 0.8889 pu.	8	6/1/2007
HEDLEY 69kV, 54280	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9376 pu. Test case voltage is 0.8525 pu.	66	
HEDLEY 69kV, 54280	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9622 pu. Test case voltage is 0.8779 pu.	111	
HEDLEY 69kV, 54280	10WP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9092 pu. Test case voltage is 0.8972 pu.	115	
HEDLEY 69kV, 54280	10WP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9093 pu. Test case voltage is 0.8976 pu.	119	
HOLLIS 138kV, 54170	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9066 pu. Test case voltage is 0.8296 pu.	13	6/1/2007
HOLLIS 138kV, 54170	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9274 pu. Test case voltage is 0.85 pu.	53	
HOLLIS TAP 138kV, 54291	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9087 pu. Test case voltage is 0.832 pu.	17	6/1/2007
HOLLIS TAP 138kV, 54291	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9295 pu. Test case voltage is 0.8524 pu.	57	

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	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8267 pu. Test case voltage is 0.7636 pu.	0	12/1/2008
JERICHO 115kV, 54276	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9377 pu. Test case voltage is 0.8888 pu.	116	
JERICHO 69kV, 54277	10WP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9017 pu. Test case voltage is 0.8893 pu.	21	12/1/2008
JERICHO 69kV, 54277	10WP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9018 pu. Test case voltage is 0.8897 pu.	22	
Kirby 115kV, 50932	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.887 pu. Test case voltage is 0.7234 pu.	0	12/31/2006
Kirby 115kV, 50932	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9131 pu. Test case voltage is 0.7927 pu.	16	
Kirby 115kV, 50932	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9447 pu. Test case voltage is 0.8985 pu.	145	
LAKE PAULINE 138kV, 54296	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9295 pu. Test case voltage is 0.8249 pu.	42	12/31/2006
LAKE PAULINE 138kV, 54296	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9334 pu. Test case voltage is 0.8757 pu.	87	
LAKE PAULINE 138kV, 54296	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9497 pu. Test case voltage is 0.8901 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)
LAKE PAULINE 69kV, 54297	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9521 pu. Test case voltage is 0.8967 pu.	141	6/1/2009
LE-TP51 69kV, 52487	10SP, 51928-51938, SPS SPS-YOGS, ALLRDT - SHLC3T 115kV	Base case voltage is 0.9021 pu. Test case voltage is 0.8995 pu.	121	6/1/2010
McLean Rural 115kV, 50840	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8886 pu. Test case voltage is 0.8237 pu.	0	6/1/2007
McLean Rural 115kV, 50840	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9094 pu. Test case voltage is 0.8433 pu.	21	
MCLELLN 115kV, 50838	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9427 pu. Test case voltage is 0.8958 pu.	137	6/1/2009
MEMPHIS 69kV, 54282	10WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.748 pu. Test case voltage is 0.6687 pu.	0	6/1/2007
MEMPHIS 69kV, 54282	15SP, 54277-54278, AEPW WTU , JERICHO - CLARENDON 69kV	Base case voltage is 0.9015 pu. Test case voltage is 0.8893 pu.	18	
MEMPHIS 69kV, 54282	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9394 pu. Test case voltage is 0.8522 pu.	68	
MEMPHIS 69kV, 54282	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9642 pu. Test case voltage is 0.8778 pu.	111	
MEMPHIS 69kV, 54282	15SP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9093 pu. Test case voltage is 0.8973 pu.	116	
MEMPHIS 69kV, 54282	15SP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9098 pu. Test case voltage is 0.8977 pu.	121	

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)
Moore County Interchange 230kV, 50669	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9136 pu. Test case voltage is 0.8171 pu.	21	12/31/2006
Moore County Interchange 230kV, 50669	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9371 pu. Test case voltage is 0.8812 pu.	100	
NORTH MEMPHIS REA 69kV, 54281	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9383 pu. Test case voltage is 0.8513 pu.	66	6/1/2007
NORTH MEMPHIS REA 69kV, 54281	15SP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9058 pu. Test case voltage is 0.8937 pu.	72	
NORTH MEMPHIS REA 69kV, 54281	15SP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9063 pu. Test case voltage is 0.8941 pu.	77	
NORTH MEMPHIS REA 69kV, 54281	10WP, 54277-54278, AEPW WTU , JERICHO - CLARENDON 69kV	Base case voltage is 0.9082 pu. Test case voltage is 0.8968 pu.	108	
NORTH MEMPHIS REA 69kV, 54281	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9631 pu. Test case voltage is 0.8769 pu.	110	

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)
NW Memphis 69kV, 54275	15SP, 54277-54278, AEPW WTU , JERICHO - CLARENDON 69kV	Base case voltage is 0.9006 pu. Test case voltage is 0.8883 pu.	7	6/1/2007
NW Memphis 69kV, 54275	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9395 pu. Test case voltage is 0.8523 pu.	68	
NW Memphis 69kV, 54275	15SP, 50932-54276, SPS SPS-AMA - AEPW WTU , Kirby - JERICHO 115kV	Base case voltage is 0.9085 pu. Test case voltage is 0.8964 pu.	105	
NW Memphis 69kV, 54275	15SP, 54276-54277-54303, AEPW WTU , JERICHO 115-69kV	Base case voltage is 0.9089 pu. Test case voltage is 0.8969 pu.	111	
NW Memphis 69kV, 54275	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9643 pu. Test case voltage is 0.878 pu.	112	
NW Memphis 69kV, 54275	10WP, 54277-54278, AEPW WTU , JERICHO - CLARENDON 69kV	Base case voltage is 0.9107 pu. Test case voltage is 0.8993 pu.	141	
RED RIVER ARSENAL 69kV, 54283	07WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8735 pu. Test case voltage is 0.6759 pu.	0	6/1/2007
RED RIVER ARSENAL 69kV, 54283	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9374 pu. Test case voltage is 0.8505 pu.	65	
RED RIVER ARSENAL 69kV, 54283	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9619 pu. Test case voltage is 0.8754 pu.	107	
SAYRE 138kV, 54167	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9419 pu. Test case voltage is 0.8996 pu.	149	6/1/2010

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	06WP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8198 pu. Test case voltage is 0.6722 pu.	0	12/31/2006
SHAMROCK 115kV, 54295	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8771 pu. Test case voltage is 0.8003 pu.	0	
SHAMROCK 115kV, 54295	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8555 pu. Test case voltage is 0.7779 pu.	0	
SHAMROCK 115kV, 54295	10WP, 54119-99933, AEPW WESTERN - , OKLAUNION - 2005-15T 345kV	Base case voltage is 0.9312 pu. Test case voltage is 0.8836 pu.	98	
SHAMROCK 115kV, 54295	06WP, 54119-99933, AEPW WESTERN - , OKLAUNION - 2005-15T 345kV	Base case voltage is 0.9332 pu. Test case voltage is 0.8843 pu.	102	
SHAMROCK 138kV, 54293	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9046 pu. Test case voltage is 0.8238 pu.	9	6/1/2007
SHAMROCK 138kV, 54293	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9266 pu. Test case voltage is 0.846 pu.	50	
SHAMROCK 69kV, 54294	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.89 pu. Test case voltage is 0.8107 pu.	0	6/1/2007
SHAMROCK 69kV, 54294	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.8681 pu. Test case voltage is 0.788 pu.	0	
SHAMROCK 69kV, 54294	10WP, 54119-99933, AEPW WESTERN - , OKLAUNION - 2005-15T 345kV	Base case voltage is 0.9438 pu. Test case voltage is 0.8989 pu.	146	

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)
SP-CROS 69kV, 51561	15SP, 51564-51688, SPS SPS-CNPL, Crosby Interchange - Lubbock East Interchange 115kV	Base case voltage is 0.9025 pu. Test case voltage is 0.8999 pu.	144	6/1/2015
SWEETWATER 69kV, 56060	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9069 pu. Test case voltage is 0.8852 pu.	48	6/1/2007
SWEETWATER 69kV, 56060	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9191 pu. Test case voltage is 0.8786 pu.	71	
SWEETWATER 69kV, 56060	10WP, 55832-55885, WFEC AEP-CS , BRANTLEY - DURHAM 69kV	Base case voltage is 0.9039 pu. Test case voltage is 0.8996 pu.	136	
TAMARAC TAP 138kV, 54158	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9355 pu. Test case voltage is 0.898 pu.	142	6/1/2010
WALTERS 69kV, 54097	15SP, 54187-54189, AEPW WESTERN , LAWTON DISPOSAL TAP - LAWTON RELIFT TAP 69kV	Base case voltage is 0.9001 pu. Test case voltage is 0.899 pu.	14	6/1/2015
WELLINGTON 138kV, 54292	10SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9052 pu. Test case voltage is 0.8264 pu.	10	6/1/2007
WELLINGTON 138kV, 54292	07SP, 54119-54131, AEPW WESTERN , OKLAUNION - LAWTON EASTSIDE 345kV	Base case voltage is 0.9266 pu. Test case voltage is 0.8475 pu.	50	

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 150MW 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 of the generation, the Customer will not need to install additional reactive compensation in its substation. 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. Dynamic Stability studies performed as part of the impact study will provide additional guidance as to whether any required 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 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 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 AEPW, SPS and WFEC 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 voltage at the Point of Interconnection, the Customer will not need to install reactive compensation in its new substation. Dynamic Stability studies performed as part of the impact study will provide additional guidance as to whether any required 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.

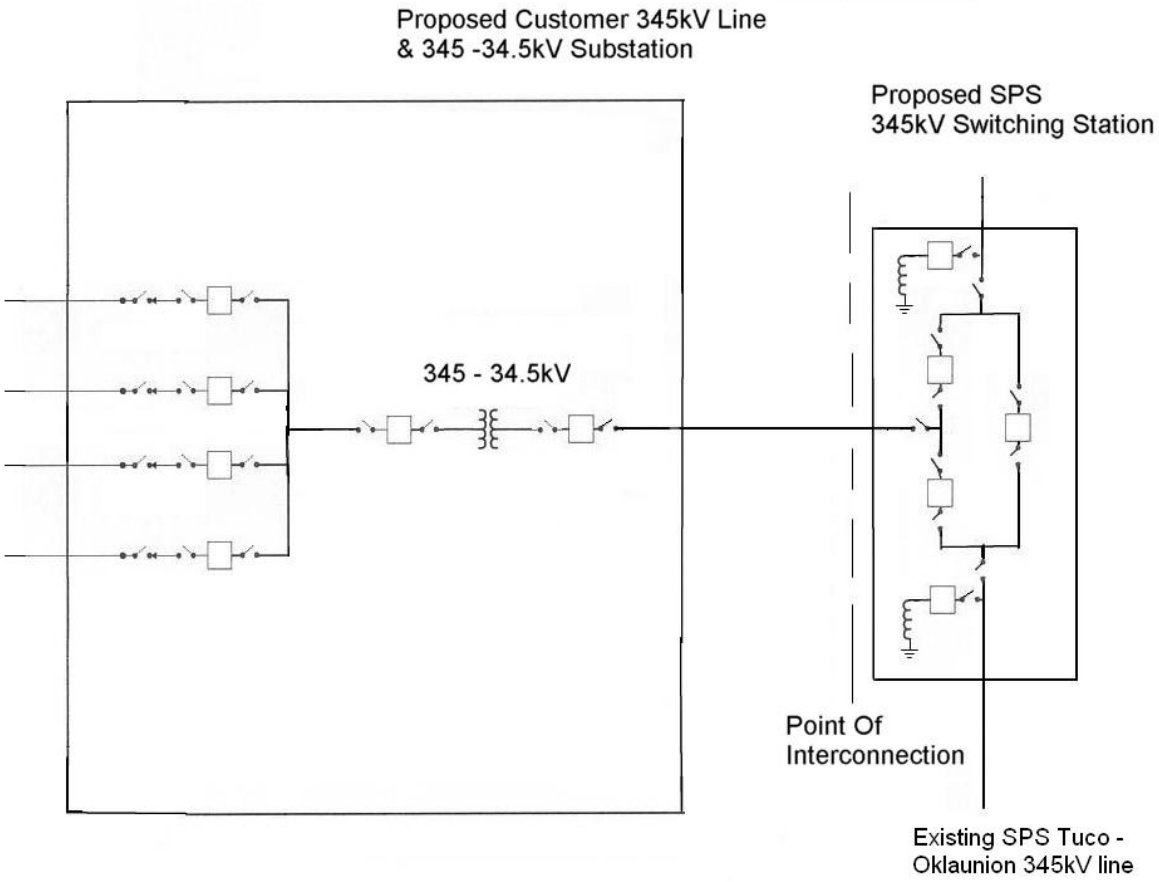

Figure 1: Proposed Interconnection
(Final substation design to be determined)

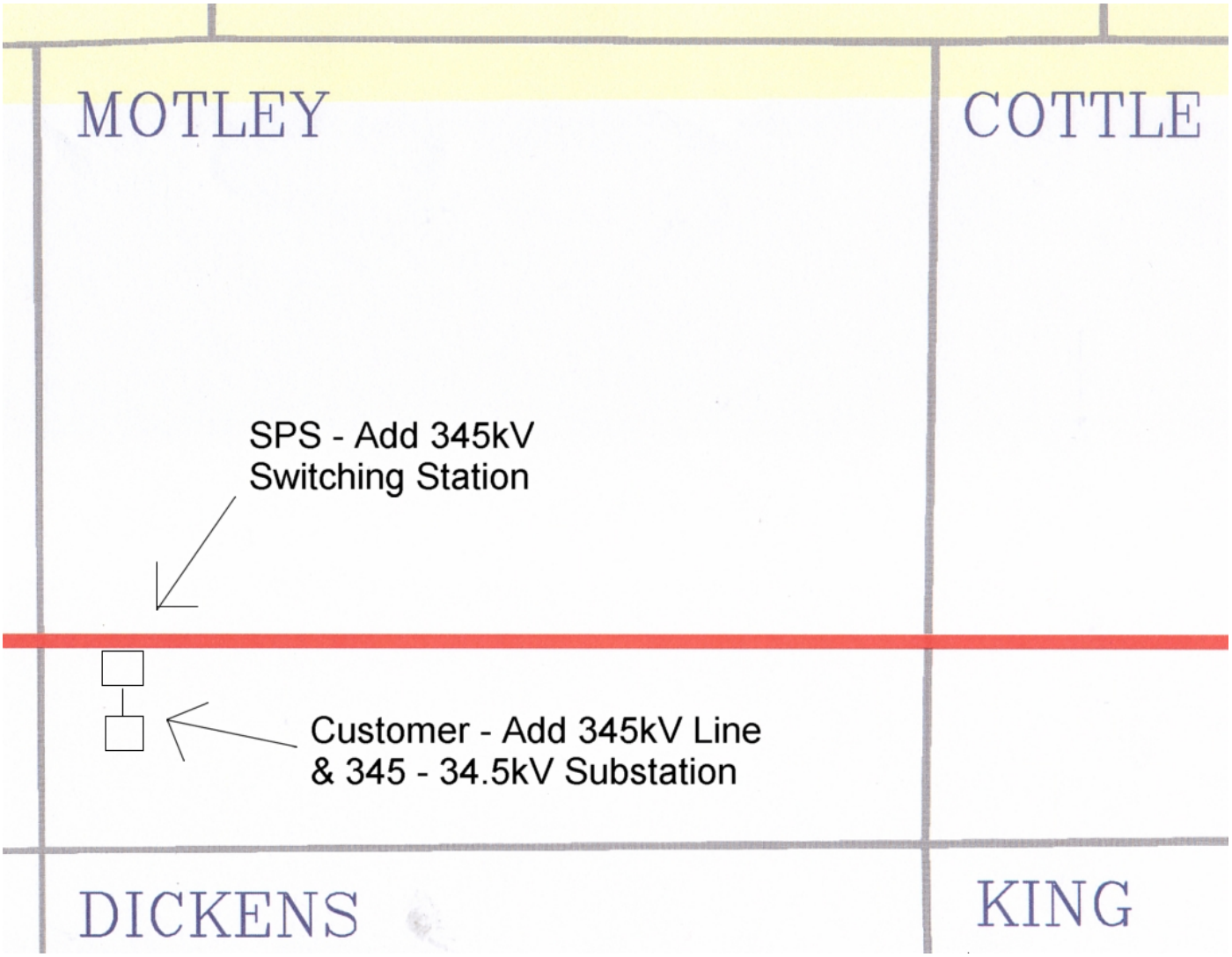

Figure 2: Map Of The Surrounding Area