



***Feasibility Study
For
Generation Interconnection
Request
GEN-2006-004***

***SPP Tariff Studies
(#GEN-2006-004)***

August, 2006

Executive Summary

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 610MW(summer)/620MW(winter) of generation within the service territory of American Electric Power (AEP) in Rogers County, Oklahoma. The proposed point of interconnection is the Northeastern Power Station 345kV bus. The proposed in-service date is June 1, 2011.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 610/620MW of generation with transmission system reinforcements within the local transmission systems. The requirements for interconnection consist of adding a new 345kV terminal to the existing breaker-and-a-half configuration at Northeastern Power Station. Adding a new 138kV terminal is also required in order to accommodate the auxiliary transformer for the new generator. In addition, the relocation of several 138kV lines within the substation is necessary to avoid transmission lines being crossed over by the new terminals to the GSU and auxiliary transformer.

The total cost for adding the new 345kV GSU terminal, the new 138kV auxiliary transformer terminal, and relocating seven (7) 138kV lines within the Northeastern Power Station switchyard, the required interconnection facilities, is estimated at \$6,393,000. Other Network Constraints in the American Electric Power West (AEPW), Oklahoma Gas & Electric (OKGE); Westar Energy (WERE), and Kansas City Power & Light (KCPL) 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 (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 345kV, 138kV, and 24kV facilities from the Customer GSU and auxiliary transformers up to the point of interconnection. **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.

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. These contingency analyses will have to be re-evaluated as part of a transmission service request.

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 AEPW service territories 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.

Nothing in this study should be construed as a guarantee of transmission service. If the customer wishes to sell power from the facility, a separate request for transmission service shall be requested on Southwest Power Pool's OASIS by the Customer.

Introduction

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting 610MW(summer)/620MW(winter) of generation within the service territory of American Electric Power (AEP) in Rogers County, Oklahoma. The proposed interconnection configuration is to add a new 345kV terminal to the existing breaker-and-a-half bus at Northeastern Power Station. The proposed in-service date is June 1 2011.

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 terminal to the Northeastern 345kV breaker-and-a-half bus for the addition of the generator and associated GSU. Also necessary is a new 138kV terminal to accept the auxiliary transformer for the new generator. In addition, several 138kV transmission lines at Northeastern power station will need to be relocated in order to avoid crossing the lines to the new generator and auxiliary transformer over the existing lines at the station.

The total cost for adding a new 345kV terminal, a new 138kV terminal, and associated line terminal relocations is \$6,393,000. Other Network Constraints in the AEPW, SPS, OKGE, WERE, and KCPL 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 the 345kV facilities from the Customer's 345kV and generator voltage equipment into the Northeastern 345kV bus. The Customer is responsible for these facilities up to the point of interconnection.

The costs of interconnecting the facility to the AEPW transmission system are listed in Table 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.

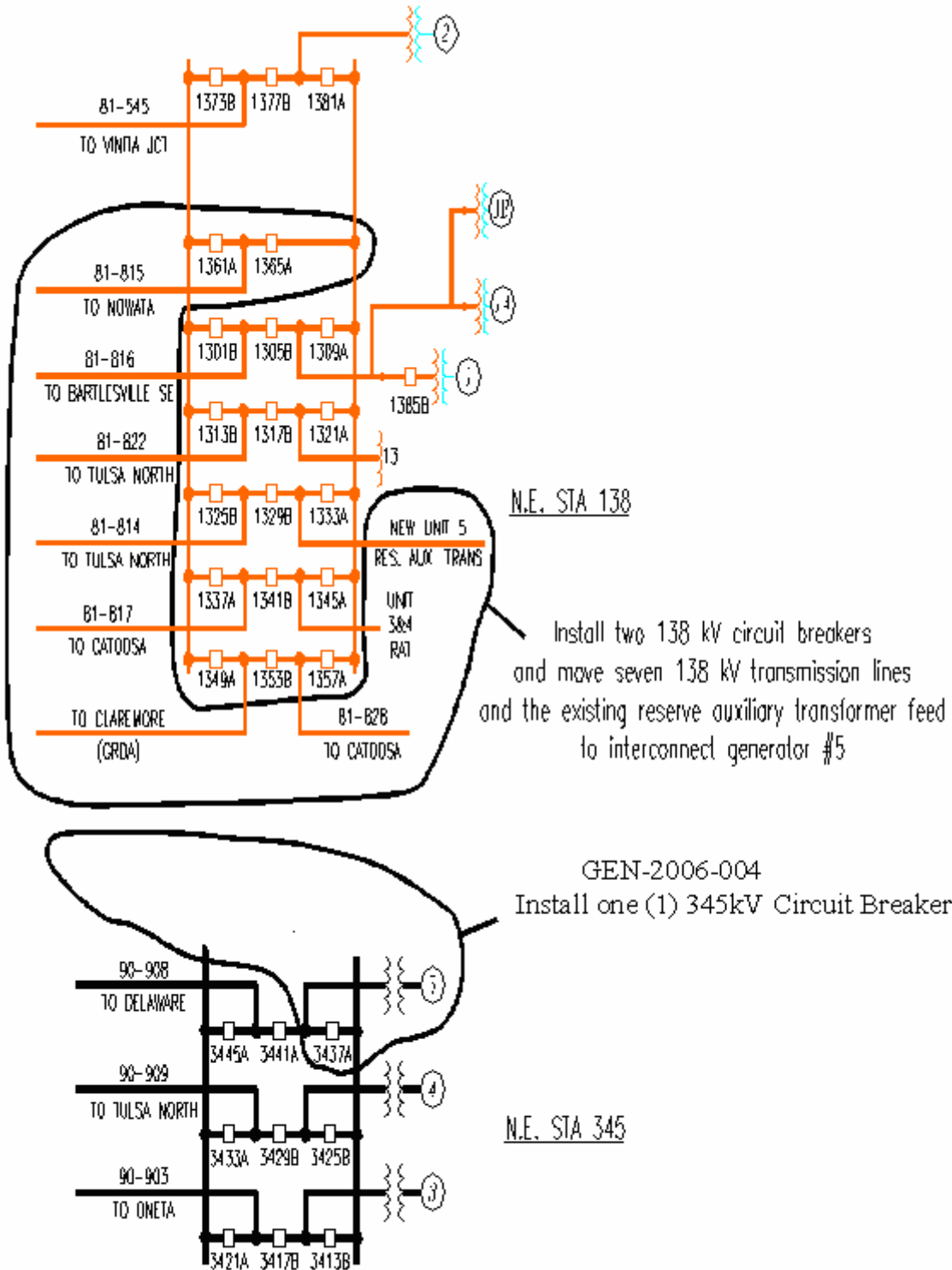
Table 1: Direct Assignment Facilities

Facility	ESTIMATED COST (2006 DOLLARS)
Customer – 345kV, 24kV equipment	*
Customer – 345kV connection from GSU to Northeastern 345kV bus	\$214,000
Customer – 138kV connection from Reserve auxiliary transformer to Northeastern 138kV bus	\$203,000
Total	*

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

Table 2: Required Interconnection Network Upgrade Facilities

Facility	ESTIMATED COST (2006 DOLLARS)
AEP – Add 345kV terminal including one 345kV circuit breaker to the Northeastern 345kV breaker-and-a-half bus.	\$1,831,000
AEP – Add 138kV terminal including two (2) 138kV circuit breakers to the Northeastern 138kV breaker-and-a-half-bus.	\$3,500,000
AEP – Relocate seven 138kV lines at Northeast 138kV switchyard	\$939,000
AEP- Relocate Reserve auxiliary transformer feed for Units #3 and #4 at Northeastern 138kV switchyard	\$123,000
Total	\$6,393,000



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

Powerflow Analysis

A powerflow analysis was conducted for the facility using modified versions of the 2011 Summer and Winter Peak, and 2016 Summer Peak models. Five different scenarios of each of the season models were used to evaluate the request. 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 June 1, 2011. The available seasonal models used were through the 2016 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 610/620MW and location, additional criteria violations will occur on the existing AEPW, SPS, OKGE, WERE, and KCPL transmission systems under steady state and contingency conditions in the peak seasons. These contingency analyses will have to be re-evaluated as part of a transmission service request.

There are 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.

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 AEPW, WERE, EMDE, KACY, KCPL, MIPU, SWPS, OKGE, WFEC, GRDA, OMPA, INDN, SPRM, and SWPA were applied and the resulting scenarios analyzed. This satisfies the 'more probable' contingency testing criteria mandated by NERC and the SPP criteria.

Table 3: Network Constraints

Facility
AEP 'BARTLESVILLE SOUTHEAST - NORTH BARTLESVILLE 138KV CKT 1'
AEP 'BEAVER - EUREKA SPRINGS 161KV CKT 1'
AEP-WERE 'COFFEYVILLE TAP - DEARING 138KV CKT 1'
AEP 'COFFEYVILLE TAP - NORTH BARTLESVILLE 138KV CKT 1'
OKGE 'FAIRMONT TAP - WOODRING 138KV CKT 1'
AEP 'LINWOOD - MCWILLIE STREET 138KV CKT 1'
AEP 'NORTHEAST STATION - TULSA NORTH 345KV CKT 1'
KCPL 'PAOLA (PAOLA 11) 345/161/13.8KV TRANSFORMER CKT 11'
OKGE 'PECAN CREEK (PECANCK1) 345/161/13.8KV TRANSFORMER CKT 1'
OKGE 'WAUKOMIS TAP - WOODRING 138KV CKT 1'

Table 4: Contingency Analysis

FACILITY	SEASON	RATE (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
'PECAN CREEK (PECANCK1) 345/161/13.8KV TRANSFORMER CKT 1'	11sp	370	106.5	0	'FT SMITH - MUSKOGEE 345KV CKT 1' 'HARTS ISLAND - SOUTH SHREVEPORT 138KV CKT 1'
'LINWOOD - MCWILLIE STREET 138KV CKT 1'	11sp	209	103.4	404	'DELAWARE - NEOSHO 345KV CKT 1' 'DELAWARE - NORTHEAST STATION 345KV CKT 1'
'COFFEYVILLE TAP - DEARING 138KV CKT 1'	11sp	232	103.3	497	'NORTHEAST STATION - TULSA NORTH 345KV CKT 1'
'NORTHEAST STATION - TULSA NORTH 345KV CKT 1'	11sp	1055	101.5	580	'NORTHEAST STATION - TULSA NORTH 345KV CKT 1'
'BROKEN ARROW NORTH - SOUTH TAP - ONETA 138KV CKT 1'	11sp	235	100.1	605	
'COFFEYVILLE TAP - DEARING 138KV CKT 1'	11wp	232	109.3	289	'DELAWARE - NEOSHO 345KV CKT 1'
'TUCO INTERCHANGE (TUCO XX4) 345/230/13.2KV TRANSFORMER CKT 1'	16sp	560	108.8	79	'FINNEY STATION - HOLCOMB 345KV CKT 1'
'COFFEYVILLE TAP - DEARING 138KV CKT 1'	16sp	232	115.7	116	'DELAWARE - NEOSHO 345KV CKT 1' 'DELAWARE - NORTHEAST STATION 345KV CKT 1'
'BARTLESVILLE SOUTHEAST - NORTH BARTLESVILLE 138KV CKT 1'	16sp	235	105.3	363	'FAIRMONT TAP - WOODRING 138KV CKT 1'
'WAUKOMIS TAP - WOODRING 138KV CKT 1'	16sp	287	103.2	463	
'PAOLA (PAOLA 11) 345/161/13.8KV TRANSFORMER CKT 11'	16sp	440	101.4	469	'PAOLA - WEST GARDNER 345KV CKT 1' 'DELAWARE - NORTHEAST STATION 345KV CKT 1'
'COFFEYVILLE TAP - NORTH BARTLESVILLE 138KV CKT 1'	16sp	235	102.6	490	'BROOKLINE - SUB 383 - MONETT 345KV CKT 1'
'BEAVER - EUREKA SPRINGS 161KV CKT 1'	16sp	274	101.2	503	'WAUKOMIS TAP - WOODRING 138KV CKT 1'
'FAIRMONT TAP - WOODRING 138KV CKT 1'	16sp	287	101.6	536	'DELAWARE - NORTHEAST STATION 345KV CKT 1'
'NORTHEAST STATION - TULSA NORTH 345KV CKT 1'	16sp	1055	100.8	594	

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 project is estimated at \$6,393,000 for AEP's Transmission Owner interconnection facilities listed in Table 2 excluding upgrades of other transmission facilities by AEP, OKGE, WERE, and KCPL listed in Table 3 of which are Network Constraints. At this time, the cost estimates for Direct Assignment facilities including those in Table 1 have not all 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 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. These contingency analyses will have to be re-evaluated as part of a transmission service request.

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 2: Map Of The Surrounding Area