



***Feasibility Study  
For  
Generation Interconnection  
Request  
GEN-2005-018***

***SPP Tariff Studies  
(#GEN-2005-018)***

**April 21, 2006**

## **Executive Summary**

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 32MW of combustion generation within the service territory of OG&E Electric Services (OKGE) in Muskogee County Oklahoma. The proposed point of interconnection is in the existing Muskogee 161kV Substation. This 161kV substation is owned by OKGE. The proposed in-service date is March 31, 2007.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 32MW of generation with transmission system reinforcements within the local American Electric Power West (AEPW), Grand River Dam Authority (GRDA) and OKGE transmission systems. The requirements for interconnection consist of adding a 161-13.2kV generator step-up unit (GSU) at the Customer's new station site. This 161-13.2kV transformer addition shall be installed and maintained by the Customer. OKGE will install new bus, breaker, switches and metering as required in the existing substation to accommodate a new 161kV line to the Customer station. The Customer will have the 161kV line built to the existing substation.

The total cost for adding the GSU in the new 161-13.2kV Station will be estimated by the Customer. The total cost for adding the new bus, breaker, switches and metering as required in the existing Muskogee 161kV Substation, the interconnection facility, to accommodate a new 161kV line has been estimated by OKGE. Other Network Constraints in the AEPW, GRDA and OKGE 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 within the SPP footprint in OKGE 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 13.2kV facilities within the Customer's new station.

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 highest values of loading may be included in this table. There are no other proposed generation additions in the general area of the Customer's facility.

## Introduction

<OMITTED TEXT> (Customer) has requested a feasibility study for the purpose of interconnecting 32MW of combustion generation within the service territory of OG&E Electric Services in Muskogee County Oklahoma. The existing Muskogee 161kV Substation is owned by OKGE, and the proposed generation interconnection is with OKGE in this facility. The proposed in-service date is March 31, 2007.

## 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 161-13.2kV GSU by the Customer in its new station and interconnecting in the OKGE Muskogee Substation via a new 161kV line. This station addition shall be installed and maintained by the Customer. A specific route of the Customer's 161kV facilities to serve its 161-13.2kV station has been defined. It is assumed that obtaining all necessary right-of-way for the new 161kV facilities will not be a significant expense.

The total cost for OKGE to add new 161kV facilities in the Muskogee 161kV Substation, the interconnection facility, is \$926,917. Other Network Constraints in the AEPW, GRDA and OKGE 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 161kV facilities from the new station into the existing Muskogee Substation estimated at a cost of \$471,190. The Customer is responsible for all 161kV facilities up to the point of interconnection. This cost does not include the Customer's 161-13.2kV facilities and the cost estimate should be determined by the Customer.

The costs of interconnecting the facility to the OKGE 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 (2006 DOLLARS)
Customer – 161-13.2 kV Station facilities.	*
Customer – 161kV facilities between Customer facilities and existing OKGE 161kV Substation constructed by OKGE.	\$471,190
Customer - Right-of-Way for Customer facilities.	*
OKGE - Add 161kV main/transfer bus, breaker, switches and metering in the existing Muskogee Substation.	926,917
<b>Total</b>	*

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

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

Facility	ESTIMATED COST (2006 DOLLARS)
OKGE – No additional 161kV facilities.	\$0
<b>Total</b>	<b>\$0</b>



**Table 4: Contingency Analysis Results**

Facility	Model & Contingency	Facility Loading (% Rate B) Or Voltage (PU)	ATC (MW)	Date Required (M/D/Y)
CATOOSA - CATAUTO1 138-( )kV, 53802 - WND 1,	07SP, 53802-54438-54634, AEPW TULSA - GRDA GRDA , CATOOSA 161- 138kV CKT 2	107.1	0	6/1/2007
CATOOSA - CATAUTO1 138-( )kV, 53802 - WND 1	10SP, 53802-54438-54634, AEPW TULSA - GRDA GRDA , CATOOSA 161- 138kV CKT 2	102.8	0	
CATOOSA - CATAUTO1 161-( )kV, 54438 - WND 2,	07SP, 53802-54438-54634, AEPW TULSA - GRDA GRDA , CATOOSA 161- 138kV CKT 2	107.1	0	6/1/2007
CATOOSA - CATAUTO1 161-( )kV, 54438 - WND 2	10SP, 53802-54438-54634, AEPW TULSA - GRDA GRDA , CATOOSA 161- 138kV CKT 2	102.8	0	
CATOOSA - CATAUTO2 138-( )kV CKT 2, 53802 - WND 1,	07SP, 53802-54438-54633, AEPW TULSA - GRDA GRDA , CATOOSA 161- 138kV	107.5	0	6/1/2007
CATOOSA - CATAUTO2 138-( )kV CKT 2, 53802 - WND 1	10SP, 53802-54438-54633, AEPW TULSA - GRDA GRDA , CATOOSA 161- 138kV	103.2	0	
CATOOSA - CATAUTO2 161-( )kV CKT 2, 54438 - WND 2,	07SP, 53802-54438-54633, AEPW TULSA - GRDA GRDA , CATOOSA 161- 138kV	107.4	0	6/1/2007
CATOOSA - CATAUTO2 161-( )kV CKT 2, 54438 - WND 2	10SP, 53802-54438-54633, AEPW TULSA - GRDA GRDA , CATOOSA 161- 138kV	103.1	0	
CLARKSVILLE - MUSKOGEE 345kV, 53756 - 55224,	15SP, 53794-55224, AEPW TULSA - OKGE MUSKOGEE, RIVERSIDE STATION - MUSKOGEE 345kV	110.6	0	6/1/2011
CLARKSVILLE - MUSKOGEE 345kV, 53756 - 55224,	15SP, 53794-55224, AEPW TULSA - OKGE MUSKOGEE, RIVERSIDE STATION - MUSKOGEE 345kV	110.6	0	

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)
SUNNYSIDE - SUNNYS3 138-( )kV, 55135 - WND 1,	15SP, 54033-55045, AEPW EASTERN - OKGE SHAWNEE , PITTSBURG - SEMINOLE 345kV	108.3	0	6/1/2011
SUNNYSIDE - SUNNYS3 345-( )kV, 55136 - WND 2,	15SP, 54033-55045, AEPW EASTERN - OKGE SHAWNEE , PITTSBURG - SEMINOLE 345kV	107.7	0	6/1/2011
WESTMOORE - PENNSYLVANIA 138kV, 54887 - 54925,	07WP, 54953-54954, OKGE METRO , HOLLYWOOD - INDIAN HILLS 138kV	108.6	0	12/1/2007
WESTMOORE - PENNSYLVANIA 138kV, 54887 - 54925	07WP, 54954-54955, OKGE METRO , INDIAN HILLS - MOORE 138kV	108.0	0	
WESTMOORE - PENNSYLVANIA 138kV, 54887 - 54925	07WP, 54894-54898, OKGE METRO , CZECH HALL - CIMARRON 138kV	106.3	0	
WESTMOORE - PENNSYLVANIA 138kV, 54887 - 54925	07WP, 54893-54894, OKGE METRO , XEROX - CZECH HALL 138kV	104.6	0	
WESTMOORE - PENNSYLVANIA 138kV, 54887 - 54925	07WP, 54955-54960, OKGE METRO , MOORE - OAKCREEK 138kV	103.7	0	
WESTMOORE - PENNSYLVANIA 138kV, 54887 - 54925	07WP, 54893-54896, OKGE METRO , XEROX - MORGAN 138kV	103.3	0	
WESTMOORE - PENNSYLVANIA 138kV, 54887 - 54925	07WP, 54933-54961, OKGE METRO , DRAPER LAKE - GM 138kV	102.7	0	
WESTMOORE - PENNSYLVANIA 138kV, 54887 - 54925	07WP, 54861-54896, OKGE METRO , MUSTANG - MORGAN 138kV	102.5	0	
WESTMOORE - PENNSYLVANIA 138kV, 54887 - 54925	07WP, 54961-54984, OKGE METRO , GM - WILD MARY 138kV	100.4	11	

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, 2007 & 2010 Summer and Winter Peak, 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 in OKGE. The proposed in-service date of the generation is March 31, 2007. 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 32MW and location, additional criteria violations will occur on the existing AEPW, GRDA and OKGE facilities under steady state conditions in the peak seasons. There are no other proposed generation additions in the general area of the Customer's facility.

## **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, Grand River Dam Authority, and OG&E Electric Services 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 \$0 for OKGE's interconnection Network Upgrade facilities listed in Table 2 excluding upgrades of other transmission facilities by AEPW, GRDA and OKGE 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 all been defined by the Customer. The Direct Assignment facilities including 161kV line and main/transfer bus, breaker, switches and metering for the existing Muskogee 161kV Substation have been estimated at a cost of \$ 1,398,107. 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. When a facility is



overloaded for more than 10 contingencies, then only the results with the 10 highest values of loading may be included in this 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 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.



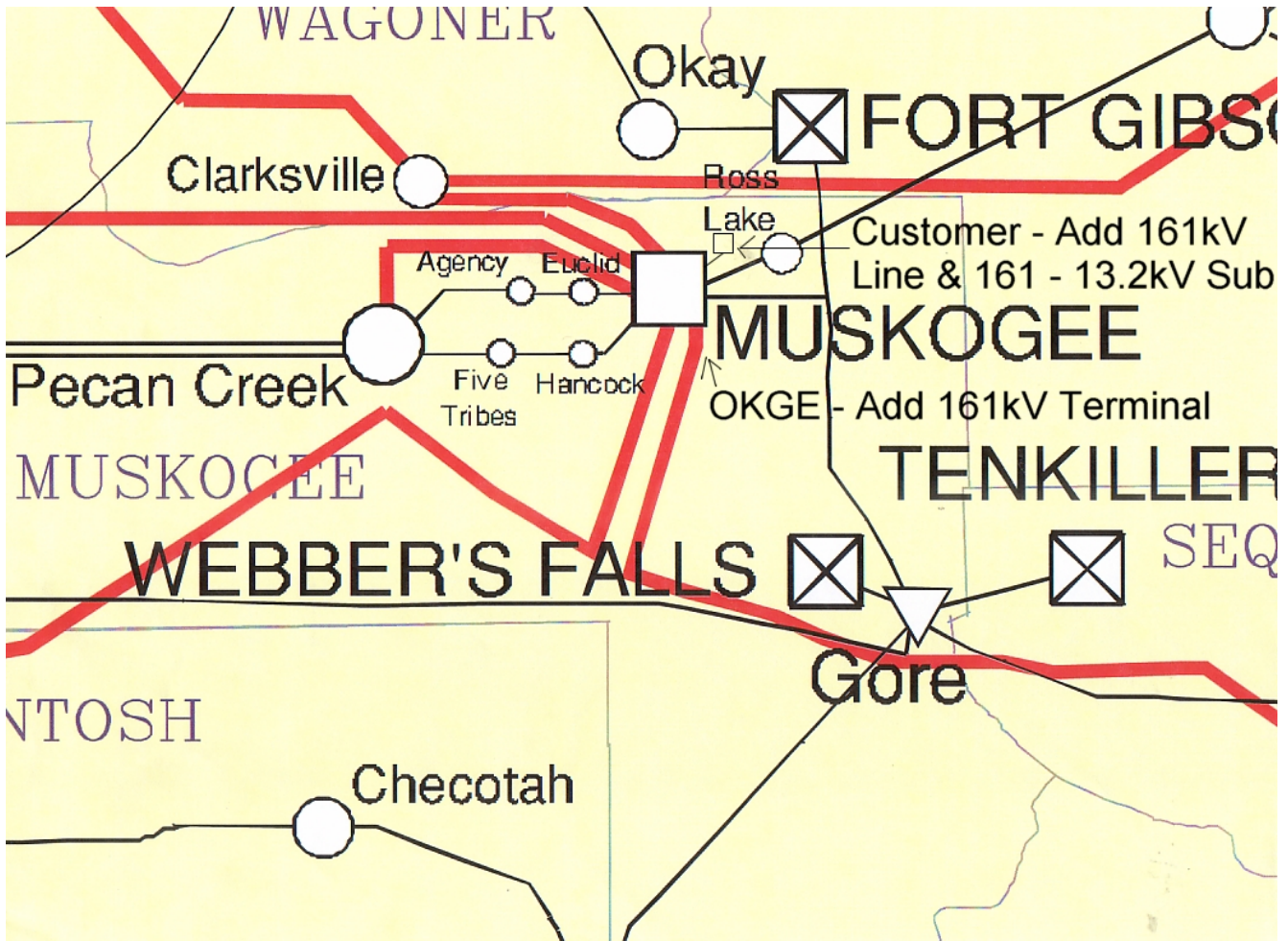


Figure 2: Map Of The Surrounding Area