Feasibility Study
For
Generation Interconnection Request
GEN-2007-029

SPP Tariff Studies
(#GEN-2007-029)

February 2008

Executive Summary

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 200 MW of wind generation within the control area of Western Farmers Electric Cooperative (WFEC) located in Caddo County, Oklahoma. The proposed interconnection point is in the existing Washita (WFEC) 138 kV ring bus substation, owned by WFEC. The proposed in-service date is December, 2010.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 200 MW of generation with transmission system reinforcements within the local transmission system. In order to maintain acceptable reactive power compensation, the customer will be required to pay for the installation of a combined total of at least 40 Mvar of 34.5 kV capacitor bank(s) to be installed in the Customer's collector substation. Dynamic Stability studies performed as part of the System Impact Study will provide additional guidance as to whether the required reactive compensation can be static or a portion must be dynamic (such as a SVC).

The requirement to interconnect the 200 MW of wind generation on the existing Washita (WFEC) 138 kV substation consists of adding a new 138 kV circuit-breaker and line terminal at Washita. The new terminal will be constructed and maintained by WFEC. The Customer did not propose a specific route for the 138 kV line extending to serve its 345/34.5 kV collection facilities. It is assumed that obtaining all necessary right-of-way for the new transmission line to serve its facilities will not be a significant expense.

The total minimum cost for building the required facilities for this 200 MW of generation is $1,000,000. These costs are shown in Tables 1 and 2. This cost does not include building the 138 kV line from the Customer 138/34.5 kV collector substation into the point of interconnection. This cost also does not include the Customer's 138/34.5 kV collector substation or the 34.5 kV, 40 Mvar capacitor bank(s). Network constraints in the American Electric Power West (AEPW), Oklahoma Gas and Electric (OKGE), Southwestern Public Service Company (SPS) and WFEC transmission systems that were identified are shown in Table 3. These Network constraints will have to be verified with a Transmission Service Request (TSR) and associated studies. 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, this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements.

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.

There are several other proposed generation additions in the general area of the Customer's facility. It was assumed in this preliminary analysis that not all of these other projects within the WFEC control areas 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.

The required interconnection costs listed in Tables 1 and 2 and other upgrades associated with Network Constraints 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 submits a Transmission Service Request through Southwest Power Pool's OASIS.

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Introduction

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 200 MW of wind generation within the control area of Western Farmers Electric Cooperative (WFEC) located in Caddo County, Oklahoma. The proposed interconnection point is in the existing Washita (WFEC) 138 kV ring bus substation, owned by WFEC. The proposed in-service date is December, 2010.

Interconnection Facilities

The primary objective of this study is to identify the system problems associated with connecting the generation 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 requirement to interconnect the 200 MW of wind generation on the existing Washita (WFEC) 138 kV substation consists of adding a new 138 kV circuit-breaker and line terminal at Washita. The new terminal will be constructed and maintained by WFEC. The Customer did not propose a specific route for the 138 kV line extending to serve its 138/34.5 kV collection facilities. It is assumed that obtaining all necessary right-of-way for the new transmission line to serve its facilities will not be a significant expense.

Other Network Constraints in the American Electric Power West (AEPW), Oklahoma Gas and Electric (OKGE), Southwestern Public Service Company (SPS) and WFEC transmission systems that were identified are shown in Table 3. 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.

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

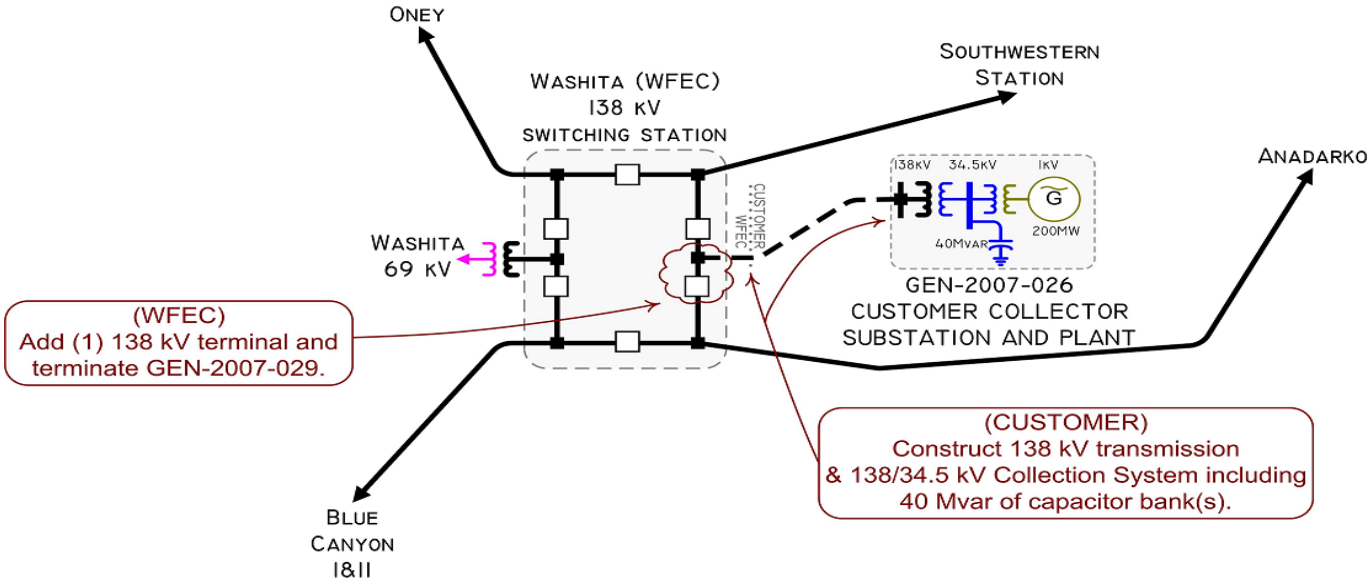

Figure 1: Proposed Method of Interconnection

(Final design to be determined)

Interconnection Estimated Costs

The minimum cost for adding a new 138 kV circuit-breaker and line terminal serving GEN-2007-029 facilities is estimated at $1,000,000. These costs are listed in Tables 1 and 2. These estimates will be refined during the development of the System Impact Study based on the final designs. This cost does not include building the Customer's 138 kV transmission line extending from the point of interconnection to serve its 138/34.5 kV collection facilities. This cost also does not include the Customer's 138/34.5 kV collector substation or the 40 Mvar of capacitor bank(s), all of which should be determined by the Customer. The Customer is responsible for these 138 kV – 34.5 kV facilities up to the point of interconnection.

The costs of interconnecting the facility to the WFEC 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.

Table 1: Direct Assignment Facilities

FACILITY	ESTIMATED COST (2007 DOLLARS)
CUSTOMER – 138/34.5 kV substation facilities.	*
CUSTOMER – 138 kV line between Customer substation and WFEC 138 kV substation.	*
CUSTOMER – 34.5 kV, 40 Mvar capacitor bank(s) to be installed in the Customer 138/34.5 kV collector substation.	*
CUSTOMER – Right-of-Way for all Customer facilities.	*
TOTAL	*****

* *Estimates of cost to be determined.*

Table 2: Required Interconnection Network Upgrade Facilities

FACILITY	ESTIMATED COST (2007 DOLLARS)
WFEC – 138 kV circuit breaker and line terminal to be built for generation request #GEN-2007-029 on the Washita (WFEC) 138 kV ring bus substation. Work to include associated switches, control relaying, high speed communications, metering and related equipment and all related structures.	$1,000,000
TOTAL	**$1,000,000**

* *Estimates of cost to be determined.*

Powerflow Analysis

A powerflow analysis was conducted for the facility using modified versions of the 2012 summer and winter peak models, and the 2017 summer peak model. 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 December, 2010. The available seasonal models used were through the 2017 Summer Peak of which is the end of the current SPP planning horizon.

Following current practice, this analysis was conducted assuming that previous queued requests in the immediate area of this interconnect request were in service. The analysis of the Customer's project indicates that, given the requested generation level of 200 MW and location, additional criteria violations will occur on the existing AEPW, OKGE, SPS and WFEC transmission systems under steady state and contingency conditions in the peak seasons. Table 3 lists these overloaded facilities.

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 one contingency, only the highest loading on the facility for each season is included in the table.

In order to maintain a zero reactive power flow exchanged at the point of interconnection, additional reactive compensation is required. The Customer will be required to install a combined total of 40 Mvar of capacitor bank(s) in the Customer's 138/34.5 kV collector substation on the 34.5 kV bus. Dynamic Stability studies performed as part of the System Impact Study will provide additional guidance as to whether the reactive compensation can be static or a portion must be dynamic (such as a SVC or STATCOM). It is possible that an SVC or STATCOM device will be required at the Customer facility because of FERC Order 661A Low Voltage Ride-Through Provisions (LVRT) which went into effect January 1, 2006. FERC Order 661A orders that wind farms stay on-line for 3-phase faults at the point of interconnection even if that requires the installation of a SVC or STATCOM device.

There are several other proposed generation additions in the general area of the Customer's facility. Some of the local projects that were previously queued were assumed to be in service in this Feasibility Study. Not all local projects that were previously queued and have advanced to nearly complete phases were included in this Feasibility Study.

Powerflow Analysis Methodology

The Southwest Power Pool (SPP) criteria states that: “The transmission system of the SPP region shall be planned and constructed so that the contingencies as set forth in the Criteria will meet the applicable NERC Planning Standards for System Adequacy and Security – Transmission System Table l hereafter referred to as NERC Table l) and its applicable standards and measurements”.

Using the created models and the ACCC function of PSS\E, single contingencies in portions or all of the modeled control areas of Sunflower Electric Power Corporation (SUNC), Missouri Public Service (MIPU), Westar Energy (WERE), Kansas City Power & Light (KCPL), West Plains (WEPL), Midwest Energy (MIDW), Oklahoma Gas and Electric (OKGE), American Electric Power West (AEPW), Grand River Dam Authority (GRDA), Southwestern Public Service Company (SPS), Western Farmers Electric Cooperative (WFEC) and other control areas were applied and the resulting scenarios analyzed. This satisfies the ‘more probable’ contingency testing criteria mandated by NERC and the SPP criteria.

Powerflow Results

Table 3: Network Constraints

AREA	OVERLOADED ELEMENT
AEPW	FLETCHER TAP - LAWTON EASTSIDE 138KV CKT 1
AEPW	HOBART JUNCTION - TAMARAC TAP 138KV CKT 1
AEPW	NORGE ROAD - SOUTHWESTERN STATION 138KV CKT 1
AEPW/SPS	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
AEPW/WFEC	SOUTHWESTERN STATION - WASHITA 138KV CKT 1
OKGE	DIVISION AVE - HAYMAKER 138KV CKT 1
OKGE	MUSKOGEE - PECAN CREEK 345KV CKT 1
WFEC	ANADARKO – BLANCHARD 69KV CKT 1
WFEC	ANADARKO - CORN TAP 138KV CKT 1
WFEC	ANADARKO - CYRIL 69KV CKT 1
WFEC	ANADARKO - GRGIAJT4 138.00 138KV CKT 1
WFEC	ANADARKO - WASHITA 138KV CKT 1
AEPW	American Electric Power West
WFEC	Western Farmers Electric Cooperative
OKGE	Oklahoma Gas and Electric
SPS	Southwestern Public Service Company

Table 4: Contingency Analysis

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
12SP	HOBART JUNCTION - TAMARAC TAP 138KV CKT 1	105	114	0	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
12SP	ANADARKO - GRGIAJT4 138.00 138KV CKT 1	144	106	42	BASE CASE
12SP	NORGE ROAD - SOUTHWESTERN STATION 138KV CKT 1	143	110	57	SOUTHWESTERN STATION - VERDEN 138KV CKT 1
12SP	ANADARKO - WASHITA 138KV CKT 1	212	148	77	SOUTHWESTERN STATION - WASHITA 138KV CKT 1
12SP	FLETCHER TAP - LAWTON EASTSIDE 138KV CKT 1	143	113	92	ELGIN JUNCTION - SOUTHWESTERN STATION 138KV CKT 1
12SP	SOUTHWESTERN STATION - WASHITA 138KV CKT 1	260	159	71	ANADARKO - WASHITA 138KV CKT 1
12SP	ANADARKO - CORN TAP 138KV CKT 1	118	103	149	BASE CASE
12WP	ANADARKO - CYRIL 69KV CKT 1	61	116	0	ANADARKO - GRGIAJT4 138.00 138KV CKT 1
12WP	DIVISION AVE - HAYMAKER 138KV CKT 1	308	105	0	CIMARRON - CZECH HALL 138KV CKT 1
12WP	ANADARKO - WASHITA 138KV CKT 1	212	165	32	SOUTHWESTERN STATION - WASHITA 138KV CKT 1
12WP	SOUTHWESTERN STATION - WASHITA 138KV CKT 1	260	149	57	ANADARKO - WASHITA 138KV CKT 1
12WP	ANADARKO – BLANCHARD 69KV CKT 1	34	103	185	2003-05T – ANADARKO 138KV CKT 1
12SP	HOBART JUNCTION - TAMARAC TAP 138KV CKT 1	105	118	0	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1
17SP	ANADARKO - GRGIAJT4 138.00 138KV CKT 1	144	105	71	BASE CASE
17SP	ANADARKO - WASHITA 138KV CKT 1	212	148	78	SOUTHWESTERN STATION - WASHITA 138KV CKT 1
17SP	NORGE ROAD - SOUTHWESTERN STATION 138KV CKT 1	143	109	81	SOUTHWESTERN STATION - VERDEN 138KV CKT 1
17SP	FLETCHER TAP - LAWTON EASTSIDE 138KV CKT 1	143	111	103	ELGIN JUNCTION - SOUTHWESTERN STATION 138KV CKT 1
17SP	2006-02T 230.00 - GRAPEVINE INTERCHANGE 230KV CKT 1	351	103	113	GEN525562 1
17SP	SOUTHWESTERN STATION - WASHITA 138KV CKT 1	260	129	115	ANADARKO - WASHITA 138KV CKT 1
17SP	MUSKOGEE - PECAN CREEK 345KV CKT 1	478	101	159	CLARKSVILLE - MUSKOGEE 345KV CKT 1
17SP	ANADARKO - CORN TAP 138KV CKT 1	118	101	188	BASE CASE

Note: When transmission service associated with this interconnection is evaluated, the loading of the facilities listed in this Table may be greater due to higher priority reservations. If the loading of a facility is higher, the level of ATC will be lower.

Conclusion

The minimum cost of interconnecting the Customer's interconnection request is estimated at $1,000,000 for Direct Assignment Facilities and Network Upgrades. At this time, the cost estimates for other Direct Assignment facilities including those in Tables 1 and 2 have not been defined by the Customer. In addition to the Customer's proposed interconnection facilities, the Customer will be responsible for installing a total of 40 Mvar of capacitor bank(s) in the Customer's substation for reactive support. As stated earlier, some but not all of the local projects that were previously queued are assumed to be in service in this Feasibility Study. These costs exclude upgrades of other transmission facilities that were listed in Table 3 of which are Network Constraints.

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 one contingency, only the highest loading on the facility for each season is included in the table.

These interconnection costs do not include any cost that may be associated with short circuit or transient stability analysis. These studies will be performed if the Customer signs a System Impact Study Agreement. At the time of the System Impact Study, a better determination of the interconnection facilities may be available.

The required interconnection costs listed in Tables 1 and 2 and other upgrades associated with Network Constraints 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 submits a Transmission Service Request through Southwest Power Pool's OASIS.

Appendix A: Point of Interconnection Area Map

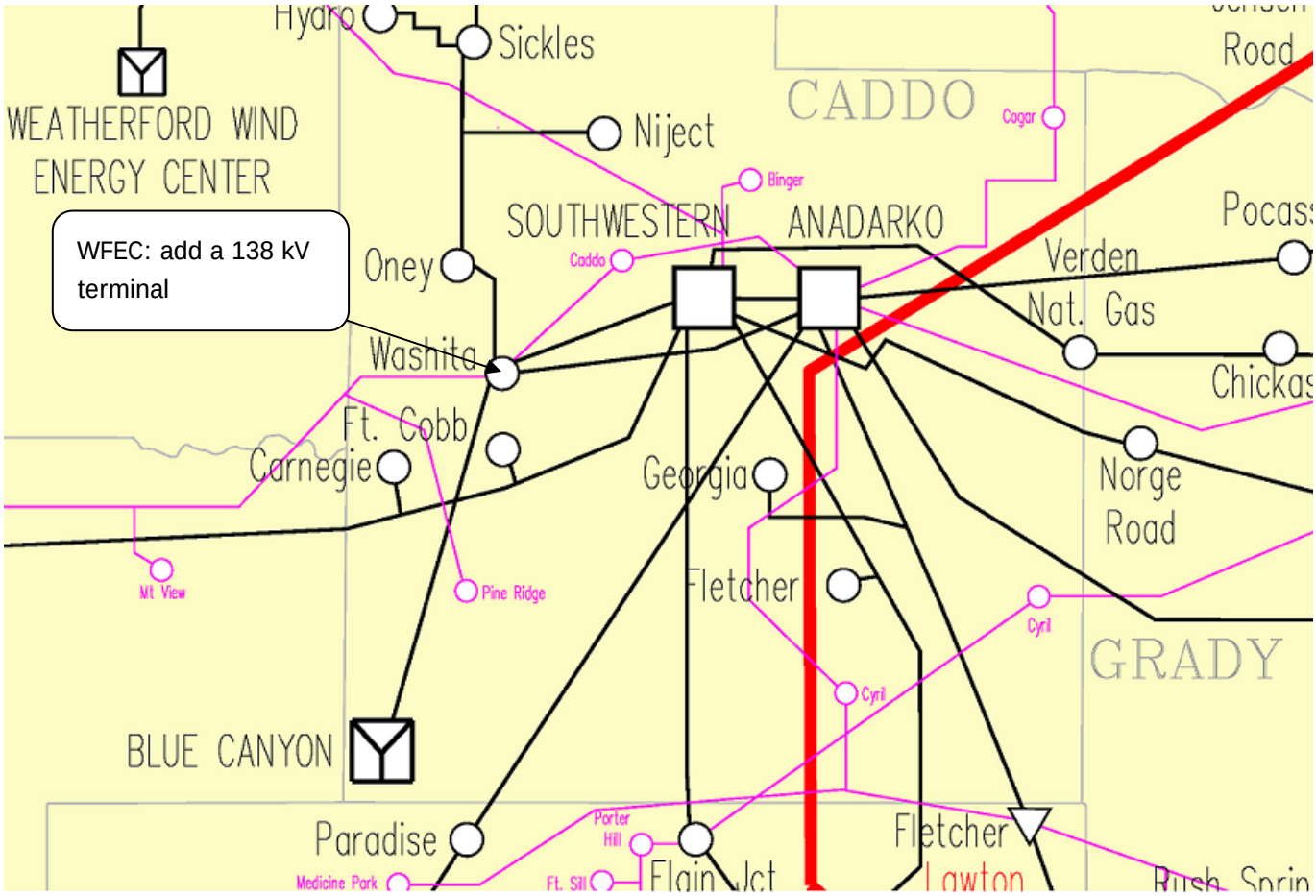

Figure 2: Point of Interconnection Area Map