



**SPP** *Southwest  
Power Pool*

***Feasibility Study  
For  
Generation Interconnection  
Request  
GEN-2006-029***

***SPP Tariff Studies  
(#GEN-2006-029)***

**December, 2006**

## **Executive Summary**

<OMITTED TEXT> (Customer) has requested a Feasibility study for the purpose of interconnecting 300MW/360MW (summer/winter rating) of generation within the control area of Westar Energy (Westar) in Sedgwick County, Kansas. The proposed method of interconnection is to interconnect into the existing 138kV switchyard at Evans Energy Center by adding two positions in the existing bus. The Evan's 138kV bus is set up as a breaker-and-a-half configuration. This substation is owned by Westar. The proposed in-service date for the generation is May 1, 2008.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 300/360MW of generation with transmission system reinforcements within the local transmission systems.

The requirements to interconnect the 300/360MW of generation at the existing Westar Evans Energy Center consist of adding two new 138kV circuit breakers and generator terminals to the existing breaker-and-a-half bus configuration. The total minimum cost for adding the 138kV terminals to the station is \$1,200,000 and is shown in Table 2. Other Network Constraints in the Westar and West Plains (WEPL) transmission 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 (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. These costs do not include building the 138kV lines/buswork from the Customer' facilities into the Evan Energy Center 138kV 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.

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.

## Introduction

<OMITTED TEXT> (Customer) has requested a Feasibility study for the purpose of interconnecting 300MW/360MW (summer/winter rating) of generation within the control area of Westar Energy (Westar) in Sedgwick County, Kansas. The proposed method of interconnection is to add two additional 138kV terminals to the existing breaker-and-a-half bus configured switching station located at Evans Energy Center, which is owned by Westar. The proposed in-service date is May 1, 2008.

## Interconnection Facilities

The primary objective of this study is to identify the system problems associated with connecting the plant into 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 of the 300/360MW consist of adding two new GSUs by the Customer as part of its new facilities. The GSUs will have a high side of 138kV and a low side determined by each of the generator's voltage. The specifics of the number of generators and the generator configuration will be addressed in the Impact Study if the Customer executes an Impact Study agreement for this request. The GSUs will interconnect into the Evans Energy Center 138kV bus via two new 138kV terminal additions to the existing breaker-and-a-half bus. A specific layout for the Customer's 138kV facilities to serve the GCU and associated equipment has not been defined.

The total estimated cost for Westar to add two 138kV circuit breakers and associated switching, relaying, buswork, etc. to the existing Evans Energy Center ring bus is \$1,200,000. This cost is shown in Table 2. These estimates will be refined during the development of the impact study based on the final designs. Other Network Constraints in the Westar and WEPL transmission system that were identified are listed in Table 3. This cost does not include building the 138kV facilities from the Customer facilities into the Westar Evans Energy Center 138kV switchyard. The Customer is responsible for these 138kV facilities up to the point of interconnection.

The costs of interconnecting the facility to the Westar 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.

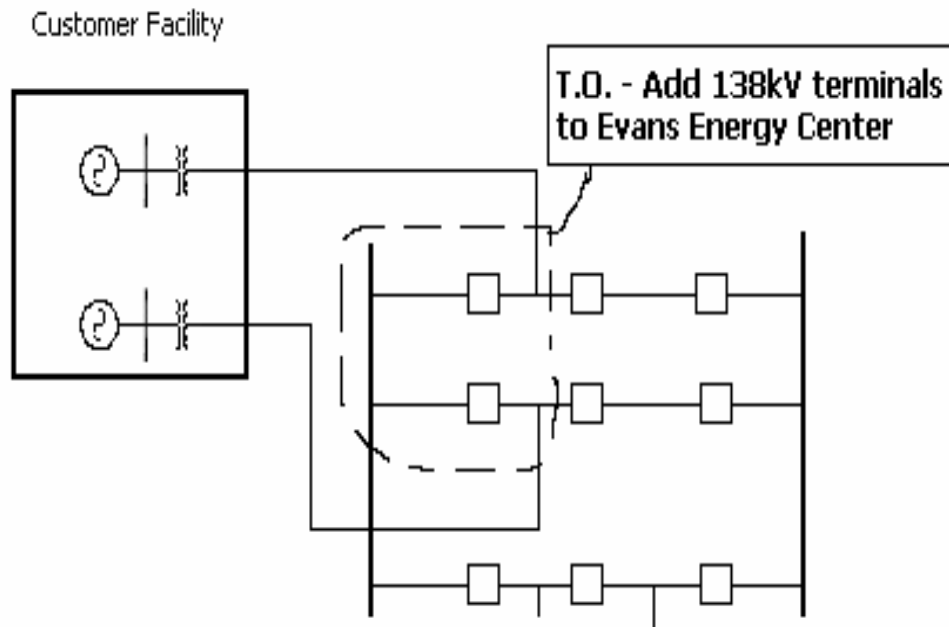
### Table 1: Direct Assignment Facilities

Facility	ESTIMATED COST (2006 DOLLARS)
Customer – 138kV-GSU voltage Substation facilities.	*
Customer – 138kV facilities between Customer facilities and Westar Evans Energy Center 138kV switching station	*
Customer - Right-of-Way for Customer facilities.	*
<b>Total</b>	*

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

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

Facility	ESTIMATED COST (2006 DOLLARS)
Westar – Add two 138kV generator/line terminals to the existing Evans Energy Center 138kV bus including two 138kV circuit breakers, associated switches, buswork, relaying and all miscellaneous equipment.	\$1,200,000
<b>Total</b>	<b>\$1,200,000</b>



**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 2008 & 2011 summer and winter peak, and 2016 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. This method allows the request to be studied as an Energy Resource (ER) Interconnection request. The proposed in-service date of the generation is May 1, 2008. 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 300/360MW and location, additional criteria violations will occur on the existing Westar and WEPL transmission systems under steady state and contingency conditions in the peak seasons.

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.

There are several other proposed generation additions in the general area of the Customer's facility. These 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 Missouri Public Service (MIPU), Westar (WERE), Kansas City Power & Light (KCPL), West Plains (WEPL), Midwest Energy (MIDW), 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.

**Table 3. Network Constraints**

NETWORK CONSTRAINTS
WERE - '16TH & WOODLAWN JUNCTION - 3RD & VAN BUREN 69KV CKT 1'
WERE - 'CHISHOLM - EVANS ENERGY CENTER NORTH 138KV CKT 1'
WERE - 'EL PASO - FARBER 138KV CKT 1'
WERE - 'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'
WEPL - 'G06-21T 138 - MEDICINE LODGE 138KV CKT 1'
WERE - "GILL ENERGY CENTER EAST (GEC3 GSU) 138/69/14.4KV TRANSFORMER CKT 1'
WERE - 'GILL ENERGY CENTER SOUTH (GILL 5X) 138/69/13.2KV TRANSFORMER CKT 1'
WERE - 'HOOVER NORTH - LAKERIDGE 138KV CKT 1'
WERE - "HOOVER NORTH (HOOVER1X) 138/69/13.2KV TRANSFORMER CKT 1'
WEPL - 'MEDICINE LODGE - PRATT 115KV CKT 1'
WEPL - 'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'
WEPL - 'PRATT - ST JOHN 115KV CKT 1'
WEPL - 'SEWARD - ST JOHN 115KV CKT 1'
WEPL - 'ST JOHN - ST JOHN 115KV CKT 1'

**Table 4. Contingency Analysis**

ELEMENT	SEASON	RATE (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
<b>2008 SUMMER PEAK</b>					
'GILL ENERGY CENTER EAST (GEC3 GSU) 138/69/14.4KV TRANSFORMER CKT 1'	08sp	137	149.7	0	'GILL ENERGY CENTER SOUTH - GILL ENERGY CENTER WEST 138KV CKT 1'
'HOOVER NORTH (HOOVER1X) 138/69/13.2KV TRANSFORMER CKT 1'	08sp	165	105.0	86	'SPP-WERE-29'
'16TH & WOODLAWN JUNCTION - 3RD & VAN BUREN 69KV CKT 1'	08sp	65	126.8	120	'HUTCHINSON ENERGY CENTER (HEC 122X) 115/69/34.5KV TRANSFORMER CKT 1'
'16TH & WOODLAWN JUNCTION - MEADOWLARK 69KV CKT 1'	08sp	71	116.1	182	'HUTCHINSON ENERGY CENTER (HEC 122X) 115/69/34.5KV TRANSFORMER CKT 1'
'EL PASO - FARBER 138KV CKT 1'	08sp	168	105.7	183	'WICHITA - WOODRING 345KV CKT 1'
'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'	08sp	382	103.8	192	'SPP-WERE-29'
'CHISHOLM - EVANS ENERGY CENTER NORTH 138KV CKT 1'	08sp	382	104.7	218	'SPP-WERE-35'
'GILL ENERGY CENTER SOUTH (GILL 5X) 138/69/13.2KV TRANSFORMER CKT 1'	08sp	165	100.4	279	'GILL ENERGY CENTER EAST (GEC3 GSU) 138/69/14.4KV TRANSFORMER CKT 1'
<b>2008 WINTER PEAK</b>					
'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	08wp	65	335.8	0	'CLEARWT - GILL ENERGY CENTER WEST 138KV CKT 1'
'PRATT - ST JOHN 115KV CKT 1'	08wp	79.7	282.3	0	'CLEARWT - GILL ENERGY CENTER WEST 138KV CKT 1'
'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	08wp	56	113.3	119	'BASE CASE'
'MEDICINE LODGE - PRATT 115KV CKT 1'	08wp	79.7	120.7	353	'CLEARWT - GILL ENERGY CENTER WEST 138KV CKT 1'
<b>2011 SUMMER PEAK</b>					
'GILL ENERGY CENTER EAST (GEC3 GSU) 138/69/14.4KV TRANSFORMER CKT 1'	11sp	137	146.0	0	'GILL ENERGY CENTER SOUTH - GILL ENERGY CENTER WEST 138KV CKT 1'
'HOOVER NORTH (HOOVER1X) 138/69/13.2KV TRANSFORMER CKT 1'	11sp	165	107.7	0	'SPP-WERE-29'
'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	11sp	65	163.0	0	GEN:G06-22 1'



**Table 4: Contingency Analysis**

ELEMENT	SEASON	RATE (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
'POTTER COUNTY INTERCHANGE (POTTR CO) 345/230/13.2KV TRANSFORMER CKT 1'	11sp	560	104.6	0	'GEN:51442 1'
'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	11sp	56	115.7	12	'BASE CASE'
'EL PASO - FARBER 138KV CKT 1'	11sp	168	108.0	108	'WICHITA - WOODRING 345KV CKT 1'
'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'	11sp	382	106.6	119	'SPP-WERE-29'
'CHISHOLM - EVANS ENERGY CENTER NORTH 138KV CKT 1'	11sp	382	109.2	140	'SPP-WERE-35'
<b>2011 WINTER PEAK</b>					
'G06-21T 138 - MEDICINE LODGE 138KV CKT 1'	11wp	71.7	336.0	0	'SPP-WERE-34A'
'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	11wp	65	356.7	0	'HARPER - MILAN TAP 138KV CKT 1'
'PRATT - ST JOHN 115KV CKT 1'	11wp	79.7	291.3	0	'HARPER - MILAN TAP 138KV CKT 1'
'SEWARD - ST JOHN 115KV CKT 1'	11wp	79.7	153.1	0	'HARPER - MILAN TAP 138KV CKT 1'
'ST JOHN - ST JOHN 115KV CKT 1'	11wp	88	125.3	0	'HARPER - MILAN TAP 138KV CKT 1'
'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	11wp	56	114.6	127	'BASE CASE'
'MEDICINE LODGE - PRATT 115KV CKT 1'	11wp	79.7	132.9	350	'HARPER - MILAN TAP 138KV CKT 1'
<b>2016 SUMMER PEAK</b>					
'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	16sp	56	181.0	0	GEN:G06-22 1'
'GILL ENERGY CENTER EAST (GEC3 GSU) 138/69/14.4KV TRANSFORMER CKT 1'	16sp	137	141.6	0	'GILL ENERGY CENTER SOUTH - GILL ENERGY CENTER WEST 138KV CKT 1'
'EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1'	16sp	382	114.8	0	'SPP-WERE-29'
'HOOVER NORTH - LAKERIDGE 138KV CKT 1'	16sp	382	102.1	230	'SPP-WERE-29'
'HOOVER NORTH (HOOVER1X) 138/69/13.2KV TRANSFORMER CKT 1'	16sp	165	114.7	0	'SPP-WERE-29'
'CHISHOLM - EVANS ENERGY CENTER NORTH 138KV CKT 1'	16sp	382	114.5	37	'SPP-WERE-35'

## **Table 4: Contingency Analysis**

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.

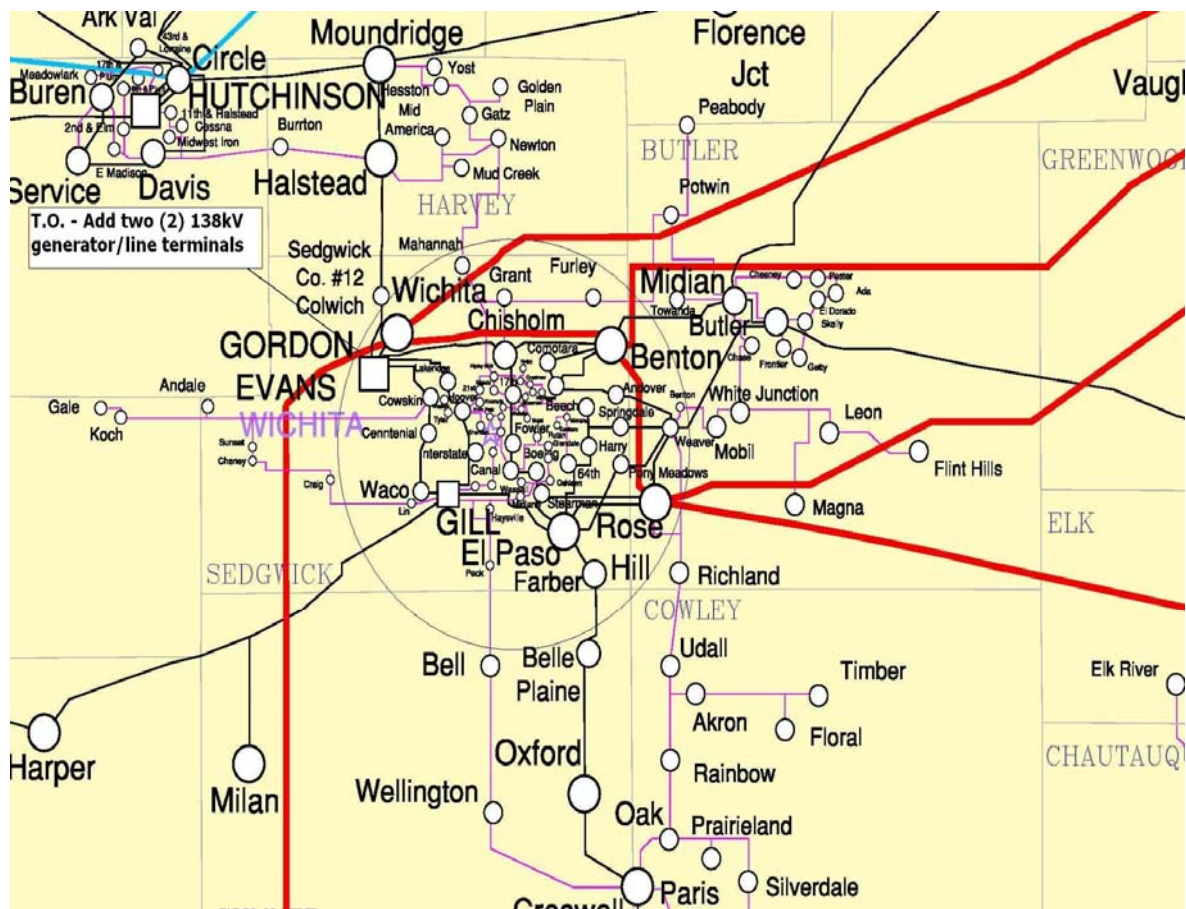
## **Conclusion**

The minimum cost of interconnecting the Customer's interconnection request is estimated at \$1,200,000 for Westar's interconnection Network Upgrade facilities listed in Table 2. These costs exclude upgrades of other transmission facilities by Westar and WEPL 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, the 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 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.

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 LOCAL AREA**