Feasibility Study
For
Generation Interconnection Request
GEN-2007-018

SPP Tariff Studies
(#GEN-2007-018)

September, 2007

Executive Summary

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 315 MW of gas fired generation within the control area of Missouri Public Service (MIPU) located in Pettis County, Missouri. The proposed method of interconnection is a new 161 kV ring-bus switching station to be located on the existing Sedalia – Sedalia East 161kV line owned by MIPU. The proposed in-service date is May 31, 2010.

Power flow analysis has indicated that for the powerflow cases studied, it is possible to interconnect the 315 MW of generation with transmission system reinforcements within the local transmission system. The requirement to interconnect the 315 MW of generation to the MIPU transmission system consists of constructing a new 161kV ring-bus switching station. The new station will be constructed and maintained by MIPU.

The total minimum cost for building the required facilities for this 315 MW of generation is $3,200,000. These costs are shown in Tables 1 and 2. Network constraints in the MIPU, Associated Electric Cooperative (AECI), and Ameren (AMRN) 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. This cost does not include building the 161 kV generator leads from the Customer's generator step up (GSU) transformer.

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 MIPU, KCPL, and AECI 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.

Introduction

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 315 MW of gas fired generation within the control area of Missouri Public Service (MIPU) located in Pettis County, Missouri. The proposed method of interconnection is a new 161 kV ring-bus switching station to be located on the existing Sedalia – Sedalia East 161kV line owned by MIPU. The proposed in-service date is May 31, 2010.

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 of the 315 MW of generation consist of constructing a new 161 kV three-breaker ring-bus switching station near the generation site on the existing Sedalia – Sedalia East 161 kV transmission line, owned by MIPU. This substation will be constructed and maintained by MIPU. A preliminary one-line drawing of the interconnection facilities are shown in Figure 1.

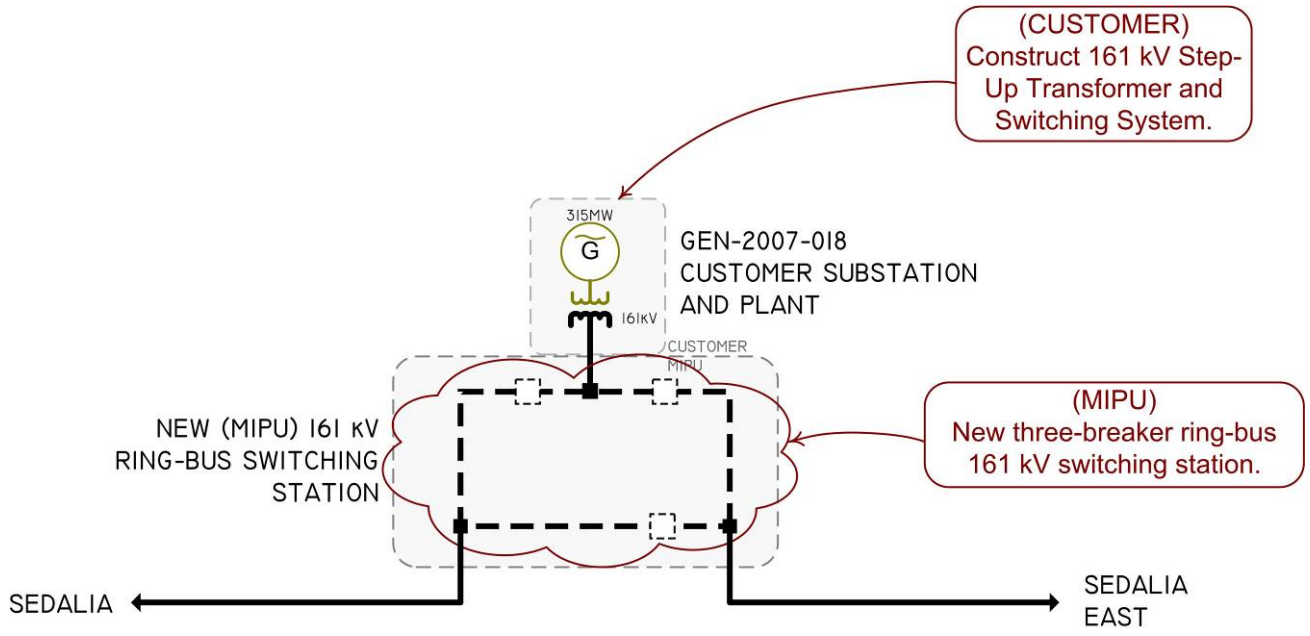

Figure 1: Proposed Method of Interconnection

(Final design to be determined)

Interconnection Estimated Costs

The minimum cost for adding constructing the new three breaker 161kV ring bus substation on the Sedalia – Sedalia East 161kV line for GEN-2007-018 is estimated at $3,200,000. 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 generator voltage and 161 kV facilities up to the point of interconnection. Other Network Constraints in the the MIPU, Associated Electric Cooperative (AECI), and Ameren (AMRN) transmission systems that were identified are shown in Table 3.

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 – GSU substation facilities.	*
CUSTOMER – 161 kV generator leads for GSU substation to the MIPU switching station.	*
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)
MIPU – (1) 161kV three-breaker ring-bus switching station for GEN-2007-018 located in Pettis County on the Sedalia – Sedalia East 161kV transmission line. Station to include breakers, switches, control relaying, high speed communications, metering and related equipment and all related structures.	$3,200,000
TOTAL	**$3,200,000**

** Estimates of cost to be determined.*

Powerflow Analysis

A powerflow analysis was conducted for the facility using modified versions of the 2009 summer and winter peak, the 2012 summer and winter peak models, and the 2017 summer peak model. There were two different scenarios run for the 2012 model years. One scenario included a previous queued coal plant nearby but not in the SPP footprint. The other scenario omitted this coal plant. 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 October 15, 2010. The available seasonal models used were through the 2017 Summer Peak of which is the end of the current SPP planning horizon.

Powerflow analysis of the Customer's project indicates that, given the requested generation level of 315 MW and location, additional criteria violations will occur on the MIPU, Associated Electric Cooperative (AECI), and Ameren (AMRN) 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.

A TSR study is also in progress for this generation interconnection request. Network Upgrades which are under study for the deliverability for this generating facility include, but are not limited to the following.

- Option 1 – Build a new 161kV transmission line from GEN-2007-018 facility to the AECI Georgetown substation (approx. 3 miles). Add 161kV terminal at GEN-2007-018 and AECI Georgetown.
    - Cost is approximately $3,435,000 additional cost to the cost in Table 2.

-or-

- Option 2 - Tap the existing AECI Georgetown-Sedalia 161kV transmission line. Build a double circuit 161kV transmission line to the GEN-2007-018 facility (approx. 1 mile). Add two 161kV terminals at GEN-2007-018.
    - Cost is approximately $2,745,000 additional cost to the cost in Table 2.

These costs will be finalized in the TSR study for this request.

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 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 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
AECI	'GEORGETOWN (GEORGETO) 161/69/13.2KV TRANSFORMER CKT 1'
AECI	'MOBERLY TAP - THOMAS HILL 161KV CKT 1'
MIPU-AMRN	'OVERTON 161.00 - SEDALIA EAST 161KV CKT 1'
MIPU	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
MIPU	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'
AECI	'THOMAS HILL (THOMAS H) 345/161/13.8KV TRANSFORMER CKT 1'
MIPU	'WARRENSBURG EAST - WARRENSBURG PLANT 69KV CKT 1'
MIPU	Missouri Public Service
AECI	Associated Electric Cooperative Inc.
AMRN	Ameren

Table 4: Contingency Analysis

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
10SP	'GEORGETOWN (GEORGETO) 161/69/13.2KV TRANSFORMER CKT 1'	56	113.786	137	'NORTON (NORTON) 161/69/13.2KV TRANSFORMER CKT 1'
10SP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	245	123.7262	237	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'
10SP	'OVERTON 161.00 - SEDALIA EAST 161KV CKT 1'	223	125.1686	244	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
10SP	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'	245	124.2549	253	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
10SP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	227	108.5342	286	'SYSTEM INTACT'
10WP	'GEORGETOWN (GEORGETO) 161/69/13.2KV TRANSFORMER CKT 1'	56	121.3605	54	'NORTON (NORTON) 161/69/13.2KV TRANSFORMER CKT 1'
10WP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	245	124.2083	229	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'
10WP	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'	245	124.9238	252	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
10WP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	227	116.6252	260	'SYSTEM INTACT'
12SP	'GEORGETOWN (GEORGETO) 161/69/13.2KV TRANSFORMER CKT 1'	56	142.8347	0	'THOMAS HILL – MCCREDIE 345KV/MCCREDIE – KINGDOM 345KV
12SP	'THOMAS HILL (THOMAS H) 345/161/13.8KV TRANSFORMER CKT 1'	557	119.7294	0	'THOMAS HILL – MCCREDIE 345KV/MCCREDIE – KINGDOM 345KV
12SP	'MOBERLY TAP - THOMAS HILL 161KV CKT 1'	372	108.4819	0	'THOMAS HILL – MCCREDIE 345KV/MCCREDIE – KINGDOM 345KV
12SP	'THOMAS HILL (THOMAS H) 345/161/13.8KV TRANSFORMER CKT 1'	625	106.7028	11	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'
12SP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	245	124.6947	230	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'
12SP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	245	123.9831	241	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
12SP	'OVERTON 161.00 - SEDALIA EAST 161KV CKT 1'	223	124.323	246	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
12SP	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'	245	124.3216	253	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
12SP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	227	112.4704	273	'SYSTEM INTACT'
12WP	'THOMAS HILL (THOMAS H) 345/161/13.8KV TRANSFORMER CKT 1'	557	119.6419	0	'THOMAS HILL – MCCREDIE 345KV/MCCREDIE – KINGDOM 345KV
12WP	'GEORGETOWN (GEORGETO) 161/69/13.2KV TRANSFORMER CKT 1'	56	149.3593	0	'NORTON (NORTON) 161/69/13.2KV TRANSFORMER CKT 1'
12WP	'MOBERLY TAP - THOMAS HILL 161KV CKT 1'	386	104.3487	0	'THOMAS HILL – MCCREDIE 345KV/MCCREDIE – KINGDOM 345KV
12WP	'THOMAS HILL (THOMAS H) 345/161/13.8KV TRANSFORMER CKT 1'	625	106.6249	13	'THOMAS HILL – MCCREDIE 345KV/MCCREDIE – KINGDOM 345KV
12WP	'WARRENSBURG EAST - WARRENSBURG PLANT 69KV CKT 1'	32	132.039	55	'ODESSA - WARRENSBURG EAST 161KV CKT 1'
12WP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	245	127.4072	213	'NORTON - SALISBURY 161KV CKT 1'
12WP	'WARRENSBURG EAST - WARRENSBURG PLANT 69KV CKT 1'	30	108.9797	228	'SYSTEM INTACT'
12WP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	227	122.2207	242	'SYSTEM INTACT'
12WP	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'	245	125.5795	250	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
17SP	'THOMAS HILL (THOMAS H) 345/161/13.8KV TRANSFORMER CKT 1'	557	123.5023	0	'THOMAS HILL – MCCREDIE 345KV/MCCREDIE – KINGDOM 345KV
17SP	'MOORE COUNTY INTERCHANGE 230/115KV TRANSFORMER CKT 1'	252	105.667	0	'HERRING TAP - RIVERVIEW INTERCHANGE 115KV CKT 1'
17SP	'THOMAS HILL (THOMAS H) 345/161/13.8KV TRANSFORMER CKT 1'	625	110.0653	0	'THOMAS HILL – MCCREDIE 345KV/MCCREDIE – KINGDOM 345KV

TABLE 4: Contingency Analysis (continued)

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
17SP	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'	245	124.4274	241	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'
17SP	'OVERTON 161.00 - SEDALIA EAST 161KV CKT 1'	223	123.1938	247	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
17SP	'SEDALIA EAST - SEDALIA SUB 161.00 161KV CKT 1'	245	124.5757	252	'SEDALIA - SEDALIA SUB 161.00 161KV CKT 1'
17SP	'MOBERLY TAP - THOMAS HILL 161KV CKT 1'	372	100.3117	286	'THOMAS HILL – MCCREDIE 345KV/MCCREDIE – KINGDOM 345KV

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 $3,200,000 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. 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

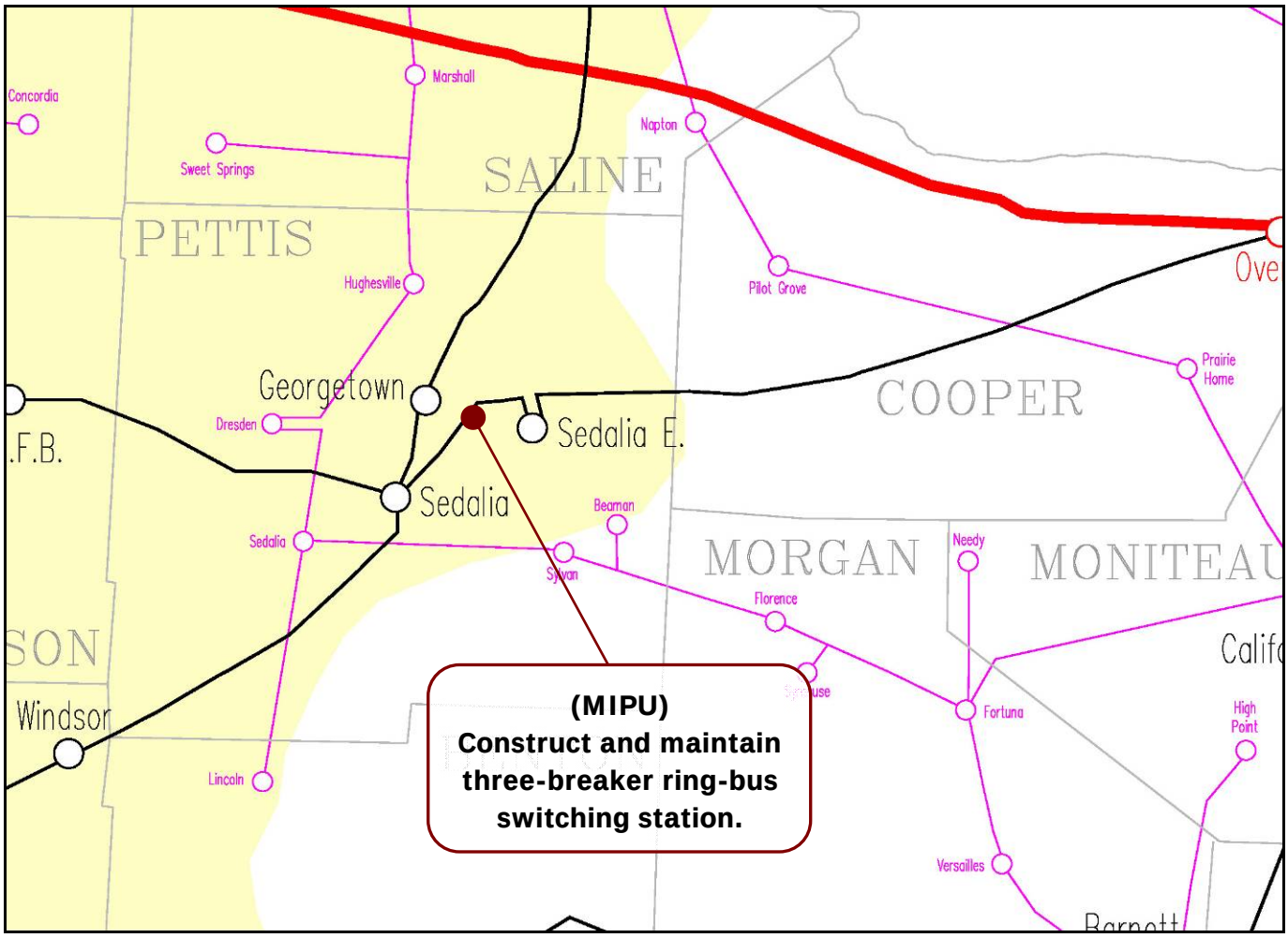

Figure 2: Point of Interconnection Area Map