



**Feasibility Study  
For  
Generation Interconnection  
Request  
GEN-2007-028**

SPP Tariff Studies  
(#GEN-2007-028)

December 2007

## **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 Mid Kansas Electric Power Company (MKEC) located in Cloud County, Kansas. The proposed method of interconnection is a new 230 kV breaker and line terminal into a previously proposed 230 kV three-breaker ring-bus switching station to be located on the existing Concordia (WERE) – East Manhattan (WERE) 230 kV transmission line, owned by MKEC. The proposed in-service date is December 1, 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 42 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 Concordia (MKEC) – East Manhattan (WERE) 230 kV transmission line consists of adding a new 230 kV breaker and line terminal into a previously proposed 230 kV three-breaker ring-bus switching station to be built for generation request #GEN-2003-6A. The new station will be constructed and maintained by MKEC. The Customer did not propose a specific route for the 230 kV line extending to serve its 230/34.5 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 \$900,000. These costs are shown in Tables 1 and 2. Network constraints in the West Plains (WEPL), Kansas City Power & Light (KACP), Missouri Public Service (MIPU) and WERE 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 230 kV line from the Customer 230/34.5 kV collector substation into the point of interconnection. This cost also does not include the Customer's 230/34.5 kV collector substation or the 34.5 kV, 42 Mvar capacitor bank(s).

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 Kansas City Power

& Light (KACP), West Plains (WEPL), and WERE 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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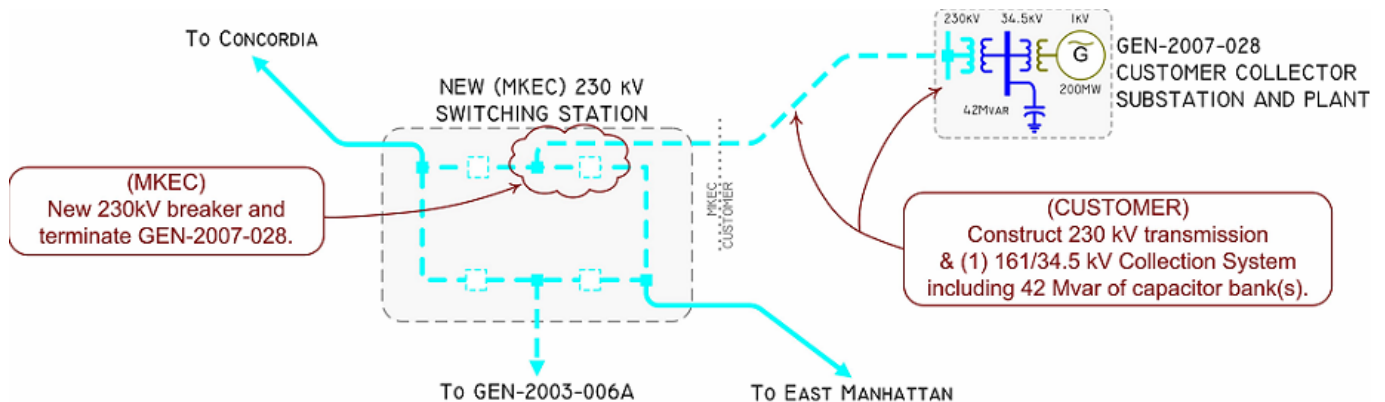
## Introduction

<OMITTED TEXT> (Customer) has requested a Feasibility Study for the purpose of interconnecting 200 MW of wind generation within the control area of Mid Kansas Electric Power Company (MKEC) located in Cloud County, Kansas. The proposed method of interconnection is a new 230 kV breaker and line terminal into a previously proposed 230 kV three-breaker ring-bus switching station to be located on the existing Concordia (WERE) – East Manhattan (WERE) 230 kV transmission line, owned by MKEC. The proposed in-service date is December 1, 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 requirement to interconnect the 200 MW of wind generation on the existing Concordia (MKEC) – East Manhattan (WERE) 230 kV transmission line consists of adding a new 230 kV breaker and line terminal into a previously proposed 230 kV three-breaker ring-bus switching station to be built for generation request #GEN-2003-006A, owned by WERE within the state of Kansas. The new station will be constructed and maintained by WERE. The Customer did not propose a specific route for the 230 kV line extending to serve its 230/34.5 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.



**Figure 1: Proposed Method of Interconnection**

(Final design to be determined)

## Interconnection Estimated Costs

The minimum cost for adding a new breaker and terminating the transmission line serving GEN-2007-028 facilities is estimated at \$900,000. 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 230 kV transmission line extending from the point of interconnection to serve its 230/34.5 kV collection facilities. This cost also does not include the Customer's 230/34.5 kV collector substation or the 42 Mvar of capacitor bank(s), all of which should be determined by the Customer. The Customer is responsible for these 230 kV – 34.5 kV facilities up to the point of interconnection. Other Network Constraints in the Mid Kansas Electric Power Company (MKEC), Kansas City Power & Light (KACP), Missouri Public Service (MIPU) and WERE 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 – (1) 230 kV transmission line from Customer collector substation to the three-breaker ring-bus station located on the Concordia (MKEC) – East Manhattan (WERE) 230 kV transmission line.	
MKEC – Termination and interconnection of CUSTOMER 230 kV transmission line into the 230 kV three-breaker ring bus. Cost of 230 kV revenue metering.	\$250,000
CUSTOMER – (1) 230/34.5 kV Customer collector substation facilities.	
CUSTOMER – 34.5 kV, 42 Mvar capacitor bank(s) to be installed in the Customer 230/34.5 kV collector substation.	
CUSTOMER – Right-of-Way for all Customer facilities.	
<b>TOTAL</b>	

\* *Estimates of cost to be determined.*

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

FACILITY	ESTIMATED COST (2007 DOLLARS)
WERE – (1) 230 kV breaker and line terminal into a previously proposed 230 kV three-breaker ring-bus switching station to be built for generation request #GEN-2003-6A on the Concordia (MKEC) – East Manhattan (WERE) 230 kV transmission line. Work to include associated switches, control relaying, high speed communications, metering and related equipment and all related structures.	\$650,000
<b>TOTAL</b>	<b>\$900,000</b>

\* *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 1, 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 WEPL, KACP, MIPU, WERE 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 42 Mvar of capacitor bank(s) in the Customer's 230/34.5 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 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 (KACP), 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
KACP/MIPU	IATAN - ST JOE 345KV CKT 1
KACP/WERE	CRAIG - STRANGER CREEK 345KV CKT 1
MIPU	NASHUA - SMITHVILLE 161KV CKT 1
MKEC	2003-6AT - CONCORDIA 230KV CKT 1
MKEC	BELOIT - CONCORDIA 115KV CKT 1
MKEC	BELOIT - GLEN ELDER 115KV CKT 1
MKEC	CLIFTON - CONCORDIA 115KV CKT 1
MKEC	CLIFTON - GREENLEAF 115KV CKT 1
MKEC	CONCORDIA - JEWELL 3 115KV CKT 1
MKEC	CONCORDIA (CONCORD6) 230/115/13.8KV TRANSFORMER CKT 1
MKEC	JEWELL 3 - SMITH CENTER 115KV CKT 1
MKEC	PHILLIPSBURG - SMITH CENTER 115KV CKT 1
MKEC	SMITH CENTER - WALDO 115KV CKT 1
WERE	29TH & EVENINGSIDE JUNCTION - 29TH & GAGE 115KV CKT1
WERE	ANZIO - FORT JUNCTION SWITCHING STATION 115KV CKT 1
WERE	AUBURN ROAD - INDIAN HILLS 115KV CKT 1
WERE	AUBURN ROAD - JEFFREY ENERGY CENTER 230KV CKT 1
WERE	AUBURN ROAD - SHERWOD 115KV CKT 1
WERE	AUBURN ROAD - SWISSVALE 230KV CKT 1
WERE	AUBURN ROAD (AUBRN77X) 230/115/13.8KV TRANSFORMER CKT 1
WERE	BAILEYVILLE N.M. STATION (NEMAHA MARSHALL R) - SMITTYVILLE N.M. COOP (NEMAHA MARSHALL R.E.) 115KV CKT 1
WERE	BAILEYVILLE N.M. STATION (NEMAHA MARSHALL R) - SOUTH SENECA 115KV CKT 1
WERE	CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1
WERE	CIRCLE - HUTCHINSON GAS TURBINE STATION 115KV CKT 1
WERE	EAST MANHATTAN - MATTERS CORNER 115KV CKT1
WERE	EAST MANHATTAN - MCDOWELL CREEK SWITCHING STATION 115KV CKT 1
WERE	EAST MANHATTAN (EMANHT3X) 230/115/18 KV TRANSFORMER CKT 1
WERE	FORT JUNCTION SWITCHING STATION - MCDOWELL CREEK SWITCHING STATION 115KV CKT 2
WERE	FORT JUNCTION SWITCHING STATION - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 2
WERE	HOYT - JEFFERY ENERGY CENTER 345KV CKT 1
WERE	JEFFREY ENERGY CENTER - MORRIS COUNTY 345KV CKT 1
WERE	LAWRENCE ENERGY CENTER UNIT 5 - LAWRENCE HILL 230KV CKT 1
WERE	LAWRENCE HILL - LAWRENCE ENERGY CENTER UNIT 5 230 KV CKT 1
WERE	LAWRENCE HILL - MIDLAND JUNCTION 230KV CKT 1
WERE	LAWRENCE HILL (LAWHL29X) 230/115/13.8KV TRANSFORMER CKT 1
WERE	MIDLAND JUNCTION (MIDJ126X) 230/115/18KV TRANSFORMER CKT 1
WERE	SOUTH GAGE (WEST) - SHERWOD 115KV CKT 1
WERE	SWISSVALE - STILWELL 345KV CKT 1
WERE	WEST JUNCTION CITY - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 1
WERE/MKEC	EAST MANHATTAN - 2003-6AT 230 KV CKT1
WERE/MKEC	KNOB HILL - GREENLEAF 115KV CKT 1
WERE/MKEC	KNOB HILL - SMITTYVILLE N.M. COOP (NEMAHA MARSHALL R.E.) 115KV CKT 1
KACP	Kansas City Power & Light
MIPU	Missouri Public Service
MKEC	Mid Kansas Electric Power Company
WERE	Westar Energy

**Table 4: Contingency Analysis**

SEASON	OVERLOADED ELEMENT	RATING (MVA)	LOADING (%)	ATC (MW)	CONTINGENCY
12SP	ANZIO - FORT JUNCTION SWITCHING STATION 115KV CKT 1	92	180	0	WR-DOUBLE12
12SP	AUBURN ROAD (AUBRN77X) 230/115/13.8KV TRANSFORMER CKT 1	308	137	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12SP	AUBURN ROAD - JEFFREY ENERGY CENTER 230KV CKT 1	565	135	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12SP	LAWRENCE HILL (LAWHL29X) 230/115/13.8KV TRANSFORMER CKT 1	308	130	0	MIDLAND JUNCTION (MIDJ126X) 230/115/18.0KV TRANSFORMER CKT 1'
12SP	EAST MANHATTAN (EMANHT3X) 230/115/18 KV TRANSFORMER CKT 1	308	126	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12SP	HOYT - JEFFERY ENERGY CENTER 345KV CKT 1	1076	124	0	JEFFERY ENERGY CENTER - MORRIS COUNTY 345KV CKT 1'
12SP	LAWRENCE HILL - LAWRENCE ENERGY CENTER UNIT 5 230 KV CKT 1	478	121	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12SP	LAWRENCE ENERGY CENTER UNIT 5 - LAWRENCE HILL 230KV CKT 1	478	117	0	GILL ENERGY CENTER EAST (GEC3 GSU) 138/69/14.4KV TRANSFORMER CKT 1'
12SP	CRAIG - STRANGER CREEK 345KV CKT 1	1195	107	0	IATAN - ST JOE 345KV CKT 1'
12SP	CONCORDIA (CONCORD6) 230/115/13.8 KV TRANSFORMER CKT 1	205	202	10	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	JEWELL 3 - SMITH CENTER 115KV CKT 1	80	178	26	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	CONCORDIA - JEWELL 3 115KV CKT 1	90	170	27	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	CLIFTON - GREENLEAF 115KV CKT 1	90	188	31	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	LAWRENCE HILL - MIDLAND JUNCTION 230KV CKT 1	359	102	40	LAWRENCE HILL (LAWHL29X) 230/115/13.8KV TRANSFORMER CKT 1'
12SP	PHILLIPSBURG - SMITH CENTER 115KV CKT 1	80	176	44	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	BELOIT - CONCORDIA 115KV CKT 1	90	150	53	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	NOB HILL - GREENLEAF 115KV CKT 1	92	169	62	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	IATAN - ST JOE 345KV CKT 1	1073	102	95	CRAIG - STRANGER CREEK 345KV CKT 1'
12SP	BELOIT - GLEN ELDER 115KV CKT 1	90	130	106	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	SMITH CENTER - WALDO 115KV CKT 1	60	134	110	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	FORT JUNCTION SWITCHING STATION - MCDOWELL CREEK SWITCHING STATION 115KV CKT 2	92	103	112	2003-6AT 230.00 - CONCORDIA 230KV CKT 1'
12SP	2003-6AT - CONCORDIA 230KV CKT 1	319	130	113	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
12SP	EAST MANHATTAN - 2003-6AT 230 KV CKT1	319	125	123	CONCORDIA (CONCORD6) 230/115/13.8KV TRANSFORMER CKT 1
12SP	AUBURN ROAD - SWISSVALE 230KV CKT 1	363	102	153	AUBURN ROAD (AUBRN77X) 230/115/13.8KV TRANSFORMER CKT 1
12SP	NOB HILL - SMITTYVILLE N.M. COOP (NEMAHA MARSHALL R.E.) 115KV CKT 1	92	122	153	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	BAILEYVILLE N.M. STATION (NEMAHA MARSHALL R) - SMITTYVILLE N.M. COOP (NEMAHA MARSHALL R.E.) 115KV CKT 1	92	121	157	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	EAST MANHATTAN - MCDOWELL CREEK SWITCHING STATION 115KV CKT 1	179	104	158	EAST MANHATTAN - MATTERS CORNER 115KV CKT 1'
12SP	BAILEYVILLE N.M. STATION (NEMAHA MARSHALL R) - SOUTH SENECA 115KV CKT 1	92	119	161	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	CLIFTON - CONCORDIA 115KV CKT 1	90	118	163	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1'
12SP	SWISSVALE - STILWELL 345KV CKT 1	721	101	167	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12SP	NASHUA - SMITHVILLE 161KV CKT 1	245	100	179	IATAN - ST JOE 345KV CKT 1'
SEASON	OVERLOADED ELEMENT	RATING	LOADING	ATC	CONTINGENCY

**TABLE 4: Contingency Analysis (continued)**

		(MVA)	(%)	(MW)	
12SP	WEST JUNCTION CITY - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 1	194	100	194	ANZIO - FORT JUNCTION SWITCHING STATION 115KV CKT 1'
12WP	AUBURN ROAD - JEFFREY ENERGY CENTER 230KV CKT 1	565	131	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12WP	HOYT - JEFFERY ENERGY CENTER 345KV CKT 1	1076	124	0	JEFFERY ENERGY CENTER - MORRIS COUNTY 345KV CKT 1
12WP	LAWRENCE HILL - LAWRENCE ENERGY CENTER UNIT 5 230 KV CKT 1	478	118	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12WP	AUBURN ROAD (AUBRN77X) 230/115/13.8KV TRANSFORMER CKT 1	308	112	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12WP	AUBURN ROAD - SWISSVALE 230KV CKT 1	363	111	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12WP	IATAN - ST JOE 345KV CKT 1	1073	107	0	CRAIG - STRANGER CREEK 345KV CKT 1
12WP	CRAIG - STRANGER CREEK 345KV CKT 1	1195	104	0	IATAN - ST JOE 345KV CKT 1
12WP	CONCORDIA (CONCORD6) 230/115/13.8 KV TRANSFORMER CKT 1	205	196	9	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
12WP	JEFFREY ENERGY CENTER - MORRIS COUNTY 345KV CKT 1	1051	104	52	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12WP	JEWELL 3 - SMITH CENTER 115KV CKT 1	80	157	62	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
12WP	PHILLIPSBURG - SMITH CENTER 115KV CKT 1	80	158	73	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
12WP	LAWRENCE ENERGY CENTER UNIT 5 - LAWRENCE HILL 230KV CKT 1	478	103	101	JEFFERY ENERGY CENTER - MORRIS COUNTY 345KV CKT 1
12WP	EAST MANHATTAN (EMANHT3X) 230/115/18 KV TRANSFORMER CKT 1	308	106	117	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
12WP	2003-6AT - CONCORDIA 230KV CKT 1	319	126	120	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
12WP	SMITH CENTER - WALDO 115KV CKT 1	60	130	123	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
12WP	EAST MANHATTAN - 2003-6AT 230 KV CKT1	319	124	125	2003-6AT 230.00 - CONCORDIA 230KV CKT 1
12WP	EAST MANHATTAN (EMANHT3X) 230/115/18 KV TRANSFORMER CKT 1	308	107	128	CONCORDIA (CONCORD6) 230/115/13.8KV TRANSFORMER CKT 1
12WP	KNOB HILL - GREENLEAF 115KV CKT 1	92	132	129	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
12WP	CLIFTON - CONCORDIA 115KV CKT 1	118	117	153	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
12WP	CONCORDIA - JEWELL 3 115KV CKT 1	118	112	156	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
12WP	CLIFTON - GREENLEAF 115KV CKT 1	118	111	169	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	AUBURN ROAD (AUBRN77X) 230/115/13.8KV TRANSFORMER CKT 1	280	166	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	ANZIO - FORT JUNCTION SWITCHING STATION 115KV CKT 1	92	156	0	WR-DOUBLE12
17SP	CIRCLE - HUTCHINSON GAS TURBINE STATION 115KV CKT 1	141	147	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	LAWRENCE ENERGY CENTER UNIT 5 - LAWRENCE HILL 230KV CKT 1	478	145	0	SPP-WERE-77
17SP	EAST MANHATTAN (EMANHT3X) 230/115/18 KV TRANSFORMER CKT 1	280	143	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	LAWRENCE HILL (LAWHL29X) 230/115/13.8KV TRANSFORMER CKT 1	280	143	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	AUBURN ROAD - JEFFREY ENERGY CENTER 230KV CKT 1	565	141	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	MIDLAND JUNCTION (MIDJ126X) 230/115/18KV TRANSFORMER CKT 1	308	130	0	LAWRENCE HILL (LAWHL29X) 230/115/13.8KV TRANSFORMER CKT 1
17SP	HOYT - JEFFERY ENERGY CENTER 345KV CKT 1	1076	129	0	JEFFERY ENERGY CENTER - MORRIS COUNTY 345KV CKT 1
17SP	AUBURN ROAD - SHERWOD 115KV CKT 1	223	118	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
SEASON	OVERLOADED ELEMENT	RATING	LOADING	ATC	CONTINGENCY

**TABLE 4: Contingency Analysis (continued)**

		(MVA)	(%)	(MW)	
17SP	LAWRENCE HILL - MIDLAND JUNCTION 230KV CKT 1	359	114	0	LAWRENCE HILL (LAWHL29X) 230/115/13.8KV TRANSFORMER CKT 1
17SP	AUBURN ROAD - INDIAN HILLS 115KV CKT 1	223	113	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	29TH & EVENINGSIDE JUNCTION - 29TH & GAGE 115KV CKT1	141	108	0	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	IATAN - ST JOE 345KV CKT 1	1073	107	0	CRAIG - STRANGER CREEK 345KV CKT 1
17SP	CRAIG - STRANGER CREEK 345KV CKT 1	1195	104	0	IATAN - ST JOE 345KV CKT 1
17SP	CONCORDIA (CONCORD6) 230/115/13.8KV TRANSFORMER CKT 1	205	201	10	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1	141	147	14	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	SOUTH GAGE (WEST) - SHERWOD 115KV CKT 1	223	110	21	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	CLIFTON - GREENLEAF 115KV CKT 1	90	188	26	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	JEWELL 3 - SMITH CENTER 115KV CKT 1	80	173	36	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	CONCORDIA - JEWELL 3 115KV CKT 1	90	166	36	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	PHILLIPSBURG - SMITH CENTER 115KV CKT 1	80	172	51	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	KNOB HILL - GREENLEAF 115KV CKT 1	92	168	57	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	BELOIT - CONCORDIA 115KV CKT 1	90	147	60	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	LAWRENCE HILL - LAWRENCE ENERGY CENTER UNIT 5 230 KV CKT 1	478	104	74	CONCORDIA (CONCORD6) 230/115/13.8KV TRANSFORMER CKT 1
17SP	JEFFREY ENERGY CENTER - MORRIS COUNTY 345KV CKT 1	956	105	109	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	2003-6AT - CONCORDIA 230KV CKT 1	319	129	115	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	BELOIT - GLEN ELDER 115KV CKT 1	90	127	116	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	EAST MANHATTAN - 2003-6AT 230 KV CKT1	319	125	123	CONCORDIA (CONCORD6) 230/115/13.8KV TRANSFORMER CKT 1
17SP	EAST MANHATTAN - 2003-6AT 230 KV CKT1	319	124	124	2003-6AT 230.00 - CONCORDIA 230KV CKT 1
17SP	SMITH CENTER - WALDO 115KV CKT 1	60	126	131	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	AUBURN ROAD - SWISSVALE 230KV CKT 1	363	102	150	AUBURN ROAD (AUBRN77X) 230/115/13.8KV TRANSFORMER CKT 1
17SP	EAST MANHATTAN - MATTERS CORNER 115KV CKT1	223	101	162	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
17SP	CLIFTON - CONCORDIA 115KV CKT 1	90	118	163	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	KNOB HILL - SMITTYVILLE N.M. COOP (NEMAHA MARSHALL R.E.) 115KV CKT 1	92	116	165	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	BAILEYVILLE N.M. STATION (NEMAHA MARSHALL R) - SMITTYVILLE N.M. COOP (NEMAHA MARSHALL R.E.) 115KV CKT 1	92	114	169	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	FORT JUNCTION SWITCHING STATION - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 2	92	101	171	JEFFERY ENERGY CENTER - SUMMIT 345KV CKT 1
17SP	BAILEYVILLE N.M. STATION (NEMAHA MARSHALL R) - SOUTH SENECA 115KV CKT 1	92	112	173	2003-6AT 230.00 - EAST MANHATTAN 230KV CKT 1
17SP	EAST MANHATTAN - MCDOWELL CREEK SWITCHING STATION 115KV CKT 1	179	101	186	EAST MANHATTAN - MATTERS CORNER 115KV CKT 1
17SP	GREENLEAF - KNOB HILL 115KV CKT 1	92	102	186	EAST MANHATTAN (EMANHT3X) 230/115/18.0KV TRANSFORMER CKT 1
17SP	NASHUA - SMITHVILLE 161KV CKT 1	245	100	197	IATAN - ST JOE 345KV CKT 1

*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 \$900,000 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 42 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