



***Facility Study
For
Generation Interconnection
Request
GEN-2010-057***

***SPP Generation
Interconnection***

(#GEN-2010-057)

November 2011

Summary

Midwest Energy and Westar Energy performed detailed Facility Studies at the request of Southwest Power Pool (SPP) for Generation Interconnection request GEN-2010-057 (201 MW). The request for interconnection was placed with SPP in accordance with SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

Interconnection Customer Interconnection Facilities

The Interconnection Customer will be responsible for the 230kV transmission line from its wind farm Substation to the Point of Interconnection (POI), the Rice County 230kV. In addition, the customer will be responsible for reactive power compensation equipment to maintain 95% lagging (providing vars) and 95% leading (absorbing vars) power factor at the point of interconnection.

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades

Per the following Facility Study, the Interconnection Customer is responsible for **\$859,521** of Transmission Owner Interconnection Facilities and \$25,307,113 for non-shared network upgrades. Of the Network Upgrades, \$5,075,244 of facilities are located on the Westar Transmission System and \$20,231,869 are located on the Midwest Energy Transmission System.

Additionally, Mid-Kansas Electric Company (MKEC) was contacted about any possible modifications needed to be made at Circle on the 230kV line terminal. At this time, there has not been a response from MKEC. When those costs become available, the study will be modified.

The previously allocated Lyons Capacitor Bank was found to no longer be needed under the certain conditions. The conditions that the Interconnection Customer agreed to is to install General Electric generators with the +/-90% power factor option as well as installing a load tap changer (LTC) on its 230/34.5kV transformer at its interconnection substation.

Shared Network Upgrades

The interconnection customer was studied within the DISIS-2011-001 Impact Study. At this time, the Interconnection Customer is allocated \$112,428 for shared network upgrades. As the Facility Study for these shared Network Upgrades is completed, these costs may change.

Upgrade Description	Allocated Cost	Total Cost
Benton – Wichita 345kV	\$112,428	\$979,609
Total	\$112,428	\$979,609

If higher queued interconnection customers withdraw from the queue, suspend or terminate their GIA, restudies will have to be conducted to determine the Interconnection Customers' allocation of shared network upgrades. All studies have been conducted on the basis of higher queued interconnection requests and the upgrades associated with those higher queued interconnection requests being placed in service.



Midwest Energy Inc.

***Facility Study for Generation Interconnection
Request GEN-2010-057***



November 16, 2011

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Study Overview

At the request of Southwest Power Pool (SPP), Midwest Energy developed the following generation interconnection facility study for interconnection request GEN-2010-057 based on the results of Definitive Interconnection System Impact Study 2011-001 (DISIS-2011-001). As studied in DISIS-2011-001, GEN-2010-057 consists of 201 MW of wind generation interconnecting to a new 230 kV bus at Midwest Energy's Rice County substation.

The purpose of this study is to provide estimated costs of facilities required for interconnection of the proposed generation to Midwest Energy's transmission system and network upgrades required on Midwest Energy's transmission system as identified in DISIS-2011-001. Additional network upgrades required for facilities of other transmission owners are not included in this study. The wind collector system, collector substation, and the 230 kV transmission line required between the collector substation and point of interconnection are not addressed in this study and are considered the responsibility of the Interconnection Customer.

Interconnection Facilities and Network Upgrades

In order to support the interconnection of GEN-2010-057, several network upgrades are necessary on Midwest Energy's transmission system. Cost estimates, within an expected tolerance of $\pm 20\%$, for Midwest Energy's Interconnection Facilities and required Network Upgrades can be found in Table 1.

A new Rice County 230/115 kV substation will be constructed with a 230/115 kV autotransformer. The Rice County-Circle line, which is currently operated at 115 kV but constructed for 230 kV, will be upgraded for 230 kV operation. This upgrade requires significant modification of the Circle 230/115 kV substation which is owned by Westar Energy, and the costs associated with upgrades at Circle, as well as line modifications between the Circle substation and the point where the line crosses highway K-61 will be provided by Westar Energy and are not included in estimates provided in this study.

Additionally, the Rice County-Lyons 115 kV line must be rebuilt to a capacity of 1000 amps, and metering instrument transformer upgrades are required at the Wheatland terminal of the Lyons-Wheatland 115 kV line to utilize the full conductor rating of 1000 amps. Installation of capacitors at Lyons may also be necessary pending a final determination from SPP. A placeholder for such capacitors is shown in Table 1, but no costs associated with the capacitors have been included in the estimates.

A conceptual one-line diagram for the new Rice County 230/115 kV substation including GEN-2010-057 Interconnection Facilities can be found in Attachment A.

Facility Study for Generation Interconnection Request GEN-2010-057

A fault study was conducted by Midwest Energy to determine if the addition of the proposed generation and contingent system upgrades caused fault levels on the Midwest Energy transmission system to exceed circuit breaker interrupting capabilities. Based on the results of the fault study, it was determined that all fault levels remain within the interrupting capability of existing circuit breakers.

Table 1 - Interconnection Facility and Network Upgrade Cost Estimate

Description	Subtotal	Total Cost
Interconnection Facilities		\$ 859,521
Midwest Energy Network Upgrades		
Rice Co. Sub - 230kV Network Upgrade	\$ 6,796,786	
Rice Co. Sub - 115kV Network Upgrade	\$ 1,038,669	
Rice-Circle 230kV Conversion	\$ 3,160,030	
New Rice-Old Rice 230kV Line Extension	\$ 1,653,960	
Rice-Lyons 115kV Line Rebuild	\$ 6,646,800	
Wheatland Substation Meter CT/VT Replacement	\$ 76,103	
Lyons 115kV Capacitors	\$ -	
Total Network Upgrades		\$ 19,372,348
Total Interconnection Facilities and Network Upgrades		\$ 20,231,869

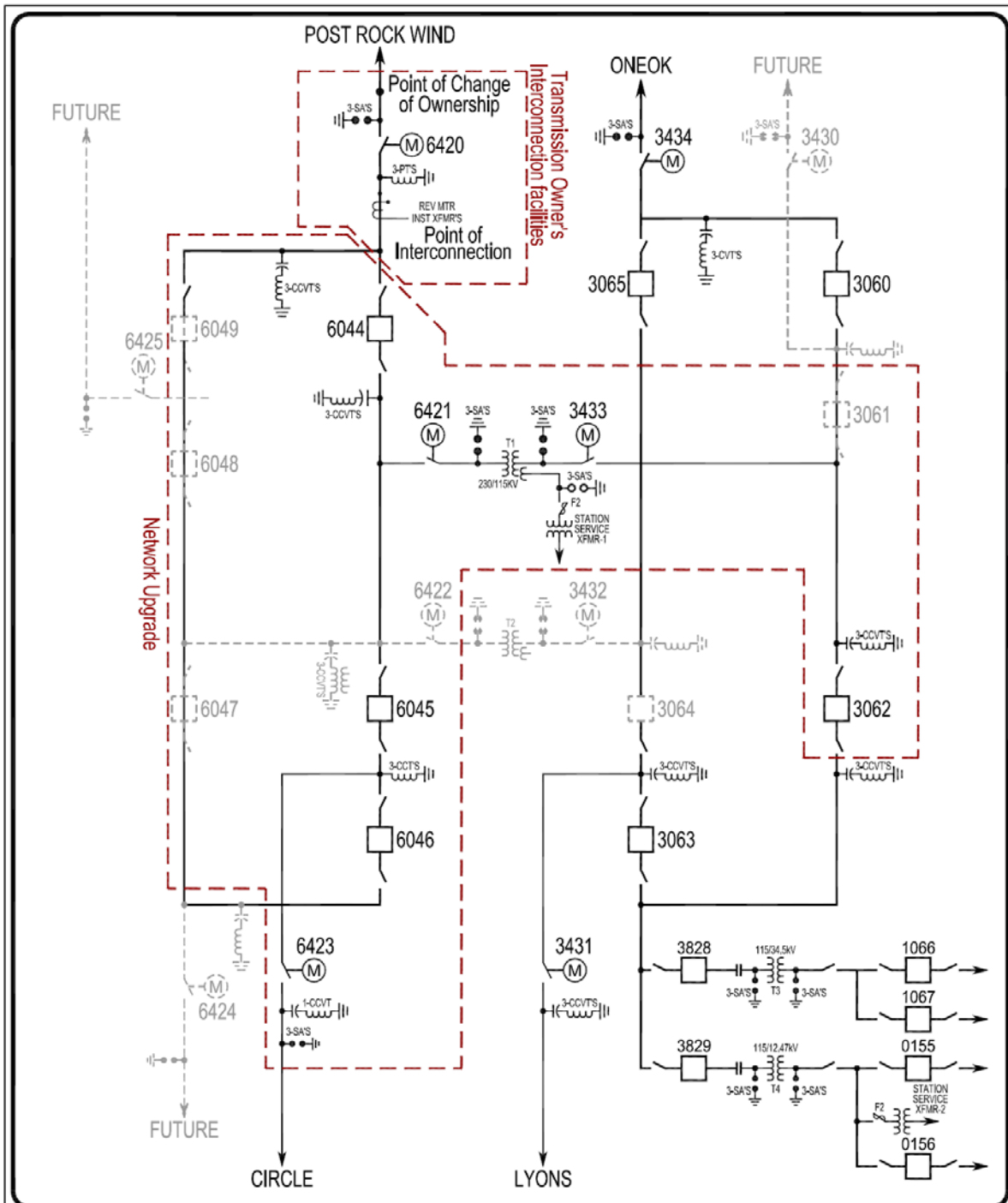
Reactive Compensation Considerations

Power factor requirements for the interconnecting generation were studied and established in DISIS-2011-001, and no additional reactive compensation beyond the capabilities of the GE 1.5 MW wind turbines was identified by Midwest Energy. Midwest Energy relied in part upon information provided by the Interconnection Customer indicating it planned to install the General Electric Wind Control featuring Dynamic VAR Control. Midwest Energy reserves the right to request installation of additional reactive compensation by the Interconnection Customer based on operational experience. Of particular concern are light load, low generation production situations resulting in elevated 230 kV and 115 kV bus voltages related to line capacitance of the Interconnection Customer's transmission line and wind generation collector system.

Midwest Energy will require the Interconnection Customer to install either:

- a. Sufficient capacitors, reactors and switching/control equipment to maintain the voltage at the Point of Interconnection at levels not less than 95% of nominal and not greater than 105% of nominal under normal operating conditions; or
- b. A control system for the turbines that is comparable to the General Electric Wind Control featuring Dynamic VAR Control that provides for real-time control of the reactive power production of the individual turbines and the generating facility as a whole. The control system shall be capable of maintaining the voltage at the Point of Interconnection at levels not less than 95% of nominal and not greater than 105% of nominal under normal operating conditions.

Attachment A Conceptual One-Line Diagram



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Post Rock Wind
Rice County Substation
Interconnection One-Line Diagram

W/O#	1-588	DATE	DRAWING NO.
DRN BY:	SJB	10-31-11	PostRockWind
CHK BY:	WND	10-31-11	SHEET 1 OF 1
REV:	SJB	10-31-11	SCALE: NONE



**Generation Interconnection Facilities
Study**

For

**Generation Interconnection Request
SPP-GEN-2010-057**

November 02, 2011

Introduction

This report summarizes the results of a Generation Interconnection Facilities Study performed for the Southwest Power Pool (SPP) by Westar Energy to evaluate a generation interconnection request by Wind Capital Group, LLC for 200 MW of wind-powered generation in Rice County, Kansas, to the transmission system of Midwest Energy (MWE). The proposed interconnection is on the MWE transmission system on the existing Circle-Rice County 230 kV line. Circle-Rice County is currently a 115 kV line, but was designed for 230 kV operation. Work will be performed at the Westar Energy (WR) owned Circle substation and the MWE owned Rice County substation to support the upgrade to 230 kV. A Feasibility Study and a System Impact Study have been completed for this project. The requested in-service date of the generating facility is October, 2012.

Project Location and Existing Facilities

The project is located in Rice County in central Kansas. The proposed interconnection is on the MWE transmission system on the existing Circle-Rice County 230 kV line. Figure 1 shows the Regional Transmission Facilities. The proposed project is not within the WR service area, however, one of the upgrades identified is a tie line between MWE and WR.

Interconnection Facilities

Interconnection to the MWE transmission system will be by way of the Circle-Rice County transmission line once it is converted to 230 kV. Work will need to be performed at the WR owned Circle Substation to re-terminate the line to 230 kV. System Protection setting changes at Circle will also be required.

230 kV Substation Work at Circle

The estimated cost is for three (3) 230 kV 3000 Amp breakers (with meter CT's for tie metering), three (3) 230 kV 3000 Amp vertical break switches, two (2) 230 kV Wave Traps, two (2) 230 kV Coupling Capacitors, nine (9) 230 kV VTs, three (3) 230 kV arrestors, 230 kV 4" bus with 2" A frames, 1590 AAC jumpers, EHV Line and Breaker Control Relay Panels, and all associated site, yard and conduit work. When the upgrade is completed, the metering will be located at Circle 230 kV. This estimate includes all equipment inside the substation fence up to the Point of Change of Ownership.

\$2,567,063

230 kV Transmission Line Work

The estimated cost is for six H-Frame steel tangent structures and two three-pole steel dead ends to re-terminate the existing Circle-Rice County 115 kV transmission line to 230 kV at Circle Substation plus associated foundations and labor. It also includes one H-Frame steel tangent structure and two three-pole steel dead ends for the necessary work on the Mid-Kansas Electric Company (MKEC) owned Circle-Great Bend (Mullergren) 230 kV line to accommodate the Circle-Rice County 230 kV re-termination.

\$2,508,181

The total cost estimate for the Stand Alone Network Upgrades (230 kV Substation Work at Circle and 230 kV Transmission Line Work) is:

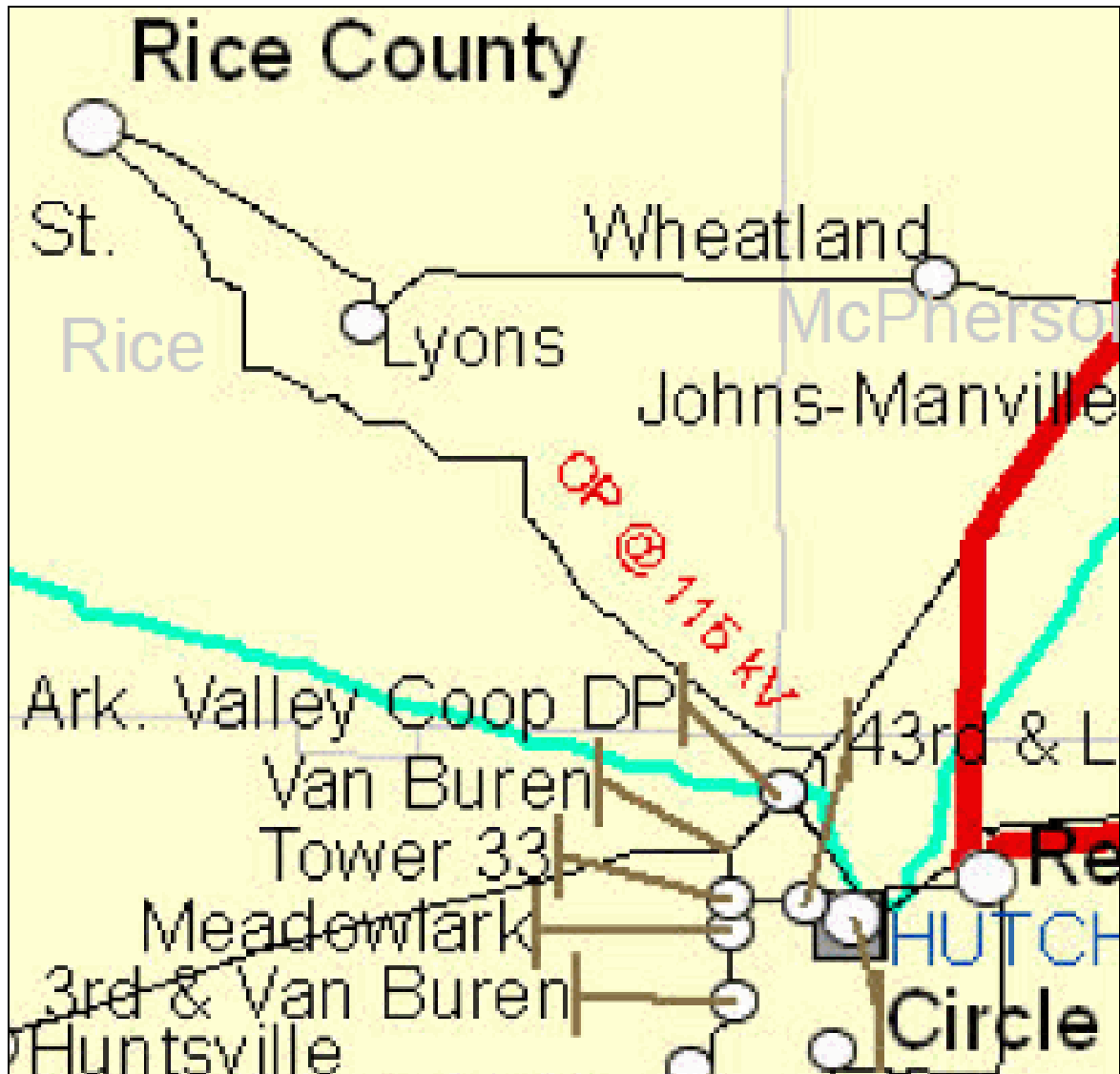
\$2,567,063 230 kV Substation Work at Circle
\$2,508,181 230 kV Transmission Line Work
\$5,075,244

This estimate is accurate to +/- twenty (20) percent, based on current prices, in accordance with Attachment A of Appendix 4 of the Interconnection Facilities Study Agreement. However, recent cost fluctuations in materials are very significant and the accuracy of this estimate at the time of actual settings cannot be assured.

8 weeks Engineering Time
40 weeks Procurement Time
12 weeks Construction Time
60 weeks Total

Westar Energy also maintains its own Facility Connection Requirements, which may be found at (www.wr.com).

Figure 1 – Circle-Rice County 230 kV



The proposed interconnection project is not within the Westar Energy service area.

Figure 3 – Circle Substation Upgrades Layout

