



**Facility Study  
For  
Generation Interconnection  
Request  
GEN-2011-017**

***SPP Generation  
Interconnection Studies***

***(#GEN-2011-017)***

**May 2013**

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## Revision History

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Date	Author	Change Description
5/29/2013	SPP	Facility Study Report Issued

## **Summary**

ITC Great Plains (ITCGP) performed a detailed Facility Study at the request of Southwest Power Pool (SPP) for Generation Interconnection request GEN-2011-017 (299MW/Wind) located in Hodgeman County in Kansas. The originally proposed in-service date for GEN-2011-017 was December 1, 2013. SPP has proposed the in-service date will be after the assigned interconnection facilities upgrades and shared network upgrades are completed. 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.

## **Phases of Interconnection Service**

It is not expected that interconnection service will require phases however, interconnection service will not be available until all interconnection facilities and network upgrades can be placed in service.

## **Interconnection Customer Interconnection Facilities**

The Interconnection Customer will be responsible for all of the transmission facilities connecting the customer owned substation to the Point of Interconnection (POI), at a new ITC Great Plains 345kV substation tap on the Spearville – Post Rock 345kV transmission line. This new 345kV substation tap is planned to be approximately twenty-three (23) miles from the Spearville Substation. The new ITCGP 345kV substation will be owned and operated by ITC Great Plains (ITCGP). The Customer will also be responsible for any equipment located at the Customer substation necessary to maintain a power factor of 0.95 lagging to 0.95 leading at the POI.

## **Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades**

To allow interconnection the Transmission Owner will need to construct a new 345kV three breaker ring bus and associated equipment for acceptance of the Interconnection Customer's Interconnection Facilities. It is also determined by ITCGP that a 55MVar line reactor will be needed on the new 345kV substation side of the transmission line to Post Rock to mitigate voltage issues. The estimated in-service date for these Interconnection Facilities is estimated for a lead time of 24 months after the Generation Interconnection Agreement (GIA) is signed. At this time GEN-2011-017 is responsible for \$11,532,284.00 (2013 dollars) of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

## **Shared Network Upgrades**

The interconnection customer was studied within the DISIS-2011-001 Impact Study. At this time, the Interconnection Customer is allocated \$82,210,340.72 for Shared Network Upgrades. 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. At this time, the Interconnection Customer is allocated the following cost for Shared Network Upgrade:

Share Network Upgrade Description	Allocated Cost	Total Cost
Beaver County 345kV Expansion (Tap & Tie Hitchland - Woodward 345kV circuit #2)	\$363,435.59	\$3,500,000.00
Beaver County - Buckner 345kV circuit #1 - Build approximately 48 miles of 345kV from Beaver County - Buckner at 3000 amps (construction by OKGE)	\$10,966,310.74	\$105,609,050.00
Beaver County - Buckner 345kV circuit #1 - Build approximately 48 miles of 345kV from Beaver County - Buckner at 3000 amps (construction by Sunflower)	\$6,707,982.63	\$64,600,000.00
Tatonga - Matthewson 345kV circuit #2 - Build Matthewson Substation. Build second 345kV circuit from Tatonga - Matthewson at 3000 amps	\$4,234,655.90	\$104,260,473.00
Matthewson - Cimarron 345kV circuit #2 - Build second 345kV circuit from Matthewson - Cimarron at 3000 amps	\$2,173,825.45	\$42,903,753.00
Mullergren - Reno 345kV double circuit - Build new double circuit 345kV transmission line from Mullergren to Circle to Reno at 3000 amps. Includes substation work at Reno. (Construction by Westar)	\$7,635,706.31	\$53,828,328.00
Spearville - Mullergren - Reno 345kV double circuit - Build new double circuit 345kV transmission line from Spearville to Mullergren to Circle at 3000 amps. Includes substation work at Spearville. (Construction by Sunflower)	\$50,128,424.10	\$353,383,059.00
<b>Total</b>	<b>\$82,210,340.72</b>	

### Other Network Upgrades

Certain Other Network Upgrades are not the cost responsibility of the Customer but will be required for full Interconnection Service. These Other Network Upgrades include:

1. Hitchland - Woodward 345kV double circuit, scheduled for 6/30/2014 in-service
2. Hitchland 345/230kV Autotransformer circuit #2, scheduled for 6/30/2014
3. Spearville - Clark - Thistle - Wichita 345kV double circuit, scheduled for 12/31/2014 in-service
4. Post Rock 345/230/13.8kV Autotransformer circuit #2, assigned to DISIS-2010-001 Customers
5. Woodward - Thistle 345kV double circuit, scheduled for 12/31/2014 in-service
6. TUCO Interchange 345/230/13.2kV Autotransformer circuit #2, scheduled for 3/31/2013 in-service
7. TUCO Interchange - Border - Woodward 345kV circuit #1, scheduled for 5/19/2014 in-service
8. Woodward 345/138kV transformer circuit #2, scheduled for 5/19/2014 in-service

Depending upon the status of higher or equally queued customers, the Interconnection Customer's in-service date is at risk of being delayed or their Interconnection Service is at risk of being reduced until the in-service date of these Other Network Upgrades.

**Conclusion**

Interconnection Service for GEN-2011-017 will be delayed until the Transmission Owner Interconnection Facilities Shared Network Upgrades are constructed. The Customer is responsible for \$11,532,284.00 (2013 dollars) of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, the Interconnection Customer is allocated \$82,210,340.72 for Shared Network Upgrades. After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 299 MW, as requested by GEN-2011-017, can be allowed. At this time the total allocation of costs assigned to GEN-2011-017 for Interconnection Service are estimated at \$93,742,624.72.

**Generation Interconnection Facilities Study Report  
for GEN 2011-017 - 299 MW Wind Generating Facility  
In Hodgeman County, Kansas.  
May 8, 2013**



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## 1.0 Overview

ITC Great Plains (“ITCGP”) has performed a facility study at the request of Southwest Power Pool (“SPP”) for Generation Interconnection request GEN-2011-017 under the SPP Open Access Transmission Tariff. The subject request entails interconnecting a 299 MW wind powered generation facility in Hodgeman County, Kansas. The project will interconnect with the Spearville to Post Rock line approximately 23 miles from the Spearville Substation. It is scheduled for completion by October 1, 2014.

The ITCGP scope of this Facility Study is to provide a cost estimate for the Customer’s interconnection facilities. This study does not directly address any of the Network Upgrades that may be identified in the DISIS, the facilities that are being constructed by the interconnection customer, or any potential sub-transmission facilities (if any) that may be required.

### 1.1 Facility Study Summary

ITCGP estimates the total project cost of the customer’s interconnection facilities will be \$ 11,532,284 (+/- 20 % accuracy) including applicable company overheads and tax gross-ups in 2013 dollars. It includes \$ 10,879,177 for Network Upgrades and \$ 653,107 for Transmission Owner Interconnection Facilities. It is further estimated that the required legal/real estate acquisition and construction activities will require approximately 24 months after the GIA is executed. The attached report contains additional details regarding the estimate as well as results of short circuit studies, review of reactive compensation, and information on Interconnection & Operating requirements.

The GEN 2011-017 interconnection facilities will require Network Upgrades on the ITCGP system to connect the new generation. Network Upgrades consist of the following:

- A new 3-breaker 345 kV interconnection station at the Point of Interconnection (POI) on the Spearville to Post Rock 345 kV line, including a 55 MVar reactor on the Post Rock line terminal
- Looping the Spearville to Post Rock 345 kV line into the new substation

In addition to the identified Network Upgrades, there are specific Interconnection Facilities which ITCGP will construct, own, operate, and maintain. These facilities include the new line entrance structure and 345kV disconnect switch on the end of the radial line from GEN 2011-017 at the new ITCGP switching station as well as any ITCGP relaying and control equipment required for the protection of the developer’s radial line.

The Interconnection Customer is responsible for constructing all sole-use facilities such as the wind farm collector station and the radial 345kV line from the collector station to the new ITCGP switching station. While this report does define Interconnection Customer owned Interconnection Facilities in enough detail to explain basic requirements, it does not define or contain all of the detailed requirements. Additional metering, communications, and operational requirements may be identified as the Interconnection and Operating Agreements are developed and further communications between the Transmission Owner and Interconnection Customer take place. The Interconnection Customer’s low voltage system is not defined in this report.

## 2.0 Voltage Guidelines:

Reactive power, voltage regulation and operating requirements will be as per Transmission Operator (TOP) and Transmission Provider directives. Interconnection Customer will operate the Generating Facility to a voltage schedule of 354 kV (1.026 pu) with a bandwidth of +/- 6 kV (0.017 pu) at the Point of Interconnection (POI) utilizing the Generating Facility’s required power factor design capability as

indicated in SPP DISIS-2011-001. As per SPP DISIS 2011-001, the Interconnection Customer's required power factor capability is 0.95 lagging to 0.95 leading (at the POI).

For further clarification, the Interconnection Customer may meet the +/- 0.95 power factor requirement by utilizing reactive capability from the wind generators or by adding external reactive compensation. Note that any reactive compensation installed by the Interconnection Customer shall not cause voltage distortion in accordance with Article 9.7.6 Power Quality of the Generation Interconnection Agreement.

The Interconnection Customer will regulate the Generating Facility's voltage to the specified voltage set-point within the defined bandwidth stated above using an automatic voltage controller utilizing the inherent reactive power capability in the wind turbines and if applicable external reactive compensation.

The above voltage schedule is subject to change. If the need for a change is identified, it will be done within the limits of the GIA provisions stated in Section 9.6 and the Generating Facility's power factor design criteria as stated above. If a schedule change is needed, appropriate written documentation of the change will be provided to the Interconnection Customer.

The Interconnection Customer is required to have a generator operator available for 24/7 communication with the TOP. The TOP may, at any time request a variance from the schedule in response to system operating/security requirements.

### **3.0 Network Upgrades**

#### **3.1 New GEN 2011-017 interconnection substation**

##### **3.1.1 Project Location:**

The new switchyard will be located at approximately 23 miles from the Spearville Substation on the Spearville to Post Rock line in Hodgeman County, Kansas.

##### **3.1.2 Project Overview:**

The purpose of this project is to build a 345kV switchyard to provide a transmission system interconnection for the GEN 2011-017 Wind Farm. The switchyard will consist of three 345kV circuit breakers arranged in a ring bus configuration expandable to a breaker and a half configuration, with an additional breaker on the 345kV reactor tapped to the Post Rock line.

The new 345kV switchyard will have a new control house with adequate AC and DC station service supplies, new control and protection panels and a new RTU for communication with the Transmission Owner's master control station.

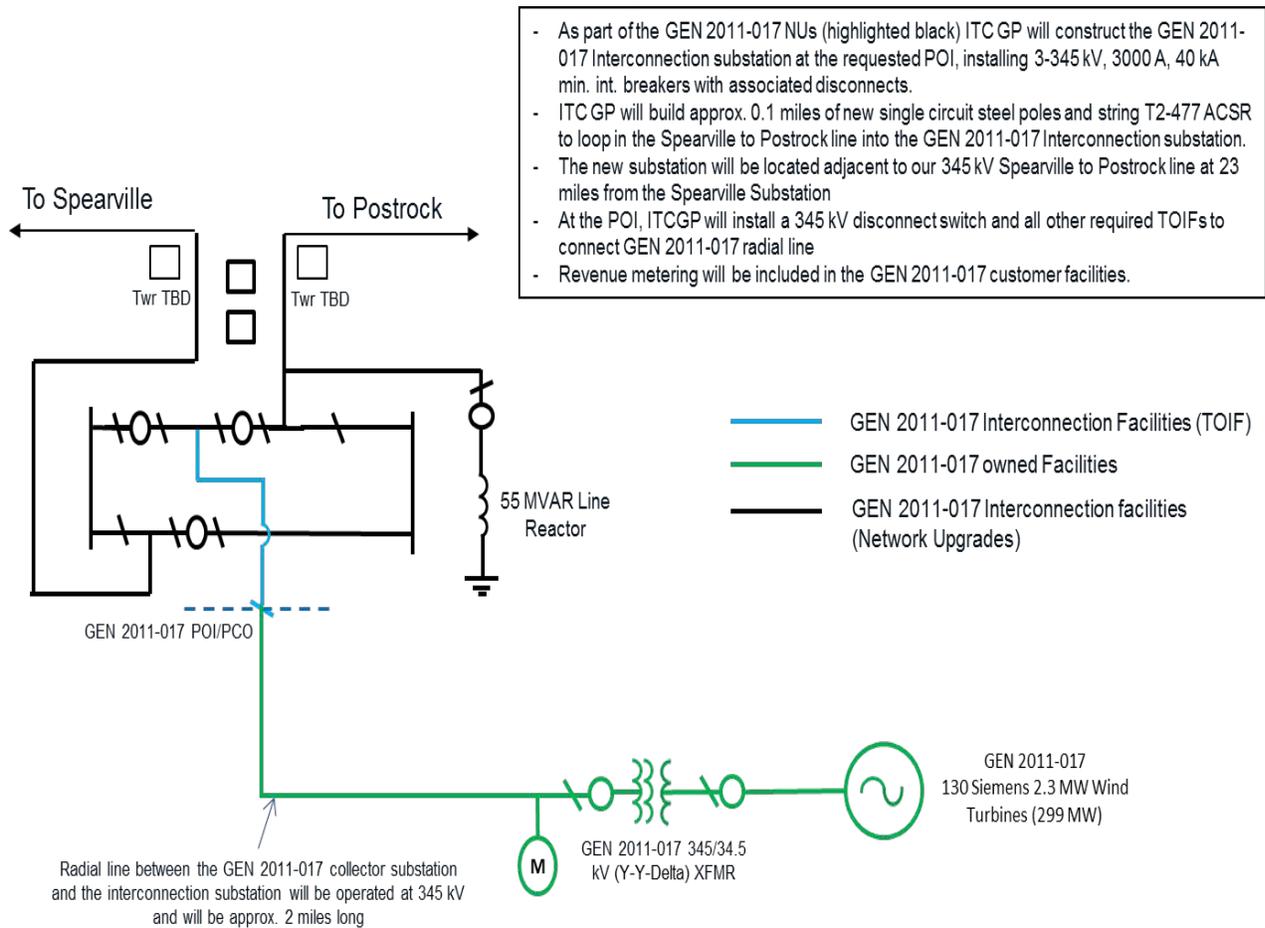
The new switchyard will cut into the 345kV Spearville to Post Rock line.

##### **3.1.3 Design Criteria:**

The Transmission Owner's standards will be applicable. Where no applicable standards are available, the Transmission Owner will substitute industry standards and other good utility practices.

### 3.1.4 One-Line Diagrams:

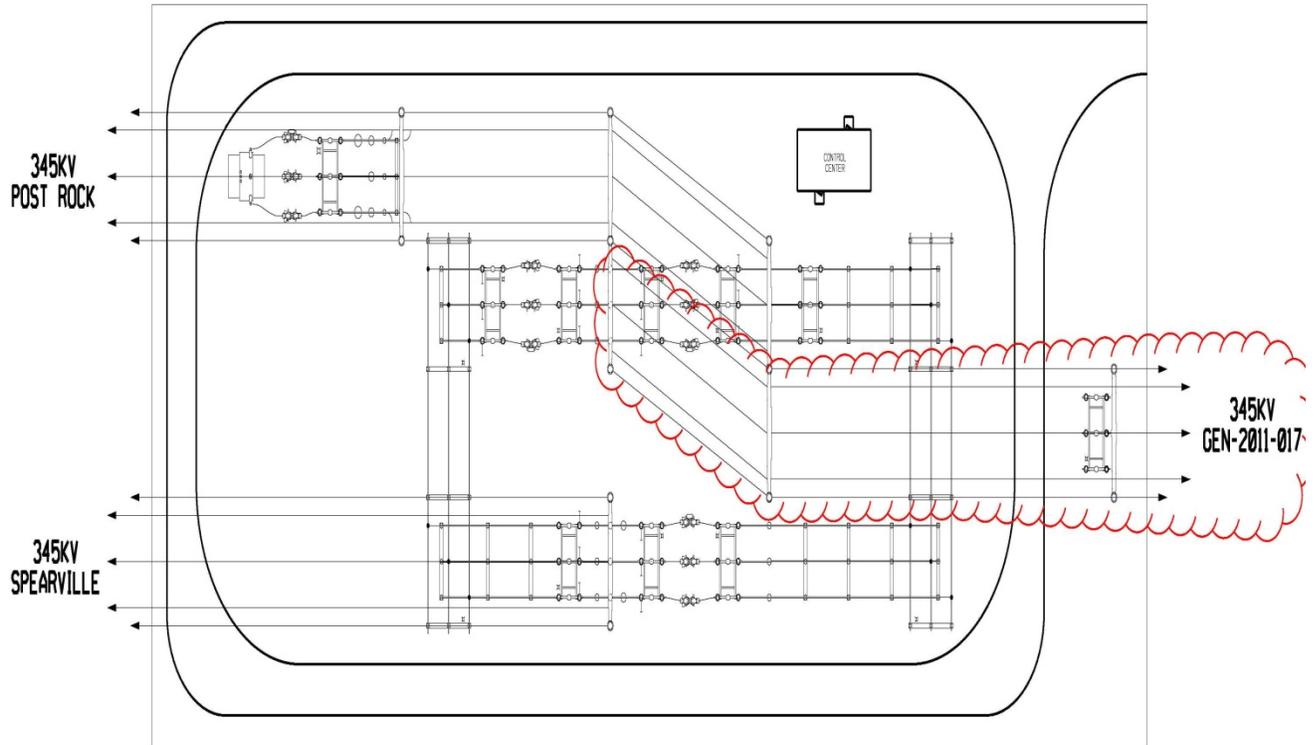
See Figure 1 for Transmission Owner One-Line.



**Figure 1 Gen-2011-017 ITCGP Interconnection Substation One Line**

### 3.1.5 Site Plan:

See Figure 2 for site plan of Transmission Owner switching station at the POI on Spearville to Post Rock 345kV line. The equipment that needs to be added to accommodate the customer's interconnection request is clouded in red.



**Figure 2 Gen-2011-017 ITCGP Interconnection Substation Site Plan**

3.1.6 Route Information: N/A

### 3.1.7 Right-of-Way Information:

It is assumed that the interconnection customer will be responsible for building the 345 kV line required to connect the ITCGP Switching Station at the POI with the customer's substation. As such, the interconnection costs contained herein do not include any costs for extending the ITCGP transmission line. Please see section 6 for general guidelines.

### 3.1.8 Permitting:

The Interconnection Customer will be responsible for satisfying all community or governmental site plan or zoning approval requirements which may include wetland or flood plain permits. The Transmission Owner will be responsible for the control center building permit and the KDHE storm water construction permits associated with the Transmission Owner portions of the construction.

### 3.1.9 Metering & Ownership Demarcation:

Covered in section 4.1.9

### 3.1.10 Protection & Control Overview:

Three sets of 345kV CCVTs will be installed, one set for each line.

Three 345kV breaker control panels with microprocessor based relays will be installed. Breaker failure protection, automatic reclosing supervised by synchronism check will be provided.

One 345kV line relaying panel with microprocessor based relays will be installed.

One 345kV line reactor control panel with microprocessor based relays will be installed.

### 3.1.11 Insulation Coordination:

345kV, 1050kV BIL

### 3.1.12 Short Circuit Study Results - Bus Fault Levels:

ITCGP calculated bus fault levels for the interconnection substation and adjacent substations to determine if the added generation will cause fault currents to exceed interrupting ratings for existing equipment and for use in sizing future equipment. Calculations are based on data for the interconnection transformer and installed wind turbines supplied by the Interconnection Customer. Variance from supplied data could materially change calculated short circuit values. Results are displayed in Table 1.

**Table 1 – Short Circuit Results**

Fault Location	Maximum Fault Current (Amps)*	
	Phase	Ground
Spearville Substation	8025	9009
Post Rock 345 kV Bus	6832	6908
GEN 2011-017 345 kV Bus	7296	6088

Fault currents shown in Table 1 are within the circuit breaker interrupting capabilities with the addition of 299 MW contributed by GEN-2011-017.

### 3.1.13 Reactive Compensation:

ITCGP evaluated the impact of the proposed interconnection on the reactive compensation equipment presently planned or in service for the Spearville and Post Rock Substation facilities. ITCGP studies concluded that there were voltage criteria violations for certain contingencies. This required the addition of a 55 MVAR line reactor at the ITCGP interconnection substation on the line going towards Post Rock (Figure 1) to mitigate these violations.

### 3.1.14 Other Equipments & Materials:

- Gas Circuit Breakers (GCB): Three (3) 345 kV, 3000A rated, 63kAIC.
- Disconnect Switch: Nine (9) 345 kV, 3000A rated, 1050 kV BIL.
- CCVTs: Six (6) 345 kV, 3-winding, 1550kV BIL.
- Insulators: Sixty six (66) 345 kV, 1050 kV BIL station post, porcelain.
- Surge Arresters: Six (6) 345 kV, vertical mount, 209 kV MCOV, polymer.
- Reactor: One (1) 345kV 55 MVAR Shunt Reactor.

- Control Cable: Control cables per Transmission Owner standards will be installed in direct buried PVC conduits, above grade LFMC conduits and in pre-cast cable trench. All control cables from the yard will be terminated at the relaying control panels. The control building will have overhead cable trays for necessary cable runs and inter-panel connections.

### 3.1.15 Relaying, Control, & SCADA:

#### Panel Requirements

- 3 – RD3024 – Tie Breaker Control (SEL-351S)
- 2 - RD3070 - “A” Line Relaying, Carrier (SEL-421 & UPLC)
- 2 - RD3076 - “B” Line Relaying, Carrier (SEL-311C & UPLC)
- 1 – Reactor Control

### 3.1.16 Grounding System:

The grounding system will be designed and installed per Transmission Owner’s standards. These standards follow the IEEE 80 standards.

### 3.1.17 Lightning Shielding Design:

Lightning shielding will be provided per Transmission Owner’s standards. Multiple H-frame structures along with shield wire will be used for lightning protection.

### 3.1.18 Yard Lighting:

Yard lighting will be installed to be sufficient for visual indication of the disconnect switch positions or egress of personnel, and will not serve as task lighting.

### 3.1.19 Structures:

The required new outdoor steel structures listed below will be hot-dipped galvanized wide flange structures or tubular steel:

- Nine (9) 345 kV disconnect switch stands
- Three (3) H-frame line entrance structures
- Six (6) 345 kV CCVT stands
- Six (6) 345 kV surge arrester stands
- Thirty three (33) 345 kV bus supports

### 3.1.20 Foundations:

Foundations and slabs will be designed and installed in accordance with the owner’s standards and specifications. The minimum design depth to firm bearing is contingent upon soil borings at the site.

### 3.1.21 Scheduling Requirements:

Legal/Real Estate Procurement	9 weeks
Material Procurement / Design	52-68 weeks
Substation Construction	32 weeks
Closeout Activities	4 weeks

### 3.1.22 Site Work:

Property acquisition and site grading will be required for the new 345kV switchyard. The new yard size will be approximately 290’ x 680’.

3.1.23 Total Cost: \$ 10,239,551  
Total Cost Estimate Accuracy: +/- 20%

Note that the cost estimate provided is expressed in 2013 terms and includes applicable company overheads.

### **3.2 Loop Spearville to Post Rock line into GEN 2011-017 interconnection substation**

#### 3.2.1 Project Location:

The new switchyard will be located at approximately 23 miles from the Spearville Substation on the Spearville to Post Rock line in Hodgeman county, Kansas.

#### 3.2.2 Project Overview:

The project involves opening the existing Spearville to Post Rock 345 kV line and looping it into the new GEN 2011-017 Interconnection Substation.

#### 3.2.3 Design Criteria:

Design Standards will be Transmission Owner Standards. Where no applicable standards are available, the Transmission Owner will utilize industry standards and good Utility practices.

#### 3.2.4 One-Line Diagrams: N/A

#### 3.2.5 Site Plan: N/A

#### 3.2.6 Route Information:

The routing associated with looping the Spearville to Post Rock circuit into the GEN 2011-017 Sub is minimal and will be contained to the property surrounding the GEN 2011-017 Substation.

#### 3.2.7 Right-of-Way Information:

The new transmission line structures will be located on existing easement or on the new substation property. Please see section 6 for general guidelines

#### 3.2.8 Permitting:

Same as that covering section 3.1.8.

#### 3.2.9 Metering & Ownership Demarcation: N/A

#### 3.2.10 Protection & Control Overview: N/A

#### 3.2.11 Insulation Coordination: N/A

#### 3.2.12 Short Circuit Study Results - Bus Fault Levels: N/A

#### 3.2.12 Other Equipments & Materials: N/A

#### 3.2.13 Relaying, Control, & SCADA: N/A

#### 3.2.14 Grounding System: N/A

#### 3.2.15 Lightning Shielding Design:

Lightning shielding design will be in accordance with the Transmission Owner's standards and specifications.

3.2.16 Yard Lighting: N/A

3.2.17 Structures:

The new transmission line structures will be 345 kV galvanized steel monopoles or lattice towers, pending the most feasible and appropriate design. Two structure(s) will be required to loop the line into the new station.

3.2.18 Foundations:

Foundations will be designed and installed in accordance with the Transmission Owner's standards and specifications. The transmission structure foundations will be drilled piers.

3.2.19 Conductors, Shield Wires, & OPGW:

The conductor will be a bundled T2-477 kcmil (26/7) ACSR "Hawk" per phase. The shield wire will be 159 kcmil (12/7) ACSR "Guinea."

3.2.20 Insulators:

Insulators will be 345 kV polymer insulators.

3.2.21 Removal of Existing Facilities:

TBD – tentatively no existing facilities will be removed.

3.2.22 Site Work: N/A

3.2.23 Total Cost: \$ 639,626

**Total Cost of Network Upgrades: 10,239,551 + 639,626 = 10,879,177**

Total Cost Estimate Accuracy: +/- 20%

Note that the cost estimate provided is expressed in 2013 terms and includes applicable company overheads.

#### **4.0 Transmission Owner Interconnection Facilities**

##### **4.1 GEN 2011-017 Substation – Interconnection Facilities**

4.1.1 Project Location:

The new switchyard will be located at approximately 23 miles from the Spearville Substation on the Spearville to Post Rock line in Hodgeman County, Kansas.

4.1.2 Project Overview:

A new line entrance structure will be added at the new GEN 2011-017 interconnection switchyard for termination of the line from the collector substation. A disconnect switch will be installed beneath this structure for isolation of the developer's line. Line relaying will be added to protect the line. A set of CCVT's and surge arresters will be added to the line terminal.

4.1.3 Design Criteria:

The Transmission Owner's standards will be applicable. Where no applicable standards are available, the Transmission Owner will substitute industry standards and other good utility practices.

4.1.4 One-Line Diagrams: See Figure 1

4.1.5 Site Plan: See Figure 2.

4.1.6 Route Information: N/A

4.1.7 Right-of-Way Information: N/A

4.1.8 Permitting: Same as that covering section 3.1.8

4.1.9 Metering & Ownership Demarcation:

The Interconnection Customer or others will provide, own, operate and maintain revenue metering. The specifics of the revenue metering will be defined during the detailed engineering phase of the project. The customer must cooperate with the Transmission Provider and Local Transmission Owner requirements in the metering design. Revenue metering equipment will be required at customer's project substation with loss compensation to the Point of Interchange in the Transmission Owner's substation.

The ownership demarcation will be at first substation steel H-frame within the security fence of the Transmission Owner substation.

The Interconnection Customer will be required to provide enough conductor to terminate on the H-frame and extend down to reach grade level.

4.1.10 Protection & Control Overview:

- One set of 345kV CCVTs will be installed on the Gen 2011 017 line.
- Two paths of fiber optic cable (OPGW) will be required for the line.
- One 345kV line relaying panel with microprocessor based relays will be installed.

4.1.11 Insulation Coordination:

345kV, 1050kV BIL

4.1.12 Short Circuit Study Results - Bus Fault Levels: See Section 3a above

4.1.13 Other Equipments & Materials:

- Disconnect Switch:  
One (1) 345 kV, 3000A rated, 1050 kV BIL.
- CCVTs: Three (3) 345 kV, 3-winding, 1550kV BIL.
- Insulators: Three (3) 345 kV, 1050 kV BIL station post, porcelain.
- Surge Arresters:  
Three (3) 345 kV, vertical mount, 209 kV MCOV, polymer.
- Control Cable  
Control cables per Transmission Owner standards will be installed in direct buried PVC conduits, above grade LFMC conduits and in pre-cast cable trench. All control cables from the yard will be terminated at the relaying control panels. The control building will have overhead cable trays for necessary cable runs and inter-panel connections.

#### 4.1.14 Relaying, Control, & SCADA:

Panel Requirements: One RD3048 Panel – Fiber optic current differential (SEL 311L Relays)

#### 4.1.15 Grounding System:

The grounding system will be designed and installed per Transmission Owner's standards. These standards follow the IEEE 80 standards.

#### 4.1.16 Lightning Shielding Design:

The attachment of the OPGW shield wire from the developer's line to the H-frame will provide lightning protection for the Interconnection Facility equipment at GEN 2011-017 interconnection substation.

#### 4.1.17 Yard Lighting:

Yard lighting will be installed to be sufficient for visual indication of the disconnect switch position or egress of personnel, and will not serve as task lighting.

#### 4.1.18 Structures:

The required new outdoor steel structures listed below will be hot-dipped galvanized wide flange structures or tubular steel:

- One (1) 345 kV disconnect switch stands
- Three (3) H-frame line entrance structures
- Three (3) 345 kV CCVT stands
- Three (3) 345 kV surge arrester stands

#### 4.1.19 Foundations:

Foundations will be designed and installed in accordance with the owner's standards and specifications. The minimum design depth to firm bearing is contingent upon soil borings at the site.

#### 4.1.20 Conductors, Shield Wires, & OPGW: N/A

#### 4.1.21 Insulators: N/A

#### 4.1.22 Removal of Existing Facilities: N/A

#### 4.1.23 Site Work: N/A

#### 4.1.24 Total Cost: \$ **653,107**

Total Cost Estimate Accuracy: +/- 20%

**Total Project cost (Network Upgrades and Interconnection facilities): \$ 11,532,284**

Note that the cost estimate provided is expressed in 2013 terms and includes applicable company overheads.

## **5.0 Interconnection Customer Interconnection Facilities**

### **5.1 GEN 2011-017 Interconnection facilities**

All facilities within the Interconnection Customer's collector substation and between the Interconnection Customer's substation and ITCGP's new GEN 2011-017 interconnection substation are not included in this report and are the sole responsibility of the Interconnection Customer. Some of the key facilities are briefly mentioned below. The Point of Interconnection (POI) and the Point of Change of Ownership (PCO) are shown in Figure.

The Interconnection Customer shall construct an approximate 2 mile 345 kV radial line from the wind farm collector station to ITCGP's new GEN 2011-017 interconnection substation. Installation of OPGW shield wire on the radial line from GEN 2011-017 containing at least 12 single mode fibers will be required for ITCGP relaying and communication purposes.

The customer's step-up transformer between the wind farm's 34.5 kV collector network and the 345 kV facilities will require a high side breaker capable of interrupting a transformer high side winding fault.

All Interconnection Customer owned 345 kV apparatus as well as the revenue metering equipment located in the Interconnection Customer's substation shall comply with ITCGP standards and will be subject to ITCGP approval. ITCGP will provide the Interconnection Customer with standards during detailed design or upon request. The Interconnection Customer is solely responsible for the SCADA and telecommunications facilities necessary to operate and monitor its facility.

Necessary trip and close signal interlocks will be provided by ITCGP to the Interconnection Customer's generation facility for the safe operation of the system. Interconnection Customer will provide breaker status and current transformer signals to ITCGP for system operation and protection.

Total Project Cost: N/A  
Total Cost Estimate Accuracy: N/A

## **6.0 Right Of Way Requirements**

The Interconnection Customer shall obtain easements from the Transmission Owner to work in or drive through the Transmission Owner's transmission line right-of-way. The Transmission Owner and Interconnection Customer will also cooperatively negotiate any easements required for the Interconnection Customer's transmission lines and structures. The Transmission Owner agrees to not unreasonably withhold easements.

For the Network Upgrades and any Transmission Owner Interconnection facilities identified in this report, the Transmission Owner agrees to obtain all necessary easements/right-of-way as required to construct those facilities that will be owned and operated by ITCGP.