Interconnection Facilities Study
For
Generator Interconnection Request
GEN-2014-049
(IFS-2014-002-17)

SPP Generator Interconnection Studies

(#GEN-2014-049)
(#IFS-2014-002-17)

October 2015

Revision History

Date	Author	Change Description
9/11/2015	SPP	Draft Interconnection Facilities Study Report Revision 0 Issued
10/14/2015	SPP	Final Interconnection Facilities Study Report Revision 0 Issued

Summary

ITC-Great Plains (ITCGP), Sunflower Electric Power Corporation/Mid-Kansas Electric Company, LLC (SUNC/MKEC), and Westar Energy, Inc. (WERE) performed detailed Interconnection Facilities Studies at the request of Southwest Power Pool (SPP) for Generator Interconnection Request (GIR) GEN-2014-049/IFS-2014-002-17 (200.00 MW/Wind) located in Pratt County, Kansas. The Interconnection Customer's originally proposed in-service date for GEN-2014-049/IFS-2014-002-17 is December 31, 2016. SPP has proposed the full interconnection service in-service date will be after the assigned Interconnection Facilities, Non-Shared Network, Shared Network Upgrades are completed. Full Interconnection Service will require the Network Upgrades listed in the "Other Network Upgrades" section. The request for interconnection was placed with SPP in accordance with SPP's Open Access Transmission Tariff, which covers new generator 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's generation facility consists of one hundred (100) General Electric (G.E.) 2.0 MW wind turbines for a total generation nameplate rating of 200.00 MW. The 34.5kV collector system for this wind facility is planned to connect to one (1) 345/34.5kV Interconnection Customer owned and maintained transformer at the Interconnection Customer owned substation. An approximate twenty-three (23) mile 345kV transmission circuit will connect GEN-2014-049/IFS-2014-002-17 to the Point of Interconnection (POI) at the existing ITCGP owned 345kV bus at the Thistle Substation. The Interconnection Customer will be responsible for all of the transmission facilities connecting the Interconnection Customer owned substation to the Point of Interconnection (POI).

The Interconnection Customer will 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, including approximately 21.9 Mvar[1] of reactors to compensate for injection of reactive power into the transmission system under reduced generating conditions. Also, the Interconnection Customer will need to coordinate with the Transmission Owner for relay, protection, control, and communication system configurations.

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades

To allow interconnection the Interconnecting Transmission Owner, ITC-Great Plains (ITCGP), will construct a new rung to the existing breaker-and-a-half configuration with two (2) new 345kV breakers and associated terminal equipment for acceptance of the Interconnection Customer's Interconnection Facilities. Currently, ITCGP estimates an Engineering and

[1] This is an approximate minimum reactor amount needed for the configuration of the wind farm studied in DISIS-2014-002 Group 03 Reduced Wind Analysis. This approximate amount of reactors is subject to change based on results of modification study discussed above.

Construction (E&C) lead time of approximately ninety-five (95) weeks after a fully executed Generation Interconnection Agreement (GIA) for the completion of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, GEN-2014-049/IFS-2014-002-17 is responsible for $3,841,791 of ITCGP Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. **Table 1** displays the estimated costs for Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

In addition to the ITC-Great Plains (ITCGP) Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades, Westar Energy, Inc. (WERE) will be required to review and update any necessary relay settings for transmission lines connecting Thistle 345kV to WERE's Wichita and Viola 345kV substations. The total current cost estimate for the WERE substation relay work is $94,783. Currently, WERE estimates an Engineering and Construction (E&C) lead time of approximately six (6) weeks after a fully executed Generator Interconnection Agreement (GIA) for the completion of WERE Non-Shared Network Upgrades.

The Interconnection Customer was studied within the DISIS-2014-002 Impact Study, and subsequent restudies for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's cost allocation was updated within the DISIS-2014-002-3 Impact Restudy. At this time, the Interconnection Customer is allocated $12,459,248 for Non-Shared Network Upgrades beyond the POI as identified in the latest impact restudy. The Milan – Clearwater rebuild Non-Shared Network Upgrades have a lead time of thirty-six (36) months after a fully executed GIA. Current cost estimate and upgrade descriptions are listed in **Table 2**.

At this time, GEN-2014-049/IFS-2014-002-17 is responsible for $16,395,822 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

Table 1: GEN-2014-049/IFS-2014-002-17 TOIF and Non-Shared Network Upgrades

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
ITCGP Interconnection Substation - Transmission Owner Interconnection Facilities 345kV Substation work for a new line terminal position, disconnect switch, insulators, arrestors, dead end structure, and relay panels	$602,206	100%	$602,206
ITCGP Interconnection Substation - Network Upgrades 345kV Substation work for building a new rung, 2- 345kV breakers, 4 disconnect switches, communication, revenue metering, line arrestors, breaker control panels, and associated siting.	$3,239,585	100%	$3,239,585
WERE Substations - Network Upgrades 345kV Substation relay work at Wichita and Viola 345kV	$94,783	100%	$94,783
Total	$3,936,574	100%	$3,936,574

Table 2: GEN-2014-049/IFS-2014-002-17 DISIS-2014-002-1 Non-Shared Network Upgrades

Non-Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
(MKEC) Milan Tap – Clearwater 138kV circuit #1: Rebuild MKEC's portion of 5.7 miles of 138kV from Milan Tap to Clearwater to at least 550 amps (Normal Rating)	$2,967,830	100%	$2,967,830
(WERE) Milan Tap – Clearwater 138kV circuit #1: Rebuild WERE's portion of approximately 6.1 miles of 138kV from Milan Tap to Clearwater to at least 550 amps (Normal Rating)	$9,491,418	100%	$9,491,418
Total	$12,459,248	100%	$12,459,248

Shared Network Upgrades

The Interconnection Customer was studied within the DISIS-2014-002 Impact Study and the DISIS-2014-002-1 Impact Restudy as Energy Resource Interconnection Service (ERIS). The Interconnection Customer's cost allocation was updated within the DISIS-2014-002-3 Impact Restudy. At this time, the Interconnection Customer is allocated $0 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 costs for Shared Network Upgrade shown in **Table 3**.

Table 3: GEN-2014-049/IFS-2014-002-17 Shared Network Upgrades

Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
None			
Total			

Other Network Upgrades[2]

Certain Other Network Upgrades are currently not the cost responsibility of the Customer but will be required for full Interconnection Service. Currently, the following Other Network Upgrades are required:

- Bucker – Spearville 345kV circuit #1 terminal equipment upgrade assigned DISIS-2010-002 Interconnection Customer.
- Clearwater – Viola 138kV circuits #1 build assigned in the SPP 2013 Integrated Transmission Planning Near Term (ITPNT) study per SPP-NTC-200228. Currently on schedule for 6/1/2019 in-service.
- FPL Switch – Woodward 138kV circuit #1 rebuild assigned to DISIS-2011-001 Interconnection Customer(s).
- Gill Energy Center – Viola 138kV circuit #1 build assigned in the SPP 2013 Integrated Transmission Planning Near Term (ITPNT) study per SPP-NTC-200228. Currently on schedule for 6/1/2019 in-service.
- Milan 138kV Substation Expansion Upgrades per SPP-NTC-200335 Network Upgrades assigned in High Priority Incremental Loads (HPILs) Study. Currently on schedule for 2/18/2018 in-service.
- Viola – Sumner County 138kV circuits #1 build assigned in the SPP 2014 Integrated Transmission Planning Near Term (ITPNT) study per SPP-NTC-200228. Currently on schedule for 6/1/2019 in-service.
- Viola 345/138/13kV Transformer circuit #1 build assigned in the SPP 2013 Integrated Transmission Planning Near Term (ITPNT) study per SPP-NTC-200228. Currently on schedule for 6/1/2019 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-2014-049/IFS-2014-002-17 will be delayed until the Transmission Owner Interconnection Facilities, Non-Shared Network; Shared Network Upgrades are constructed. The Interconnection Customer is responsible for $16,395,822 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, the Interconnection Customer is allocated $0 for Shared Network Upgrades. After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 200.00 MW, as requested by GEN-2014-049/IFS-2014-002-17, can be allowed.

At this time the total allocation of costs assigned to GEN-2014-049/IFS-2014-002-17 for interconnection Service are estimated at $16,395,822.

[2] SPP-NTC-200228 Link: http://www.spp.org/publications/NTC%20200228%20-%20Westar%20Energy%20Inc.pdf
SPP-NTC-200335 Link : http://www.spp.org/publications/MKEC%20NTC%20200335%20.pdf

Generation Interconnection Facilities Study Report
for GEN 2014-049 – 200 MW Wind Generating Facility
In Pratt County, Kansas.
April 21st, 2015

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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-2014-049 under the SPP Open Access Transmission Tariff. The subject request entails interconnecting a 200 MW wind powered generation facility in Pratt County, Kansas into ITCGP's Thistle Substation. It is proposed to be in service by December 16, 2016.

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 **$ 3,841,791** (+/ - 20 % accuracy) including applicable company overheads and potential tax gross ups in 2015 dollars. It includes **$ 3,239,585** for Network Upgrades and **$ 602,206** for Transmission Owner Interconnection Facilities. It is further estimated that the required legal/real estate acquisition and construction activities will require approximately 13 months after the GIA is executed. This 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 2014-049 interconnection facilities will require Network Upgrades on the ITCGP system to connect the new generation. Network Upgrades consist of adding two 345kV breakers and associated disconnect switches at the Thistle 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 structures and 345kV disconnect switch on the end of the radial line from GEN 2014-049 at the Thistle substation, 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 Thistle substation. 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 350 kV (1.0145pu) with a bandwidth of + 10 kV/- 5 kV (+0.029 pu/-0.0145pu) at the Point of Interconnection (POI) utilizing the Generating Facility's required power factor design capability as indicated in SPP DISIS-2014-002. As per SPP DISIS 2014-002, the Interconnection Customer's required power factor capability is 0.95 lagging to 0.95 leading (at the POI). As per SPP DISIS 2014-002, the Interconnection Customer is required to compensate for, at minimum, 21.9 MVARs of capacitance at the POI during periods of low-wind (compensation not required to be installed at 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 Project Location:
The generation facility will interconnect at the Thistle substation located in Barber County, Kansas.

3.2 Project Overview:
The purpose of this project is to add two 345 kV breakers and associated disconnect switches at the Thistle substation to provide a transmission system interconnection for the GEN 2014-049 wind farm.

3.3 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.

3.4 One-Line Diagrams:
See Figure 1 for Transmission Owner One-Line.

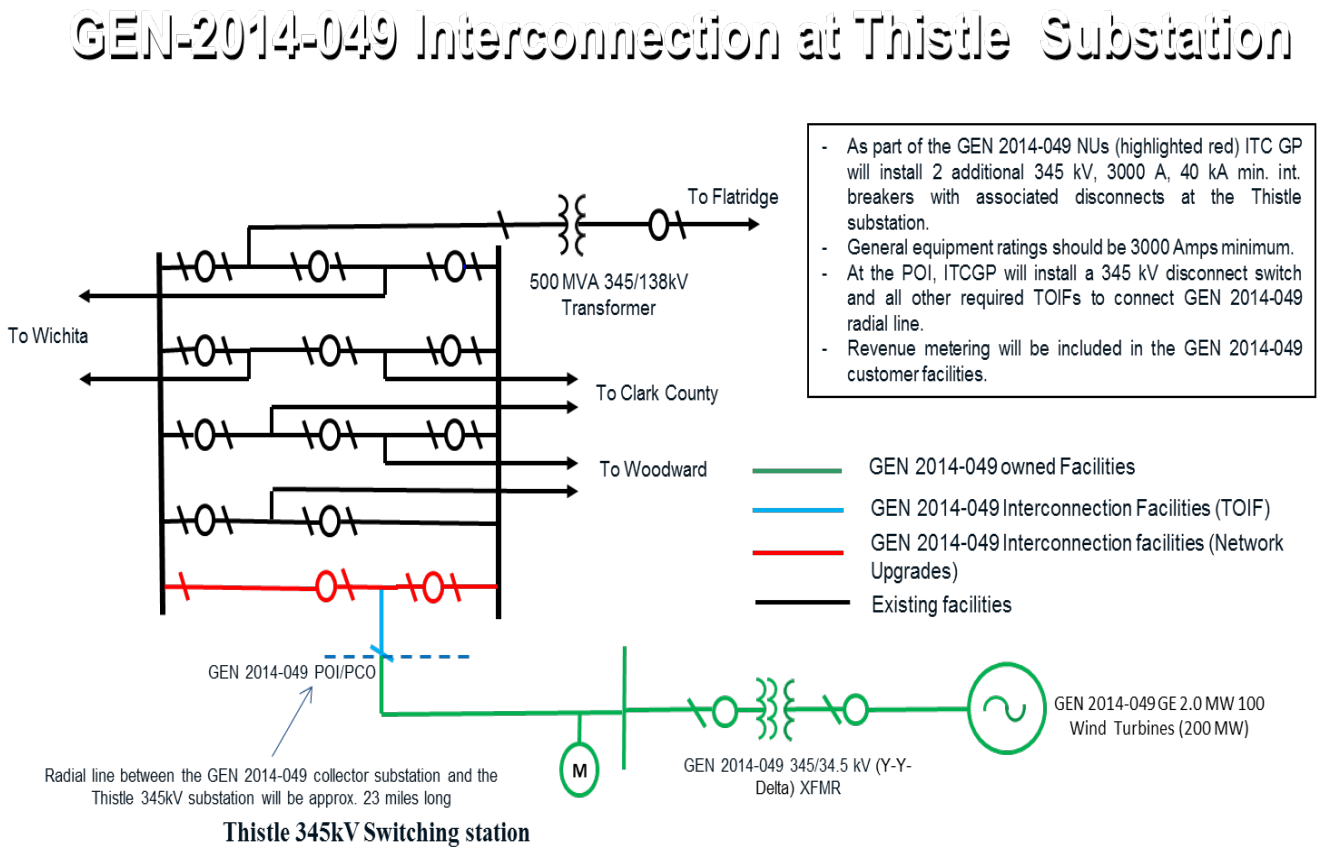


Figure 1 GEN-2014-049 ITCGP Interconnection substation one line diagram

3.5 Site Plan:
See Figure 2 for site plan of Transmission Owner switching station at the POI at the Thistle 345kV substation. The equipment that needs to be added to accommodate the customer's interconnection request is shown in red.

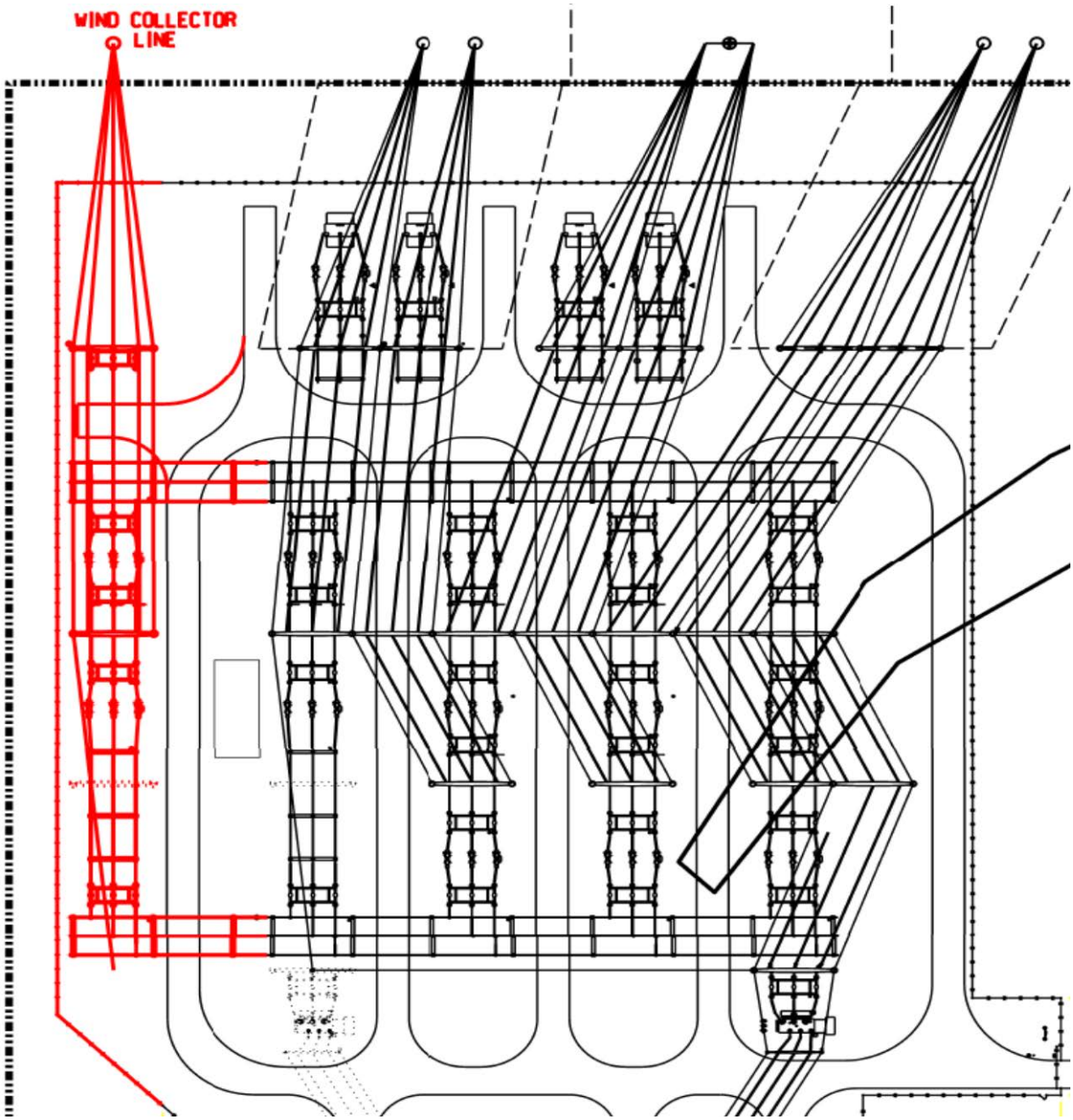


Figure 2 GEN-2014-049 ITCGP Thistle substation site plan

3.6 Route Information: N/A

3.7 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.

3.8 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.

3.9 Metering & Ownership Demarcation:
Covered in section 4.9

3.10 Protection & Control Overview:
One 345kV breaker control panel with microprocessor based relays will be installed. Breaker failure protection, automatic reclosing supervised by synchronism check will be provided.

3.11 Insulation Coordination:
345kV, 1050kV BIL

3.12 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
Clark County 345kV substation	14121	14749
Thistle 138 kV substation	17369	14870
Thistle 345 kV substation	15104	10360

Fault currents shown in Table 1 are within the circuit breaker interrupting capabilities with the addition of 200 MW contributed by GEN-2014-049.

3.13 Reactive Compensation:
ITCGP evaluated the impact of the proposed interconnection on the reactive compensation equipment presently planned or in service for the Thistle substation facilities. ITCGP studies concluded that there was no requirement for additional reactive compensation at the Thistle substation for the addition of 200 MW of GEN 2014-049.

3.14 Other Equipment's & Materials:

- Gas Circuit Breakers (GCB): Two (2) 345 kV, 3000A rated, 63kAIC.
- Disconnect Switch: Three (3) 345 kV, 3000A rated, 1050 kV BIL.
- Disconnect Switch: One (1) 345kV, 3000A rated, 1050kV BIL disconnect switches with ground blades.
- Insulators: Twenty Nine (29) 345 kV, 1050 kV BIL station post, porcelain.
- 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.

3.15 Relaying, Control, & SCADA:
Panel Requirements

- 1 – RD3024 –Breaker Control (SEL-351S)

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

3.17 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.

3.18 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.

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

- Four (4) 345kV intermediate height disconnect switch stands
- Six (6) three-phase high bus supports for the 345kV busses
- Three (3) three-phase intermediate height bus supports for connecting through the future breaker position
- Two (2) single phase bus supports for the 345kV busses
- One (1) 70' lightning mast

3.20 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.

3.21 Scheduling Requirements:

Legal/Real Estate Procurement	9 weeks
Material Procurement / Design	52 weeks
Substation Construction	26-30 weeks
Closeout Activities	4 weeks

3.23 **Total Cost of Network Upgrades: $ 3,239,585**
Total Cost Estimate Accuracy: +/- 20%

Note that the cost estimate provided is expressed in 2015 terms and includes applicable company overheads and potential tax gross ups.

4.0 Transmission Owner Interconnection Facilities

4.1 Project Location:
The generation facility will interconnect at the Thistle substation located in Barber County, Kansas.

4.2 Project Overview:
New line entrance structures will be added at the Thistle substation for termination of the line from the collector substation. A disconnect switch will be installed beneath the first 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.

4.3 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.

4.4 One-Line Diagrams: See Figure 1

4.5 Site Plan: See Figure 2.

4.6 Route Information: N/A

4.7 Right-of-Way Information: N/A

4.8 Permitting: Same as that covering section 3.8

4.9 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 the 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.

4.10 Protection & Control Overview:
- One set of 345kV CCVTs will be installed on the Gen 2014-049 line.
- Two paths of fiber optic cable (OPGW) will be required for line protection. They will be supplied by the Interconnection Customer.

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

4.11 Insulation Coordination:
345kV, 1050kV BIL

4.12 Short Circuit Study Results - Bus Fault Levels: See Section 3.12 above

4.13 Other Equipment & Materials:

- Disconnect Switch: One (1) 345 kV, 3000A rated, 1050 kV BIL.
- CCVTs: Three (3) 345 kV, 3-winding, 1550kV BIL.
- 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.

4.14 Relaying, Control, & SCADA:
Panel Requirements: One RD3048 Panel – Fiber optic current differential (SEL 311L Relays)

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

4.16 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 2014-049 interconnection substation.

4.17 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.

4.18 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 stand
- Two (2) H-frame line entrance structures
- Three (3) 345 kV CCVT stands
- Three (3) 345 kV surge arrester stands

4.19 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.

4.20 Conductors, Shield Wires, & OPGW: N/A

4.21 Insulators: N/A

4.22 Removal of Existing Facilities: N/A

4.23 Site Work: N/A

4.24 Total Cost: $ **602,206**
Total Cost Estimate Accuracy: +/- 20%
Total Project cost (Network Upgrades and Interconnection facilities): $ 3,841,791

Note that the cost estimate provided is expressed in 2015 terms and includes applicable company overheads and potential tax gross ups.

5.0 Interconnection Customer Interconnection Facilities

All facilities within the Interconnection Customer's collector substation and between the Interconnection Customer's substation and ITCGP's Thistle 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 1 above.

The Interconnection Customer shall construct an approximate 23 mile 345 kV radial line from the wind farm collector station to ITCGP's Thistle substation. Installation of OPGW shield wire on the radial line from GEN 2014-049 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.

Generation Interconnection Facility Study

For

Generation Interconnection Request SPP-GEN-2014-049

June 04, 2015

Introduction

This report summarizes the results of a Generation Interconnection Facilities Study performed for the Southwest Power Pool (SPP) by Westar Energy (WR) to evaluate a generation interconnection request by the Interconnection Customer for 200 MW of wind-powered generation in south central, Kansas, to the ITC Great Plains (ITCGP) owned Thistle 345 kV substation. Although the proposed interconnection does not tie directly into a WR owned substation, it will affect the WR owned transmission lines that leave the substation. A System Impact Study has been completed for this project. The requested in-service date of the generating facility is December 1, 2016.

Project Location and Existing Facilities

The project is located in Pratt County in south central Kansas. The proposed interconnection is approximately 23 miles southeast of this location by way of the existing ITGP owned Thistle 345 kV substation. Figure 1 shows the approximate location of the project.

Interconnection Facilities

Interconnection to the WR transmission system will be by way of the existing ITCGP owned Thistle 345 kV substation.

345 kV Substation Work

The estimated cost is for reviewing relay settings and making any necessary changes at the Wichita and Viola 345 kV substations as a result of the wind farm interconnection at Thistle after applicable protection data is received from GEN-2014-049. No substation physical upgrades are needed by Westar.
$78,870

345 kV Transmission Line Work

No transmission line upgrades are needed by Westar.
$0

The total cost estimate for the Stand Alone Network Upgrades (345 kV Substation Relay Work at Wichita and Viola 345 kV) is:

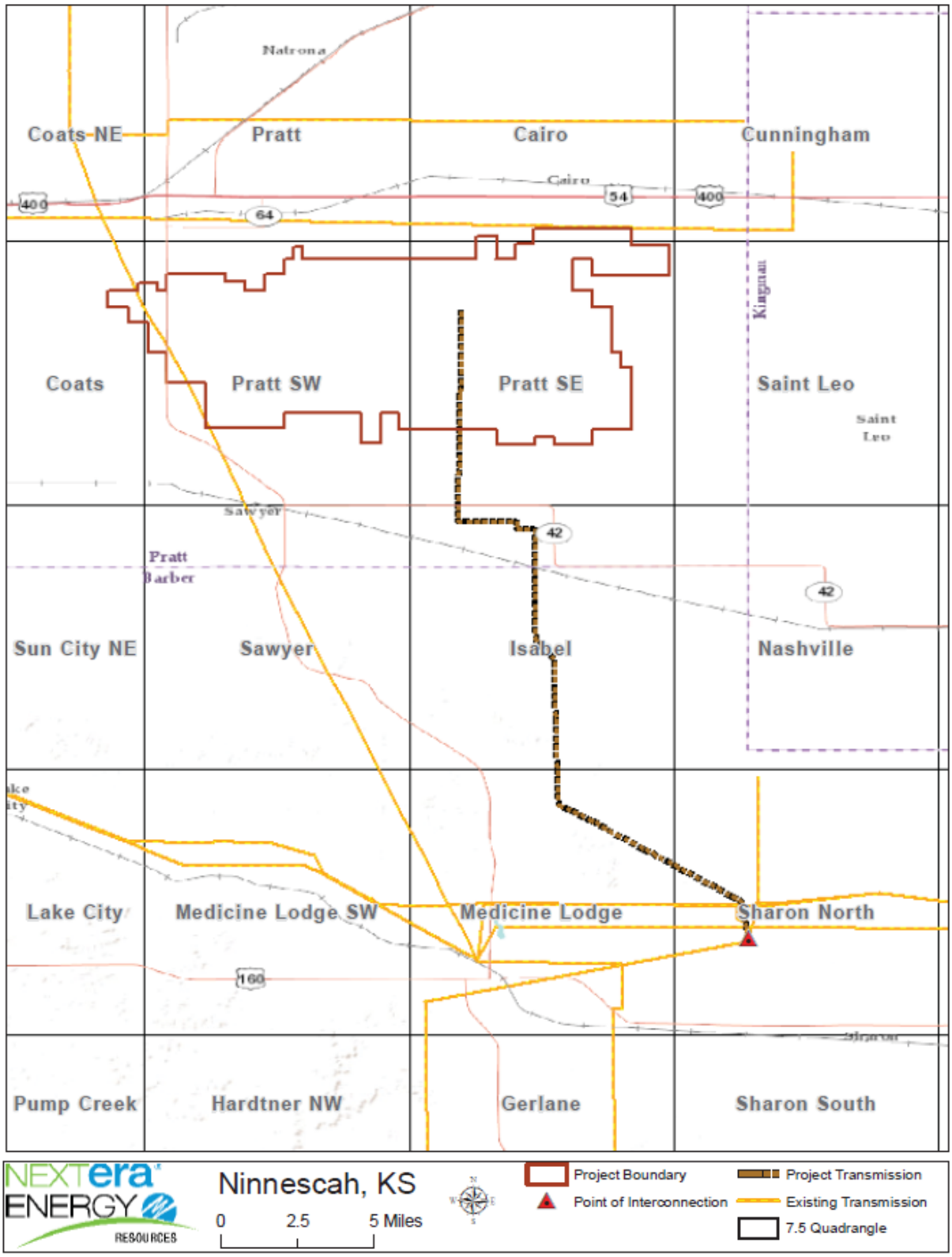
$78,870	**345 kV Substation Work**
$ 0	**345 kV Transmission Line Work**
$ 2,713	**AFUDC**
$13,200	**Contingency**
$94,783	

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.

3 weeks	Engineering Time
0 weeks	Procurement Time
3 weeks	Construction Time
6 weeks Total	

Westar Energy also maintains its own Facility Connection Requirements, which may be found at (http://www.oasis.oati.com/WR/index.html).

Figure 1 – Interconnection Map



The proposed interconnection project is at Thistle 345 kV substation.

Results of Short Circuit Analysis

As a part of this Facility Study, a short circuit study was performed to determine the available fault current at the interconnection bus (Thistle 345 kV) using PSS/E's activity SCMU. The 2016 and 2020 Summer Peak cases from the 2015 Series MDWG Classical, Max Fault Short-Circuit models were used. All GEN-2014-049 Wind Farm generation was taken out of service for this analysis and all other transmission facilities are in service. As a result, the numbers generated represent the available utility interconnection fault current:

2016 Summer:

- For a 3-Phase fault at bus number 539801 (Thistle 345 kV), the fault current is estimated to be 15552 Amps.
- For a Phase-to-Ground fault at bus number 539801 (Thistle 345 kV), the fault current is estimated to be 11352 Amps.

THEVENIN IMPEDANCE, X/R (OHM) Z+:1.071+j14.178, 13.23422 Z-:1.073+j14.178, 13.20921 Z0:5.632+j29.563, 5.24885

2020 Summer:

- For a 3-Phase fault at bus number 539801 (Thistle 345 kV), the fault current is estimated to be 15751 Amps.
- For a Phase-to-Ground fault at bus number 539801 (Thistle 345 kV), the fault current is estimated to be 11445 Amps.

THEVENIN IMPEDANCE, X/R (OHM) Z+:1.058+j14.018, 13.24926 Z-:1.060+j14.017, 13.22412 Z0:5.622+j29.488, 5.24472