INTERCONNECTION FACILITIES STUDY REPORT

GEN-2016-046

IFS-2016-001-012

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
09/18/2019	SPP	Initial draft report issued.
10/21/2019	SPP	Final report issued.
12/13/2019	SPP	Final report revised. Removed all Shared NUs in Table 3 per DISIS-2016-001-5 restudy. Table 5 costs updated accordingly.

CONTENTS

SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2016-046/IFS-2016-001-012 is for a 299 MW generating facility located in Ford County, Kansas. The Interconnection Request was studied in the DISIS 2016-001 Impact Study and DISIS-2016-001-1, DISIS-2016-001-2, DISIS-2016-001-3 Impact Restudies for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested Commercial Operation Date is 12/01/2018.

The interconnecting Transmission Owner, ITC Great Plains (ITCGP) performed a detailed IFS at the request of SPP. The full report is included in Appendix A. SPP has determined that full Interconnection Service will be available after the assigned transmission owner interconnect facilities (TOIF), non-shared network upgrades, shared network upgrades, previously allocated, and affected system upgrades that are required for full interconnection service are completed.

The primary objective of the IFS is to identify necessary Transmission Owner Interconnection Facilities, Network Upgrades, other direct assigned upgrades, cost estimates, and associated upgrade lead times needed to grant the requested Interconnection Service.

PHASE(S) OF INTERCONNECTION SERVICE

It is not expected that Interconnection Service will occur in phases. However, full Interconnection Service will not be available until all Interconnection Facilities and Network Upgrade(s) can be placed in service.

CREDITS/COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)

Interconnection Customer shall be entitled to compensation in accordance with Attachment Z2 of the SPP OATT for the cost of SPP creditable-type Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, that are not otherwise refunded to the Interconnection Customer. Compensation shall be in the form of either revenue credits or incremental Long Term Congestion Rights (iLTCR).

INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES

The Generating Facility is proposed to consist of one hundred and thirty (130) GE 2.3-116 MW wind turbine generators for a total generating nameplate capacity of 299 MW.

The Interconnection Customer's Interconnection Facilities to be designed, procured, constructed, installed, maintained, and owned by the Interconnection Customer at its sole expense include:

- 34.5 kV underground cable collector circuits;
- 34.5 kV to 345 kV transformation substation with associated 34.5 kV and 345 kV switchgear;
- One (1) 34.5/345 kV, 200/267/333 MVA (ONAN/ONAF/ONAF) step-up transformer to be owned and maintained by the Interconnecting Customer at the Interconnection Customer's substation;
- A five and a half (5.5) mile overhead 345 kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 345 kV bus at a new substation in close proximity to existing ITCGP substation Clark County - Ironwood 345 kV tap that is owned and maintained by ITCGP;
- All transmission facilities required to connect the Interconnection Customer's substation to the POI;
- Equipment at the Interconnection Customer's substation necessary to maintain a composite power delivery at continuous rated power output at the high-side of the generator substation at a power factor within the range of 95% lagging and 95% leading in accordance with Federal Energy Regulatory Commission (FERC) Order 827. Additionally, approximately 13.9 Mvars[1] of reactors will be required to compensate for injection of reactive power into the transmission system under no/reduced generating conditions. The Interconnection Customer may use inverter manufacturing options for providing reactive power under no/reduced generation conditions. The Interconnection Customer will be required to provide documentation and design specifications demonstrating how the requirements are met.

The Interconnection Customer shall coordinate relay, protection, control, and communication system configurations and schemes with the Transmission Owner.

[1] This approximate minimum reactor amount is needed for the current configuration of GEN-2016-016 as studied in the DISIS-2016-001 Impact Study and Restudies.

TRANSMISSION OWNER INTERCONNECTION FACILITIES AND NON-SHARED NETWORK UPGRADE(S)

To facilitate interconnection, the interconnecting Transmission Owner will perform work as shown below necessary for the acceptance of the Interconnection Customer's Interconnection Facilities.

Table 1 and **Table 2** lists the Interconnection Customer's estimated cost responsibility for Transmission Owner Interconnection Facilities (TOIF) and Non-Shared Network Upgrade(s) and provides an estimated lead time for completion of construction. The estimated lead time begins when the Generator Interconnection Agreement has been fully executed.

Table 1: Transmission Owner Interconnection Facilities (TOIF)

Transmission Owner Interconnection Facilities (TOIF)	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
ITC New Substation Near Clark County – Ironwood 345 kV Line: 345 kV line terminal, line switches, dead end structure, line relaying, communications, revenue metering, line arrestor, and all associated equipment and facilities necessary to accept transmission line from Interconnection Customer's Generating Facility.	$946,557	100%	$946,557	24 Months
Total	**$946,557**		**$946,557**	

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	Z2 Type[2]	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
ITC New Substation Near Clark County – Ironwood 345 kV Line: Construct a new 3 breaker substation with 3000 continuous ampacity breakers, control panels, line relaying, cut in transmission line and re-terminate, acquire land, disconnect switches, structures, foundations, conductors, insulators, and all other associated work and materials.	Non-Creditable	$9,818,753	100 %	$9,818,753	24 Months
Total		**$9,818,753**		**$9,818,753**	

* Refer to the attached TO report for more detail.

[2] Indicates the method used for calculating credits impacts under Attachment Z2 of the Tariff.

SHARED NETWORK UPGRADE(S)

The Interconnection Customer's share of costs for Shared Network Upgrades is estimated in **Table 3** below.

Table 3: Interconnection Customer Shared Network Upgrades

Shared Network Upgrades Description	Z2 Type	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
None	N/A	$0	N/A	$0	N/A
Total		**$0**		**$0**	

All studies have been conducted assuming that higher-queued Interconnection Request(s) and the associated Network Upgrade(s) will be placed into service. If higher-queued Interconnection Request(s) withdraw from the queue, suspend or terminate service, the Interconnection Customer's share of costs may be revised. Restudies, conducted at the customer's expense, will determine the Interconnection Customer's revised allocation of Shared Network Upgrades.

PREVIOUS NETWORK UPGRADE(S)

Certain Previous Network Upgrades are **currently not the cost responsibility** of the Interconnection Customer but will be required for full Interconnection Service.

Table 4: Interconnection Customer Previous Network Upgrade(s)

Previous Network Upgrade(s) Description	Current Cost Assignment	Estimated In-Service Date
None	$0	N/A

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

AFFECTED SYSTEM UPGRADE(S)

To facilitate interconnection, the Affected System Transmission Owner will be required to perform the facilities study work as shown below necessary for the acceptance of the Interconnection Customer's Interconnection Facilities. **Table 5** displays the current impact study costs as part of the Affected System Impact review. The Affected System facilities study could provide revised costs and will provide each Interconnection Customer's allocation responsibilities for the upgrades.

Table 5: Interconnection Customer Affected System Upgrade(s)

Affected System Upgrades Description	Total Cost Estimate ($)	Allocated Share (%)	Allocated Cost Estimate ($)
None	$0	N/A	$0
Total	**$0**		**$0**

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 299 MW can be granted. Full Interconnection Service will be delayed until the transmission owner interconnect facilities (TOIF), non-shared network upgrades, shared network upgrades, previously allocated, and affected system upgrades that are required for full interconnection service are completed. The Interconnection Customer's estimated cost responsibility is summarized in the table below.

Table 6: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities	$946,557
Network Upgrades	$9,818,753
Total	**$10,765,310**

A draft Generator Interconnection Agreement will be provided to the Interconnection Customer consistent with the final results of this IFS report. The Transmission Owner and Interconnection Customer will have 60 days to negotiate the terms of the GIA consistent with the SPP Open Access Transmission Tariff (OATT).

APPENDICES

A: TRANSMISSION OWNER'S INTERCONNECTION FACILITIES STUDY REPORT AND NETWORK REPORT(S)

See next page for the Transmission Owner's Interconnection Facilities Study Report and Network Report(s).

Generation Interconnection Facilities Study Report
For GEN 2016-046 – 299 MW Wind Generating Facility
In Ford County, Kansas.
Revised August 6, 2019

Table of Contents

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-2016-046 under the SPP Open Access Transmission Tariff. The subject request entails interconnecting a 299 MW wind powered generation facility in Ford County, Kansas. The project will interconnect at a new ITC GP GEN 2016-046 switching station on the Clark County to Ironwood line approximately 13 miles from the Clark County Substation. It was scheduled for completion by December 31, 2018. This date will be revised further into the process.

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 2016-001, 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 **$ 10,765,309** (+/ - 20 % accuracy) including applicable company overheads in 2020 dollars. It includes **$9,818,753** for Network Upgrades and **$946,557** 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 2016-046 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 ITCGP GEN 2016-046 interconnection station at the POI on the Clark County to Ironwood 345 kV line
- Looping in the Clark County to Ironwood 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 2016-046 at the 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 350 kV (1.014 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 2016-001. As per SPP DISIS 2016-001, 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 ITCGP GEN 2016-046 interconnection substation

3.1.1 Project Location:
This switchyard will be located at approximately 13 miles from the Ironwood Substation on the Clark County to Ironwood 345kV line in Ford 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 2016-046 Wind Farm. The switchyard will consist of three 345kV circuit breakers arranged in a breaker and a half configuration.

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 Clark County to Ironwood 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.

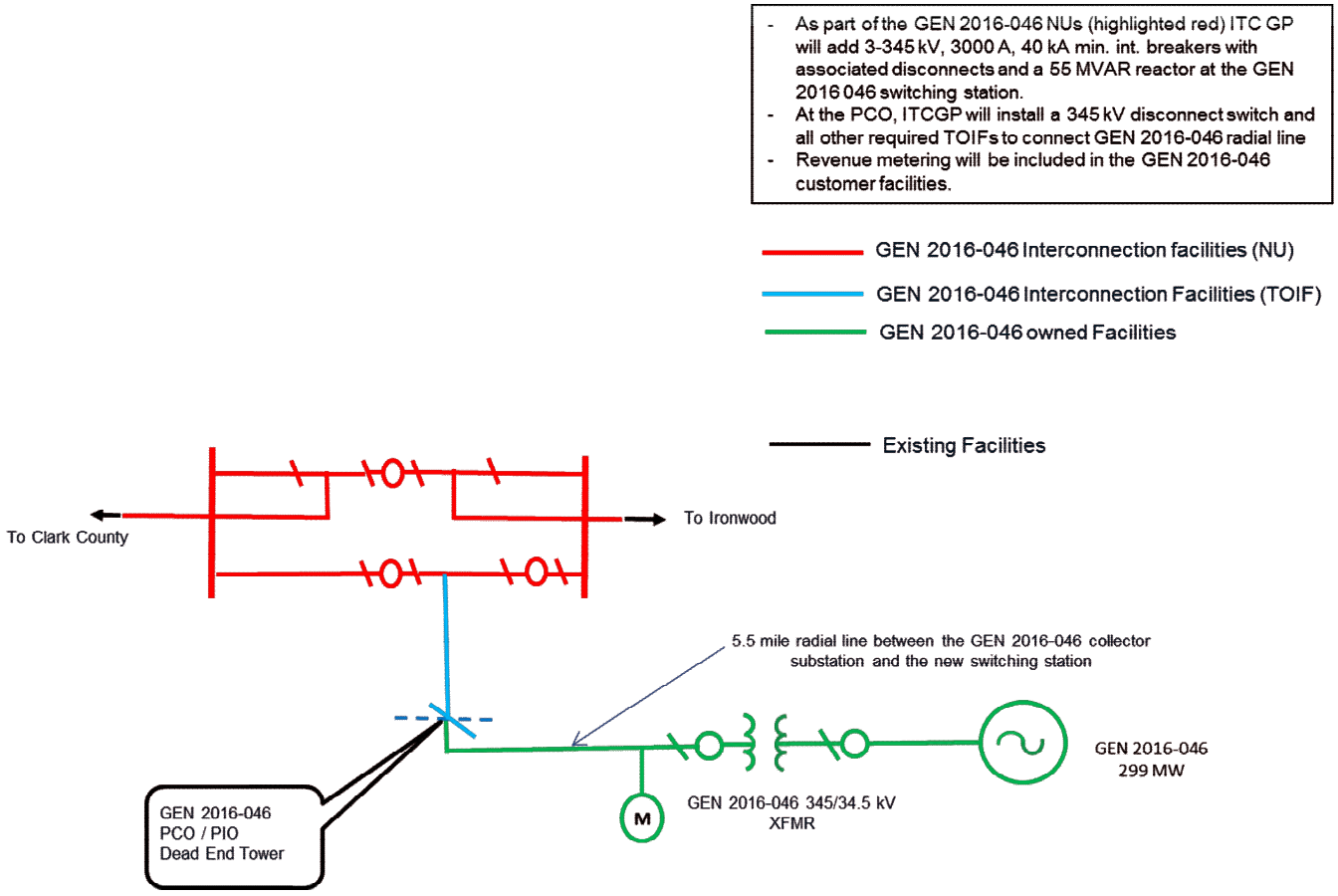

Figure 1 GEN-2016-046 ITCGP Interconnection Substation One Line

3.1.5 Route Information: N/A

3.1.6 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.

3.1.7 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.

3.1.8 Metering & Ownership Demarcation:
Covered in section 4.1.9

3.1.9 Protection & Control Overview:
Two sets of 345kV CCVTs will be installed, one set for each line.

Two 345kV wave traps will be installed 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.

Two 345kV line relaying panels with microprocessor based relays will be installed.

3.1.10 Insulation Coordination:
345kV, 1050kV BIL

3.1.11 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 Substation	11765	10478
Ironwood 345 kV Bus	12877	12719
GEN 2016-046 345 kV Bus	10040	9494

Fault currents shown in Table 1 are within the circuit breaker interrupting capabilities with the addition of 299 MW contributed by GEN-2016-046.

3.1.12 Reactive Compensation:
ITCGP evaluated the impact of the proposed interconnection on the reactive compensation equipment presently planned or in service for the Clark County and Ironwood Substation facilities. ITCGP studies concluded that an additional reactive compensation of 55 MVAR is required for interconnection of GEN 2016-046. The size of the reactor will be further refined with additional studies after the GIA is signed.

3.1.13 Other Equipments & Materials:

- Gas Circuit Breakers (GCB): three (3) 345 kV, 3000A rated, 63kAIC.
- Disconnect Switch: eight (8) 345 kV, 3000A rated, 1050 kV BIL.
- CCVTs: six (6) 345kV, 3-winding, 1550kV BIL.
- Insulators: sixty (60) 345 kV, 1050 kV BIL station post, porcelain.
- Wave traps: four (4) 345kV, 3000A, double frequency.
- Surge Arresters: six (6) 345kV, vertical mount, 209MCOV, 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.

3.1.14 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)

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

3.1.16 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.

3.1.17 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.

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

- Eight (8) 345 kV disconnect switch stands

- Nineteen (19) 345 kV bus support
- Four (4) 345kV wave trap stands
- Three (3) H-frame line entrance structures
- Six (6) 345kV CCVT stands
- Six (6) 345kV surge arrester stands

3.1.19 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 weeks
Substation Construction 32 weeks
Closeout Activities 4 weeks

3.1.20 Site Work:
Site grading will be required for the new 345kV switchyard.

3.1.21 Total Cost: $ 9,344,921
Total Cost Estimate Accuracy: +/- 20%

Note that the cost estimate provided is expressed in 2020 terms and includes applicable company overheads.

3.2 Loop Clark County to Ironwood line into GEN 2016-046 interconnection substation

3.2.1 Project Location:
The new switchyard will be located at approximately 13 miles from the Clark County Substation on the Clark County to Ironwood line in Ford county, Kansas.

3.2.2 Project Overview:
The project involves opening the existing Clark County to Ironwood 345 kV line and looping it into the new GEN 2016-046 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 Clark County to Ironwood circuit into the GEN 2016-046 Sub is minimal and will be contained to the property surrounding the GEN 2016-046 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: $ 473,832

Total Cost of Network Upgrades: $9,344,921 + $473,832 = $**9,818,753**

Total Cost Estimate Accuracy: +/- 20%

Note that the cost estimate provided is expressed in 2020 terms and includes applicable company overheads.

4.0 Transmission Owner Interconnection Facilities

4.1 GEN 2016-046 – Interconnection Facilities

4.1.1 Project Location:
This switchyard will be located approximately 13 miles from the Clark County Substation on the Clark County to Ironwood line in Ford County, Kansas.

4.1.2 Project Overview:
A new line entrance structure will be added at the ITCGP GEN 2016-046 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 2016-046 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.

4.1.11 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.
- Surge Arresters: Three (3) 345 kV, vertical mount, 209 kV MCOV, polymer.
- Control Cables: 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 2016-046 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 stand
- Two (2) 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: $ **946,557**

Total Cost Estimate Accuracy: +/- 20%

Total Project cost (Network Upgrades and Interconnection facilities): $10,765,309

Note that the cost estimate provided is expressed in 2020 terms and includes applicable company overheads and potential tax gross ups.

5.0 Interconnection Customer Interconnection Facilities

5.1 GEN 2016-046 Interconnection facilities

All facilities within the Interconnection Customer's collector substation and between the Interconnection Customer's substation and ITCGP's new GEN 2016-046 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 the 345 kV radial line from the wind farm collector station to ITCGP's new GEN 2016-046 interconnection substation. Installation of OPGW shield wire on the radial line from GEN 2016-046 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.