SPP Southwest Power Pool

Facility Study
For
Interim Interconnection of Generation Interconnection Request GEN-2012-001

SPP Generation Interconnection

(#GEN-2012-001)

July 2012

Summary

Xcel Energy Inc (Xcel), a subsidiary of Southwestern Public Service Company (SPS), performed a detailed Facility Study at the request of Southwest Power Pool (SPP) for Generation Interconnection request GEN-2012-001 (61.2 MW Wind). The originally proposed in-service date was November 30, 2012. 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. Subsequent to the request for a Definitive Interconnection System Impact Study (DISIS-2012-001) study, a request for a Limited Operation Impact Interconnection Service (LOIS) study and Interim Operation Impact Interconnection Service (IOIS) study were performed by SPP and posted May 2012. Through the LOIS and IOIS analysis, a minimum of 24 MVAr of capacitors on the 34.5 kV at the customer's substation along with Power System Stabilizers (PSS) at Tolk (Units: 1,2,) and Jones (Units: 1,2,3,4) are needed.

Phases of Interconnection Service

It is not expected that interconnection service will require phases however; the LOIS analysis shows that the full amount of the request can be interconnected on a Limited Operation basis beginning on after the power system stabilizers (PSS) are installed and capacitor requirements are met.

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), a new SPS 345kV substation, which will currently operate at 230kV, to be located on the Grassland – Borden 345kV circuit, which also is currently operating at 230kV. 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 345 kV three-breaker ring-bus substation with three-345 kV line terminals and associated equipment for acceptance of the Interconnection Customer's Interconnection Facilities. The estimated in-service date for these Interconnection Facilities is unknown but should be after the new Point of Interconnection (POI) substation is built. At this time the Customer is responsible for $7,316,677 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

Required Security for Interim Interconnection

In accordance with Article 11.5.1 of the Interim Generation Interconnection Agreement, the Interconnection Customer will be required to provide financial security in the amount of its total shared and non-shared Network Upgrades and Transmission Owner Interconnection Facilities. If the amount has not yet been determined through the Definitive Interconnection System Impact Study, then the amount is determined by the Transmission Provider based on previous studies for comparable interconnection requests.

A comparable interconnection request was studied in DISIS-2011-002 Impact Study. That request, GEN-2011-058, had the same point of interconnection as GEN-2012-001, but was for 200MW. The GEN-2011-058 request has since been withdrawn, but the costs for GEN-2012-001 were calcualted

on the basis of GEN-2011-058 being at a size of 61MW. Based on the DISIS-2011-002 Impact Study, the Interconnection Customer is allocated $2,995,748 for Shared Network Upgrades, as listed below:

1. Jones – Lubbock South 230kV circuit 2, replace line traps
2. Jones – Tuco 230kV circuit 1, replace line traps
3. Allen – Lubbock South 115kv circuit 1, rebuild (NRIS Only)
4. Lubbock South – Lubbock East 115kV circuit 1, rebuild, (NRIS Only)
5. TUCO 345/230kV Autotransformer circuit 3, build, (NRIS Only)
6. Wolfforth – Yuma 115kV circuit 1, rebuild, (NRIS Only)

In accordance with Section 11.5.1 of the Interim GIA, the Customer will be required to place financial security of $2,995,748 with 15 business days of the execution of the Interim GIA. This security will be updated upon the completion of the DISIS-2012-001 Cluster Study. This security is in addition to the $7,316,677 of non-shared network upgrades and Transmission Owner Interconnection Facilities.

Other Network Upgrades

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

1. Beaver – Woodward 345kV double circuit, scheduled for 6/30/2014 in-service
2. Beaver County – Gray County (Buckner) 345kV, assigned to DIS-2011-001 Customers
3. Beaver County 345kV Expansion, assigned to DIS-2010-002 Customers
4. Grassland – Wolfforth 230kV circuit, assigned to GEN-2008-016
5. Grassland 230/115kV circuit 1, assigned to 2011 ITP NT
6. Woodward – Border - TUCO 345kV, scheduled for 5/19/2014 in-service
7. Hitchland – Beaver County - Woodward 345kV double circuit, scheduled for 6/30/2014 in-service
8. Hitchland 345/230 transformer circuit 2, scheduled for 6/30/2014 in-service
9. Thistle - Woodward 345kV double circuit, scheduled for 12/31/2014 in-service
10. Thistle – Wichita 345kV double circuit, scheduled for 12/31/2014 in-service
11. Woodward 345/138kV Transformer circuit 2, scheduled for 05/14/2014 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-2012-001 will be delayed until the Transmission Owner Interconnection Facilities and Network Upgrades are constructed. The Customer is responsible for $7,316,677 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, the Interconnection Customer is also allocated $2,995,748 for Shared Network Upgrades. After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 61.2 MW, as requested by GEN-2012-001, can be allowed. At this time the total allocation of costs of Interconnection Service for GEN-2012-001 are estimated at 10,312,425.

Facilities Study For
Southwest Power Pool (SPP)

Total Output is 61.2 MW
Generation Facilities
Lynn County, Texas
SPP #GEN-2012-001

June 28, 2012

Xcel Energy Services, Inc.
Transmission Planning

Executive Summary

[Omitted Text] ("Interconnection Customer") in 2012 requested a interconnection of a wind energy facility located in Lynn County, Texas to the Southwestern Public Service Company (SPS) transmission network. SPS is a New Mexico Corporation and wholly owned subsidiary of Xcel Energy Inc. This facility has a net capacity of 61.2 MW. The Interconnection Customer's facility will connect to a new SPS switching station located adjacent to transmission circuit K48 between Grassland Interchange to Borden County Interchange; which is built at 345 kV but operated at 230 kV. The new Switching Station will also be designed at 345 kV and operated at 230 kV, and will be located approximately 10.2 miles south of Grassland Interchange on circuit K48. The Interconnection Customer's requested back-feed date is 10/18/2012 and commercial operation date is 12/24/2012.

The Southwest Power Pool (SPP) evaluated the request (GEN-2012-001) to interconnect the generator facility to the SPS transmission system in a Definitive Interconnection System Impact Study (DISIS-2012-001). The interconnection request was studied using seventeen (17) 3.6 MW semi-direct drive permanent-magnet wind turbine onshore/offshore type units for a total of 61.2 MW. The Interconnection Customer is required to build 230 kV transmission line from their substation wind farm facility to the SPS new switching station. The Customer will provide and install 345 kV breakers, which will be operated at 230 kV. The Interconnection Customer will be required to maintain a Power Factor between 0.95 lagging and 0.95 leading at the Point of Interconnection (POI).

The Limited and Interim Operational Impact Study determined that additional reactive support is required with a minimum of 24 MVAr of capacitors on the 34.5 kV at the customer's substation. This may be revised after system upgrades are placed in service.

SPS requires that all construction for this request be in compliance with the latest revision of the Xcel Energy Interconnection Guidelines for Transmission Interconnection Producer-Owned Generation Greater Than 20 MW available at: http://www.xcelenergy.com/Energy_Partners/Generation_Owners/Interconnection_Guidelines/Interconnections_for_Transmission. This document describes the requirements for connecting new generation to the Xcel Energy transmission systems including technical, protection, commissioning, operation, and maintenance. Also, this document has a section on Frequency and Frequency Control for the SPP Region in Section II.H.3, where as allowed under SPP criteria, SPS will open tie lines at 58.5 Hz and automatically trip generators. Due to the structure of the under-frequency load-shedding plan, it is necessary that generators be able to sustain frequencies to at least 58.5 Hz. SPS will also require that the Interconnection Customer be in compliance with all applicable criteria, guidelines, standards, requirements, regulations, and procedures issued by the North American Electric Reliability Corporation (NERC), Southwest Power Pool (SPP), and the Federal Energy Regulatory Commission (FERC) or their successor organizations.

The Interconnection Customer is responsible for all the cost of the Interconnection Facilities, installation of the Direct Assigned Interconnection Facilities; inclusive of all construction required for the 230 kV transmission line from the Interconnection Customer's substation to the SPS new switching station. The new switching station is a Stand Alone Network Upgrade and is being built by the Interconnection Customer.

"Limited Operation Studies for the early operation of the GEN-2012-001 interconnection request show a need for the installation of Power System Stabilizers (PSS) on the following generating units in the SPS transmission system.

- Tolk Unit #1-#2
- Jones Unit #1-#4

The cost to install and initialize the power system stabilizers for these units is estimated at $50,000 each for a total of $300,000. This cost is to be shared by all interconnection customers requesting Limited Operation prior to the network upgrades in DISIS-2011-002 being placed in service". This could eliminate several projects listed above under the estimated allocation costs.

Customer will order all the equipment for the switching station and have their contractor install and build the 230 kV switching station to SPS' specifications. Upon final approval, SPS will connect and energize the equipment. As for this request (GEN-2012-001), it is anticipated that the entire process of adding the new 230 kV switching station for the acceptance of the Customer facility output, will require approximately 6 months to complete after an Interconnection Agreement is signed and an authorization to proceed is received. The cost of these upgrades, inclusive of the Interconnection Customer's cost for the interconnection of this Wind Farm facility, is shown below in Table 1, with the detailed description of the cost shown in Table 3.

Table 1, Cost Summary[a]

Stand Alone Network Upgrades:	**$ 5,886,001**
`Network Upgrades:	**$ 1,200,676**
Transmission Owner Interconnection Facilities:	**$ 230,000**
Total:	**$ 7,316,677**

[a] The cost estimates are 2012 dollars with an accuracy level of ±20%.

General Description of SPS[b] Facilities

1. **Construction of New Switching Station:** See Appendix A, Figure A-1 for general vicinity location map.

   1.1. **Location:** Customer will build a new 345 kV three (3) breaker ring bus at a new switching station operated at 230 kV. Appendix A, Figure A-2, shows a preliminary one-line of the new switching station, while Figure A-3 shows a typical elevation view of the normal Point of Interconnection (POI).

   1.2. **Bus Design:** The new 345 kV three-breaker ring-bus switching station operated at 230 kV will be built to accommodate the output from the wind energy facility. This is shown in Appendix A, Figure A-2.

   1.3. **Line Terminals:** The 345 kV lines and static wire terminals (operated at 230 kV) will be designed to accommodate 14,000 pounds per phase conductor (28,000 Bundle) at maximum tension, with a maximum 15-degree pull off from normal.

   1.4. **Control House:** The control house for proposed switching station will be utilized to house the new metering, protective relaying and control devices, terminal cabinets, and any fiber-optic cable termination, etc. for the new line breaker terminals.

   1.5. **Security Fence**: The switching station will have a 7 foot chain-link fence with steel posts set in concrete with 1-foot of barbed wire on the top in a "V" configuration. The enclosed area will be approximately 400' x 400', with a rock yard surface.

   1.6. **Ground Grid**: A complete ground grid will be installed per ANSI/IEEE STD 80-1986, with our standard 4/0 copper ground mesh on 40-foot centers with ground rods and 20-foot centers in corners and loop outside of fence.

   1.7. **Site Grading**: Company contractor, per company specifications, will perform any site grading and erosion control to accommodate the new line terminal. Soil compaction shall be not less than 95% of laboratory density as determined by ASTM-D-698.

   1.8. **Station Power**: A 133 kV/120-240volt transformer tapped off of the 230 kV bus will provide station power. Station power will be provided by the certificated retail provider at the point of interconnection. A backup station power source may be taken from retail provider's local distribution if it is available. A flip-flop to automatically transfer the station power may need to be installed.

   1.9. **Relay and Protection Scheme**: The new breaker line terminals primary protection from the interconnection customer 230 kV transmission line to Grassland and to Borden will use a single power line carrier scheme. An SEL-421 Directional Comparison Un-Blocking (DCUB) and an SEL 311C Step Distance relay scheme will be used as primary and secondary relaying, respectively. The SEL 421 will be used for line/bus SCADA closing conditions for the breakers. Also, SEL-501-0 relays will be used for breaker failure protection on each circuit breaker. Similar relay modifications at Grassland Interchange and Borden County Interchange will also be required.

[b] All modifications to SPS facilities will be owned, maintained and operated by SPS.

An SEL 421 will display the bus voltage, GCB amps, MW, MVAR, and fault location. An SEL 2032 will be installed for relay communication and for other functions as required.

1.10. Revenue Metering: On the SPS new switching station 230 kV line terminal to the Interconnection Customer's substation, billing meters will be installed per ANSI C12.1 accuracy class 0.2 (3-PT's IEEE C57.13 accuracy class 0.3 and 3-CT's IEEE C57.13 accuracy class 0.15) for full 3-phase 4-wire metering. There will be two meters; one will be primary and the other will be back up. Each will have full 4 quadrant metering. Pulses out of the primary billing meter will be sent via SCADA to the Transmission Owner's Control Center in Amarillo, Texas.

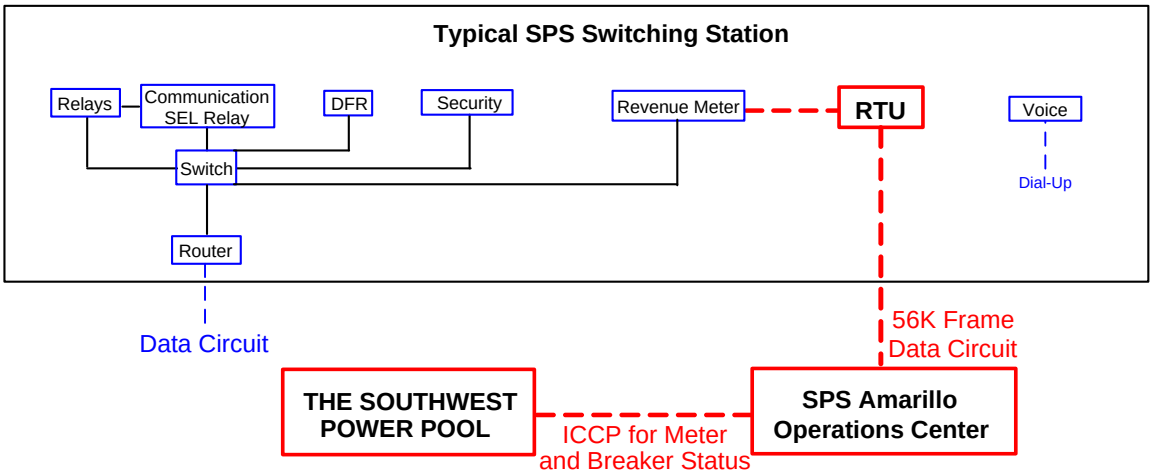
1.11. Disturbance Monitoring Device: A Disturbance Fault Recorder (DFR), capable of recording faults, swings, and long term trending, will be installed to monitor and record conditions in the substation and on the transmission lines. The disturbance equipment shall also be equipped with a GPS time synching clock. This equipment will have communication capability with a dedicated communication circuit. The disturbance equipment will have its own dedicated communications circuit.

1.12. Remote Terminal Unit (RTU): A new RTU will be utilized with communications for the new switching station. A Communication SEL Relay will be installed for relay communications and other functions as required. SPS will provide and install an RTU for metering and telemetry at the Interconnection Customer's facility as required by the latest Xcel Energy Interconnection Guidelines. The direct cost will be charged to the Interconnection Customer.

1.13. Communications: To meet its Communications obligations, the Interconnection Customer shall be responsible for making arrangements with the local phone company to provide telephone circuits as required by the Transmission Owner. Transmission Owner equipment may include, but is not limited to, the following: relay communication equipment, RTU, and disturbance monitoring equipment at the new Switching Station. Prior to any construction, the Interconnection Customer is required to contact the Transmission Owner substation-engineering department for all communication details.

The following communications schematic diagram, which includes communication equipment information for the Interconnection Customer, Transmission Provider (Southwest Power Pool) and Transmission Owner (Southwestern Public Service), is provided to assist the Parties.

A schematic outlining the proposed communications is provided below:



Interconnection Customer shall be responsible for providing fiber optic communication circuit installed in the overhead transmission line static wire for protective relaying from the customer substation to the new Switching Station.

2. **Transmission Work:**

2.1 The Interconnection Customer will construct, own, operate, and maintain any customer owned 230 kV transmission line from the Interconnection Customer's substation to the Interconnection Point at SPS's new Switching Station. Customer will build the new Switching Station per SPS specifications. This line is shown in Appendix A, Figure A-1 and is estimated to be approximately 50'. **The SPS transmission design group prior to any construction by the Interconnection Customer or its contractor on any customer 230 kV transmission lines, or doing work in close proximity to any SPS transmission line, will require an engineering review of the customer's design. It is the Interconnection Customer's responsibility to initiate the design review in a timely manner before construction of any transmission line begins. If the review has not been made or the design at any of the aforementioned locations is deemed inadequate, the crossing(s) and or termination into the interchange will be delayed until the matters are resolved. SPS will not be held responsible for these delays.**

3. Right-Of-Way:

3.1 **Permitting**: Permitting for the construction of a new 230 kV line terminal at the new Switching Station is not required from the Public Utility Commission in the State of Texas. The interconnection customer will be responsible for any permitting and right of way of their substation and the 230 kV transmission line from their substation to the Interconnection Point at new Switching Station. **The customer will be responsible for obtaining the easement for SPS's relocation of the 345 kV line operated at 230 kV to serve the new switching station and easements for the new SPS switching station**.

4. **Construction Power and Retail Service:** It is the sole responsibility of the Interconnection Customer to make arrangements for both construction and station power, which may be required for the Interconnection Customer's wind farm facility and switching station. **Additionally, if the Interconnection Customer's substation(s) and/or construction site(s) are located outside of the SPS service area, SPS cannot provide station power (retail service) and the Interconnection Customer needs to make arrangements for retail service from the local retail provider. Retail provider and Customer will be responsible for making any necessary transmission service arrangements as required under the SPP OATT.**

5. Project and Operating Concerns:

5.1 Close work between the Transmission group, the Interconnection Customer's personnel and local operating groups will be imperative in order to meet any in-service date that has been established.

5.2 The Interconnection customer will be required to maintain a Power Factor between 0.95 lagging and a 0.95 leading at the Point of Interconnection (POI). Southwest Power Pool determined in their Limited and Interim Operational Impact Study for Generation Interconnection Request in May 2012 that GEN-2012-001 would require a minimum of 24 MVAr of capacitors be installed on the 34.5 kV at customer's substation, which is required for interim operation of GEN-2012-001. This is required to maintain acceptable dynamic voltage rise as per latest revision of the Xcel Energy Interconnection Guidelines for Transmission

Interconnection Producer-Owned Generation Greater than 20 MW. The capacitor banks need to be switched in stages where the voltage rise is less than 3%.

6 **Fault Current Study:** The available fault current at the interconnection location, without any contribution from the new generator facilities, is shown in Table 2.

Table 2, - Available fault current at interconnection location

Short Circuit Information without contribution from new Generator Facilities (GEN 2012-001)				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3–Phase	Z^+	Z^0
230 kV Bus	3,697	4,641	2.812 + j28.47	9.901 + j49.692

Estimated Construction Costs

The projects required for the interconnection of 61.2 MW Wind Generation facilities consist of the projects summarized in the table below.

Table 3, Required Interconnection Projects[c]

Project	Description	Estimated Cost
	Stand Alone Network Upgrades (Interconnection Customer's expense)	
1	Build 345 kV (operated at 230 kV) 3-breaker ring station with A-Frame deadend structures.	$ 5,836,001
2	Right-of-Way (easements and surveying).	$ 50,000
	Subtotal:	**$ 5,886,001**
	Network Upgrades (at the Interconnection Customer's expense)	
3	Disturbance Monitoring Device (DFR)	$ 120,000
4	Transmission Line Work, Installation and Removal.	$ 341,638
5	Right-Of-Way (Surveying)	$ 0
6	SPS cost to review drawings (HDR) and cost for an inspector and other miscellaneous costs.	$ 277,974
7	Remote Terminal Unit (RTU)	$ 54,500
8	Relay Modifications to Terminal at Grassland Intg.	$ 203,282
9	Relay Modifications to Terminal at Borden Co. Intg.	$ 203,282
	Subtotal:	**$ 1,200,676**
	Transmission Owner Interconnection Facilities (at the Interconnection Customer's expense)	
10	Communications [d]	*$ See footnote*
11	Revenue metering	$ 200,000
12	230 kV Line arrestors	$ 30,000
	Subtotal:	**$ 230,000**
	Total Cost	**$ 7,316,677**

Engineering and Construction:

An engineering and construction schedule for this project is estimated at approximately 6 months. Other factors associated with clearances, equipment delays and work schedules could cause additional delays. The is applicable after all required agreements are signed and internal approvals are granted.

All additional cost for work not identified in this study is the sole responsibility of the Interconnection Customer unless other arrangements are made.

[c] The cost estimates are 2012 dollars with an accuracy level of ±20%.

[d] It is the Requester's responsibility to provide both the data circuit and communication circuits, see Section 1.13.

Appendix A

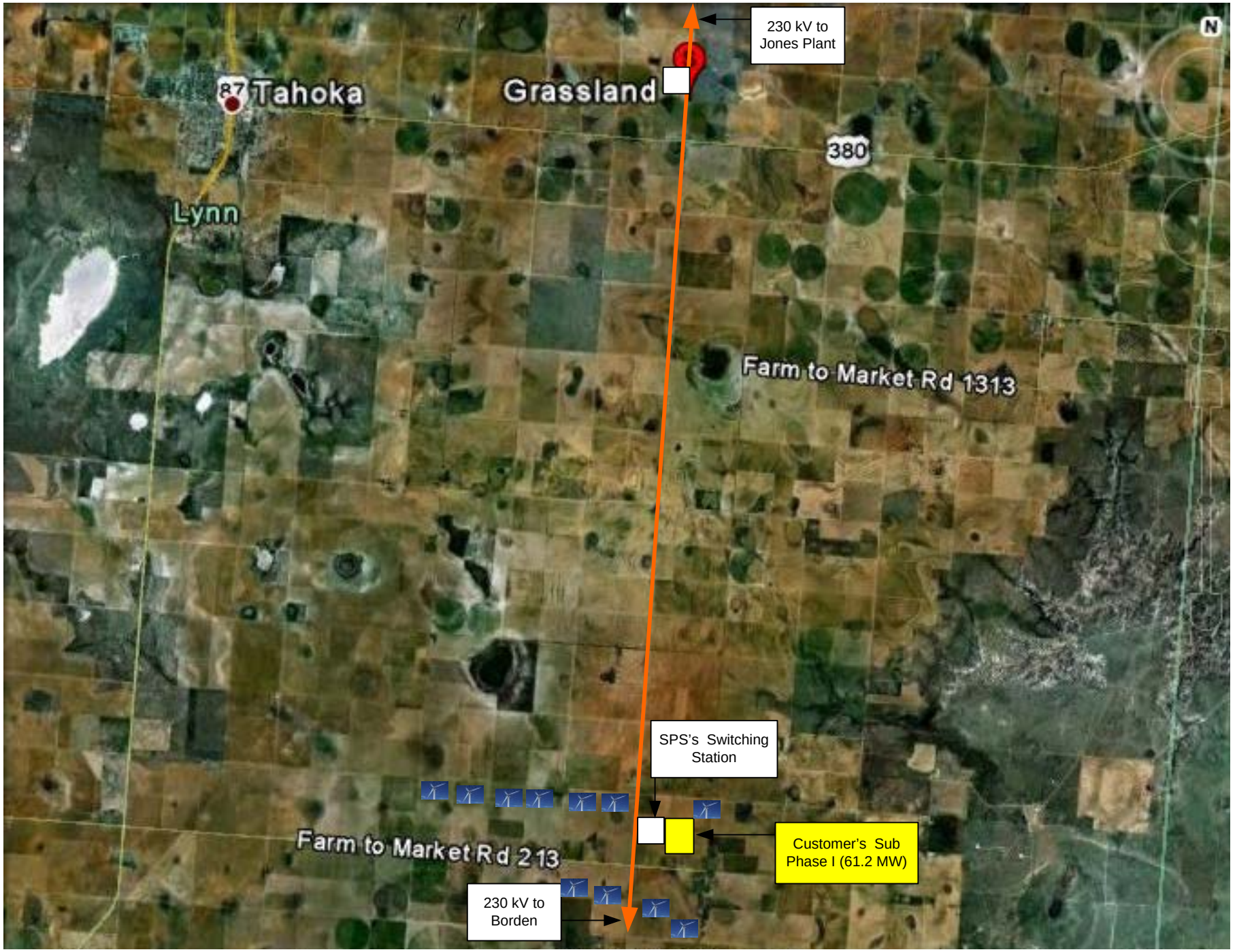


Figure A-1. Approximate location of New Switching Station

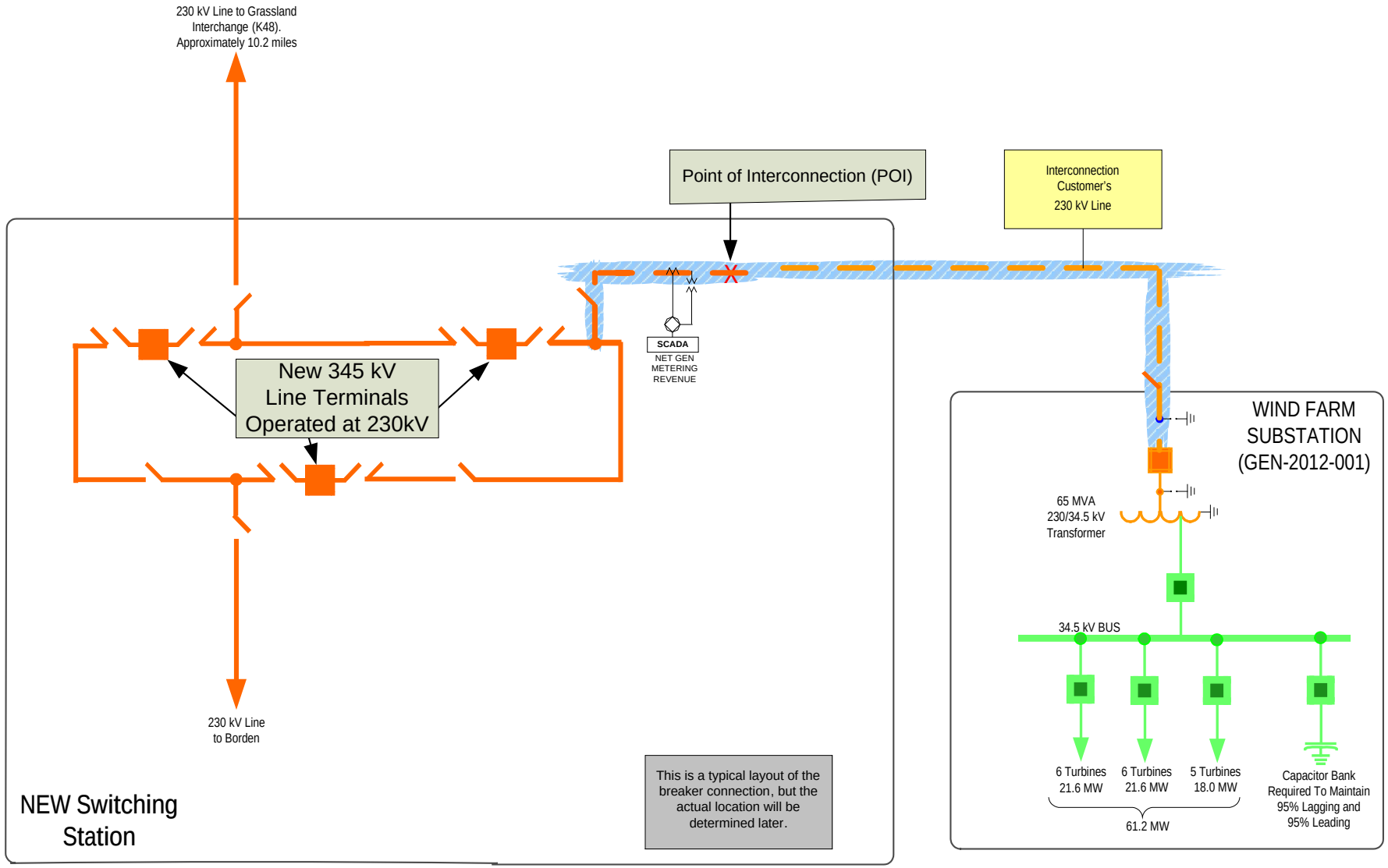


Figure A-2. One-line Diagram of New Switching Station

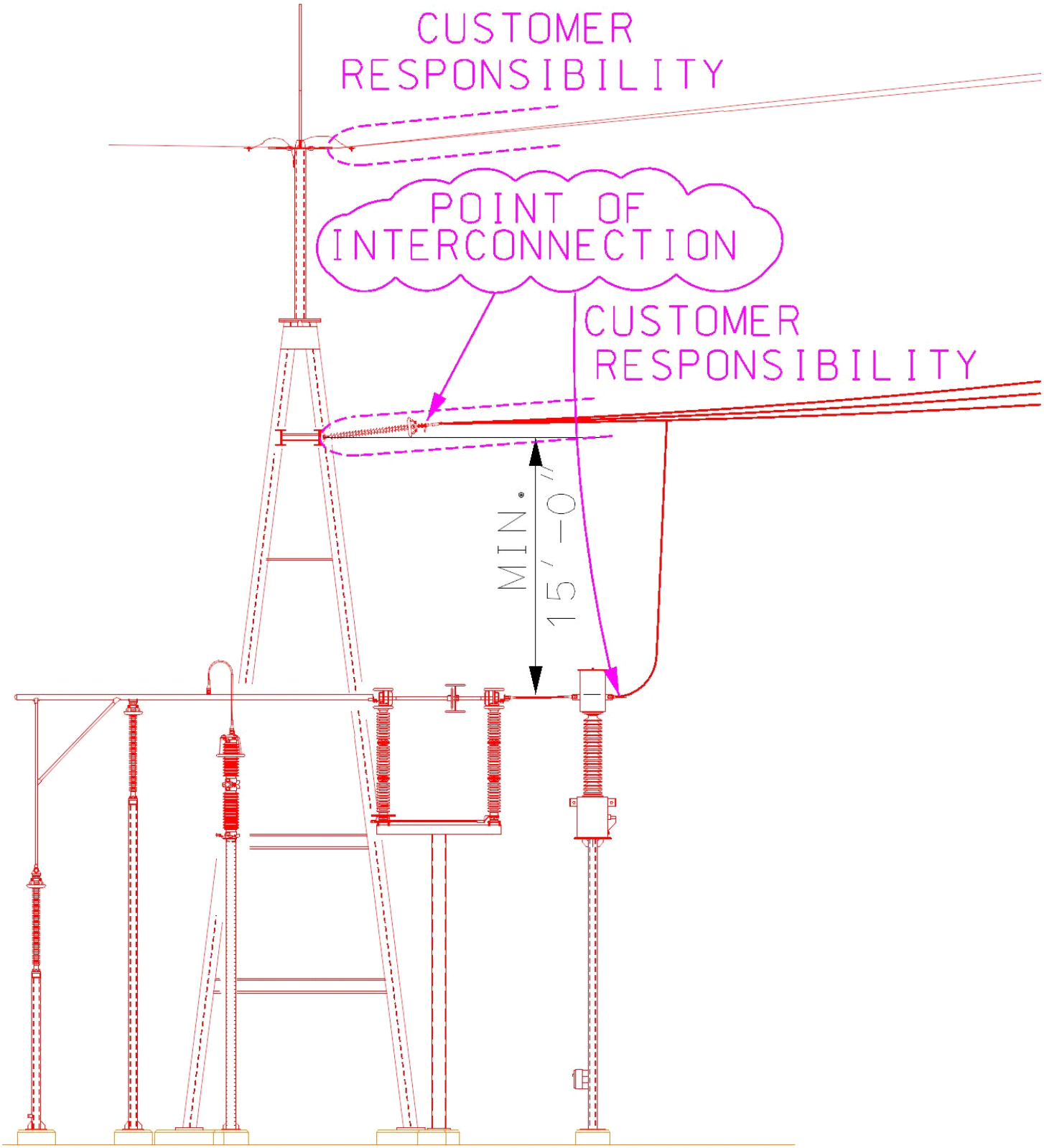


Figure A-3 Point of Interconnection & Change of Ownership (Typical)

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