



***Facility Study for Generation
Interconnection Request
GEN-2006-049***

***SPP Tariff Studies
(#GEN-2006-049)***

September, 2009

Summary

Pursuant to the tariff and at the request of the Southwest Power Pool (SPP), Southwestern Public Service (SPS) performed the following Facility Study to satisfy the Facility Study Agreement executed by the requesting customer and SPP for SPP Generation Interconnection request Gen-2006-049. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

Customer Facilities

The study minimum requirements for this request will consist of adding one (1) 345 kV line terminal at the Point of Interconnection (POI) to the proposed three-breaker SPS switching station previously requested for GEN 2003-013, add one (1)-345 kV line terminal at the existing SPS Hitchland Interchange and construct one (1)-345 kV transmission line from Hitchland Interchange to the Oklahoma Gas and Electric (OKGE) Woodward Substation. The Woodward Substation to Northwest Substation 345kV line which was also determined to be necessary for the interconnection is already under construction and is not the responsibility of the Interconnection Customer.

Another requirement by the SPP SIS study is to maintain a unity power factor at the interconnection point. The Interconnection Customer is required to install a total of 18 MVARs to be located at the 34.5 kV side of the Interconnection Customer collector's 345/34.5 kV bus. SPS recommends that the capacitor banks to be used be switched in stages according to the industry standards so that excessive voltage variations are not experienced on the SPS transmission system.

Facility Cost Considerations

The Facility Cost information included in this Facility Study was given on the assumption that Southwestern Public Service will be constructing such facilities. Given that the proposed Hitchland-Woodward 345kV line will cross between two different transmission owner boundaries, a Notice to Construct (NTC) may be issued regarding the facilities that are studied in this Facilities Study. At such time that SPP may determine that different transmission owners are to be the owner/operator/constructor of such facilities, new cost estimates may be necessary.



**Facilities Study For
Southwest Power Pool (SPP)**
400 MW Wind-Generated Energy Facility
Seward County, Kansas
SPP #GEN-2006-049

August 18, 2009

Xcel Energy Services, Inc.
Transmission Planning

Executive Summary

[omitted text] in December 2006 (“Interconnection Customer”) requested the interconnection of a wind energy facility located in Seward County, Kansas to the Southwestern Public Service Company (SPS), a New Mexico Corporation and wholly owned subsidiary of Xcel Energy Inc. 345 kV transmission network. This facility has a net capacity of 400 MW. The Interconnection Customer’s facility will connect to the proposed switching station for previously requested GEN 2003-13 located in Stevens County, Kansas approximately twenty-five (25) miles northwest of Liberal, Kansas.

The Southwest Power Pool (SPP) originally evaluated the request to interconnect the wind farm facility to the SPS transmission system in a System Impact Study (SIS) (GEN-2006-049) completed in May 2008. The original interconnection request was studied using One-Hundred-Ninety (190) Suzlon Model S88 wind turbines at 2.1 MW each for a total output of 400MW. However, this request was re-studied and completed in April 2009 using two hundred sixty six (266) GE 1.5 MW wind turbines. The objective of the re-study was to account for the results of the GEN-2006-044 re-study with 400MW original output that was reduced to 370 MW and in the process relieved of being assigned the Woodward-Northwest 345 kV transmission line.

The study minimum requirements for this request will consist of adding one (1) 345 kV line terminal at the Point of Interconnection (POI) to the proposed three-breaker SPS switching station previously requested for GEN 2003-013, add one (1)-345 kV line terminal at the existing SPS Hitchland Interchange and add two (2)-345 kV transmission lines, from Hitchland Interchange to the Oklahoma Gas and Electric (OKGE) Woodward Substation and Woodward Substation to Northwest Substation.

Another requirement by the SPP SIS study is to maintain a unity power factor at the interconnection point. The Interconnection Customer is required to install a total of 18 MVARs to be located at the 34.5 kV side of the Interconnection Customer collector’s 345/34.5 kV bus. SPS recommends that the capacitor banks to be used be switched in stages according to the industry standards so that excessive voltage variations are not experienced on the SPS transmission system. The Interconnection Customer’s expected commercial operation date and back feed date is December 31, 2010 and October 1, 2010, respectively.

The minimum requirement is contingent upon previous request GEN-2003-013 staying in the queue. If GEN-2003-013 withdraws or suspends, then the requirements at the POI will consist of a three (3) breakers, three terminal ring bus switching station and the Interconnection Customer will be responsible for the cost of building the proposed switching station. SPP also assigned the interconnection customer to be responsible for the cost of building the 345 kV transmission line between the Hitchland Interchange and Woodward Substation in the OKGE service territory.

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, Version 3.0 dated Dec 31, 2006, and is available at (http://www.xcelenergy.com/XLWEB/CDA/0,3080,1-1-1_16699_24407-1428-0_0_0-0,00.html). This document describes the requirements for connecting new generation to the Xcel Energy transmission systems including technical, protection, commissioning, operation, and maintenance. 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 the cost of the Interconnection Facilities, installation of the 18 MVAR cap banks and any Direct Assigned Interconnection Facilities; inclusive of all construction required for the 345 kV transmission line from the Interconnection Customer’s substation to the proposed SPS Switching Station. The Interconnection Customer is also responsible for obtaining any permits and/or Certificate of Convenience and Necessity (CCN) from the Public Utility Commission in the State of Kansas for the 345kV transmission lines from the Point of Interconnection to the customer’s collector system wind farm facility.

It is understood that the new switching station will have to be built first before the new 345 kV terminal is added. It is anticipated that the new switching station will require at least 32 months to complete. The new 345 kV line terminal for the acceptance of the wind farm facility output will require at least 22 months and the 120 mile Hitchland-Woodward 345 kV transmission line will require at least 44 months to complete after an Interconnection Agreement is signed and an authorization to proceed is received. Therefore, SPS will not be able to meet the requested in-service and back feed dates of December 31, 2010 and October 1, 2010, respectively.

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, Proposed Gen 2006-049 Interconnection

	Scenario One ¹	Scenario Two ²
Network Upgrade A	\$1,525,000	\$7,525,000
Network Upgrade B ³ :	\$91,625,000	\$91,625,000
Interconnection Facilities ⁴ :	\$123,000	\$123,000
Total ⁵ :	\$93,273,000	\$99,273,000

¹ Scenario 1: GEN 2003-013 “staying” in the queue. Add a new 345 kV line terminal to the proposed (3) terminal/ring switch station.

² Scenario 2: GEN 2003-013 “withdrawing” from the queue. Construct only a (3) terminal/ring switch station.

³ The Hitchland – Woodward 345kV line project has been submitted to SPP as a potential Priority Project by another entity

⁴ This is a direct assigned cost to the Interconnection Customer.

⁵ The Interconnection Customer may be required to gross up for taxes any funds provided to the Transmission Owner for Contribution in Aid of Construction (CIAC).

General Description of SPS Facilities⁶

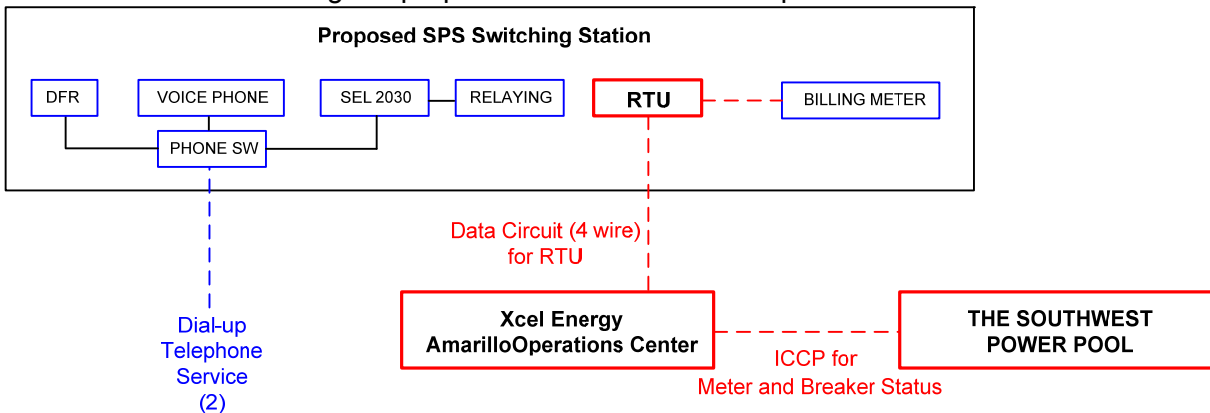
1. **Construction of New Line Terminal:** See Figure A- 1 Appendix A, for general vicinity location map.
 - 1.1. **Location:** SPS will add a new 345 kV line terminal at the proposed SPS Switching Station for GEN 2003-013. Figure A- 2, Appendix A shows the preliminary one-line of the switching station, while Figure A- 3, Appendix A shows the preliminary general arrangement plan view of the proposed switching station.
 - 1.2. **Bus Design:** The new 345 kV line terminal will be added to the proposed switching stations for GEN 2003-013 to accommodate the output from the wind energy facility of GEN 2006-049. The proposed three (3)-terminal ring bus design for GEN 2003-013 will be expanded four (4) breaker/terminal ring as shown in the preliminary one-line and general arrangement view in Figure A- 2 and Figure A- 3 of Appendix A.
 - 1.3. **Line Terminals:** The conductor will be pulled in at full tension. The substation dead end structures must be capable of 14,000 pounds per conductor (28,000 per bundle). The maximum static tension to be considered is 7,000 pounds per static wire. The dead end towers must be designed for a 15° pull-off angle.
 - 1.4. **Control House:** The new control house proposed for GEN 2003-013 will be utilized to accommodate the new metering, protective relaying and control devices, terminal cabinets, and any fiber-optic cable terminations, etc. for the new 345 kV line breaker terminal for GEN 2006-049.
 - 1.5. **Security Fence:** A new security fence shall be required for the new switching station proposed for GEN 2003-013 and shall be extended if required when the new 345 kV terminal is added to accommodate GEN 2006-049.
 - 1.6. **Ground Grid:** A complete ground-grid will be installed for the proposed switching station for 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 initial site grading and erosion control for the proposed new switching station and new line terminal. Soil compaction shall be not less that 95% of laboratory density as determined by ASTM-D-698.
 - 1.8. **Control House Station Power:** SPS will make arrangement for the proposed SPS switching station control house from the local area power provider of distribution system while the power requirements for the interconnection customer's facility will refer to Section 4.0 for the their temporary construction requirement, substation and collector systems.
 - 1.9. **Relay and Protection Scheme:** The protection scheme for the 345 kV line terminals to the interconnection customer's switching station will use pilot relaying schemes on optical

⁶ All modifications to SPS facilities will be owned, maintained and operated by SPS.

fiber installed in the static on the 345 kV transmission lines. Breaker failure relaying, line metering, and SCADA breaker control will also be implemented.

- 1.10. **Revenue Metering:** An individual billing meter will be installed for the proposed SPS switching station's 345 kV line terminal to the Interconnection Customer's switching station, along with an ION 8400 meter unit, 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. Also installed for the metering units will be optical 3-PT's and 3-CT's for full 3-phase 4-wire metering. There will be two meters per line terminal: 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:** Disturbance-monitoring equipment (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 synch clock. This equipment will have communication capability with a dedicated communication circuit. The disturbance equipment will have its own dedicated dial-up communications telephone circuit.
- 1.12. **Remote Terminal Unit (RTU):** A new RTU will be installed to accommodate the new 345 kV line terminals at the proposed switching station. SPS will provide and install if needed additional RTU cards for metering and telemetry as required by the latest Xcel Energy Interconnection Guidelines. The direct cost will be charged to the Interconnection Customer.
- 1.13. **Communications:** New telephone and data circuit at the proposed switching station to the Amarillo Control Center will be installed. *It is the Interconnection Customer's responsibility to make arrangements with the local phone company to provide telephone circuits to the relay communication equipment and disturbance-monitoring equipment at proposed switching station and to their wind farm facility. Prior to any construction the Interconnection Customer is required to contact the SPS substation-engineering department for all details.*

A schematic outlining the proposed communications is provided below:



The Interconnection Customer shall be responsible for providing fiber optic communication circuit installed in their overhead transmission line static wire indicated in Section 1.9 from the customer's switching station to proposed switching station control house. Also customer will be responsible for additional communication relays required at the switching station to the new wind farm terminal/substation to interrogate protective relays mentioned in Section 1.9.

2. Transmission Work:

- 2.1. Network Upgrade A - SPS will terminate in and out the existing 345 kV transmission line between Hitchland Interchange and Finney Interchange to the new switching station. The Interconnection Customer will construct, own, operate, and maintain the 345 kV transmission line from their switching station to the Interconnection Point (X) at the new SPS switching station as shown in, Figure A- 2 and Figure A- 4, Appendix A. ***The SPS transmission design group prior to any construction by the Interconnection Customer or its contractor on any customer 345, 230, 115, and 34.5 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 proposed SPS switching station would be delayed until the matters are resolved. SPS will not be held responsible for these delays.***
- 2.2. Network Upgrade B consists of a 345 kV 2 – 795 MCM conductor transmission line between Hitchland Interchange and Woodward Substation, in northwest Oklahoma. Termination work includes the appropriate 345 kV breaker additions at both substations, Hitchland and Woodward.

3. Right-Of-Way and Permits:

- 3.1. **Permitting:** The State of Kansas Public Utility Commission will not require a permit for the construction of a new 345 kV line terminal to receive output from the Customer's wind farm facility at the new switching station as shown in Figure A- 1, Appendix A. The interconnection customer will be responsible for any permitting and right of way of their substation, switching station, the 345 kV transmission lines from their collector substation to the proposed SPS switching station Interconnection Point.
4. **Construction Power and Distribution 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 distribution service) and the Interconnection Customer needs to make arrangements for distribution service from the local retail provider.**

5. **Project and Operating Concerns:** Close work between the SPS 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.
6. **Fault Current Study:** The available fault current at the interconnection location, without any contribution from the wind farm facilities, is shown in Table 2 below.

Table 2, - Available Fault Current at Point of Interconnection Location

Short Circuit Current Availability at the Proposed Switching Station without contribution from GEN 2006-049 and GEN-2003-13⁷				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3-Phase	Z^+	Z^0
345 kV Bus	3,100	3,775	4.094+j52.615	16.048+j86.630

⁷ Fault contribution from the proposed 345 kV lines from Hitchland-Woodward-Northwest also not included.

Estimated Construction Costs

The projects required for the interconnection of this 400 MW Wind Farm facility consist of the projects summarized in the table below.

Table 3, Required Interconnection Projects⁸

Project	Description	Cost Estimate	
		Scenario 1 ⁹	Scenario 2 ¹⁰
Network Upgrade A			
1	New Switching Station (3-Breaker Ring Bus) Facility	N/A	\$7,200,000
2	345 kV Line Terminal for Wind Farm Facility GEN 2006-049	\$1,525,000	\$0
3	Transmission Line Work	N/A	\$325,000
Subtotal:		\$1,525,000	\$7,525,000
Network Upgrade B¹¹			
4	345 kV Trans. Lines: Hitchland –Woodward (Approx. 120 miles, 345 kV construction, 3000A rating using 2 conductors 795 ACSS)	\$78,000,000	\$78,000,000
5	345 kV Breaker /Line Terminal at Hitchland Intg.	\$3,500,000	\$3,500,000
6	345 kV Breaker /Line Terminal at Woodward Sub	\$2,225,000	\$2,225,000
7	345 kV Line Reactors (25 MVAR)	\$7,900,000	\$7,900,000
Subtotal:		\$91,625,000	\$91,625,000
Interconnection Facilities (at the Interconnection Customer's expense)			
8	Communications ¹²	\$ See footnote	\$ See footnote
9	345 kV Disconnect Switch	\$ 96,000	\$ 96,000
10	Revenue metering	\$ 8,000	\$ 8,000
11	345 kV Line arrestors	\$ 19,000	\$ 19,000
Subtotal:		\$123,000	\$123,000
Total Cost:		\$93,273,000	\$99,273,000

⁸ The cost estimates are 2009 dollars with an accuracy level of ±20% except as noted, without AFUDC.

⁹ Scenario 1 (GEN 2003-013 "staying" in the queue): includes cost to build only a 345 kV line terminal to the proposed three (3)-breaker ring switch station.

¹⁰ Scenario 2 (GEN 2003-013 "withdrawing" from the queue): includes cost to build only for a three (3)-breaker/terminal ring switch station.

¹¹ This estimate "does not" include the Woodward-Mooreland 345 kV transmission line.

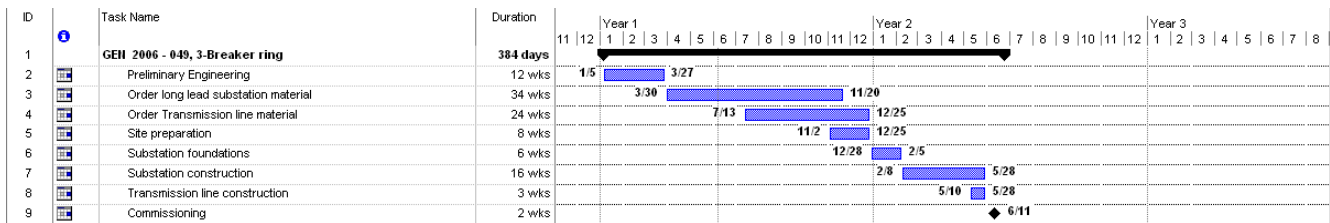
¹² It is the Requester's responsibility to provide both the data circuit and both dial-up telephone circuits, see Section 1.13.

Engineering and Construction:

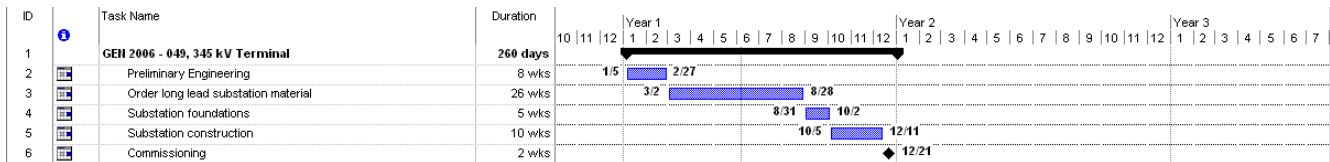
An engineering and construction schedule to build the new switching station, the new 345 kV line terminal, and the 120 miles 345 kV transmission line from Hitchland Interchange to Woodward Sub is depicted below. It is estimated at approximately 32 months for the new switching station; approximately 22 months for the new 345 kV line terminal; and approximately 44 months for the Hitchland-Woodward 345 kV transmission line.

The schedule is shown for project duration purposes only and other factors associated with clearances, equipment delays and work schedules could cause additional delays. The schedule below is applicable after all required agreements are signed, CCN are issued, and internal approvals are granted.

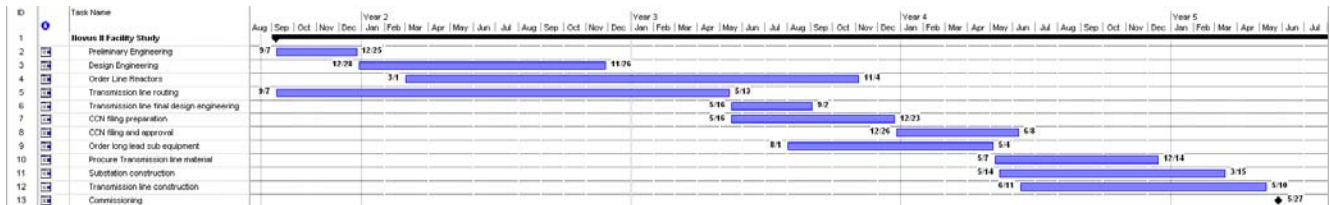
Schedule for the proposed Switching Station:



Schedule to add the new 345 kV Terminal to the proposed Switching Station:



Schedule to construct the Hitchland Interchange-Woodward Sub 345 kV transmission line:



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

Appendix A

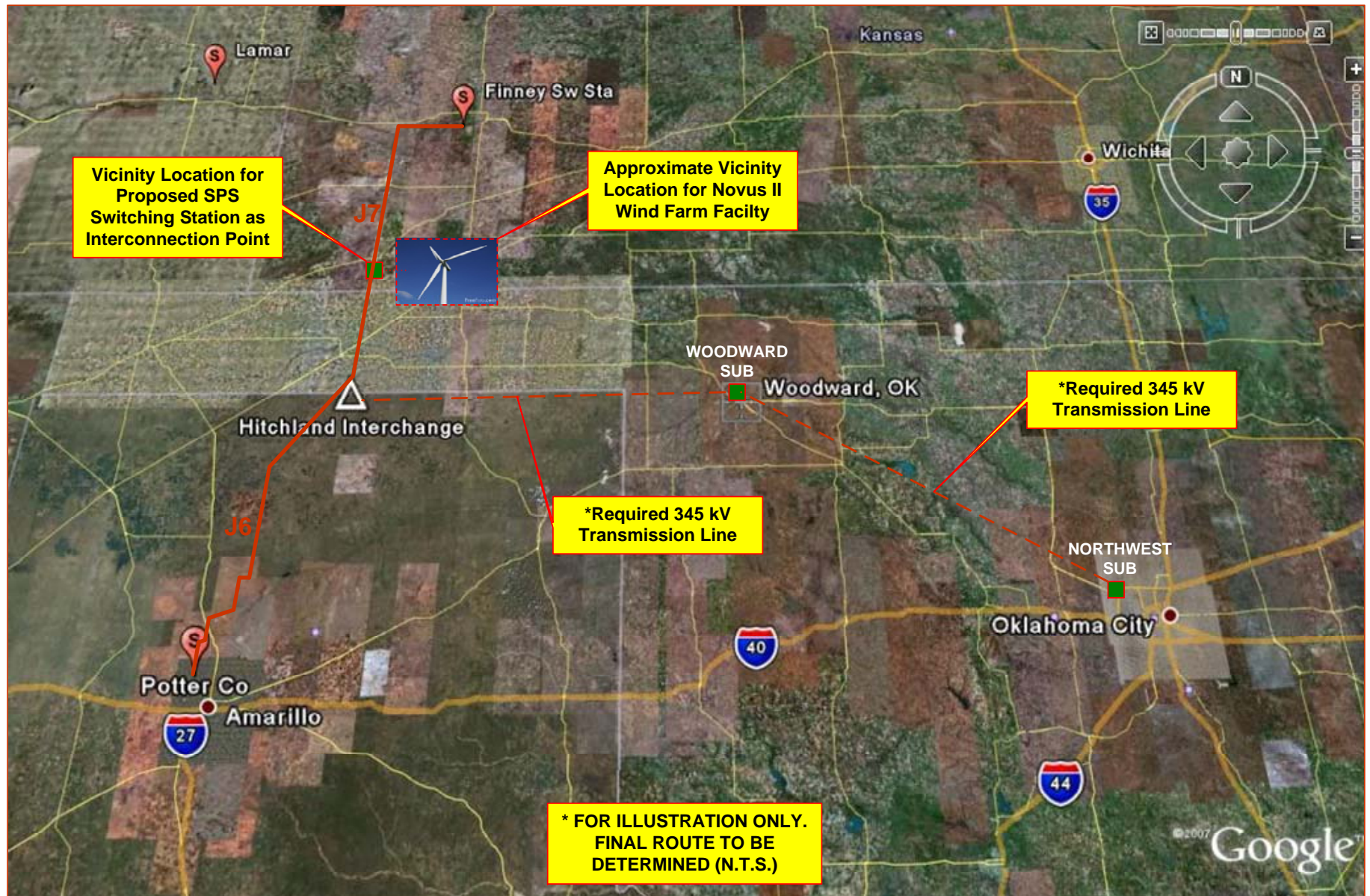


Figure A- 1 Approximate location of proposed SPS Switching Station and Wind Farm Facility

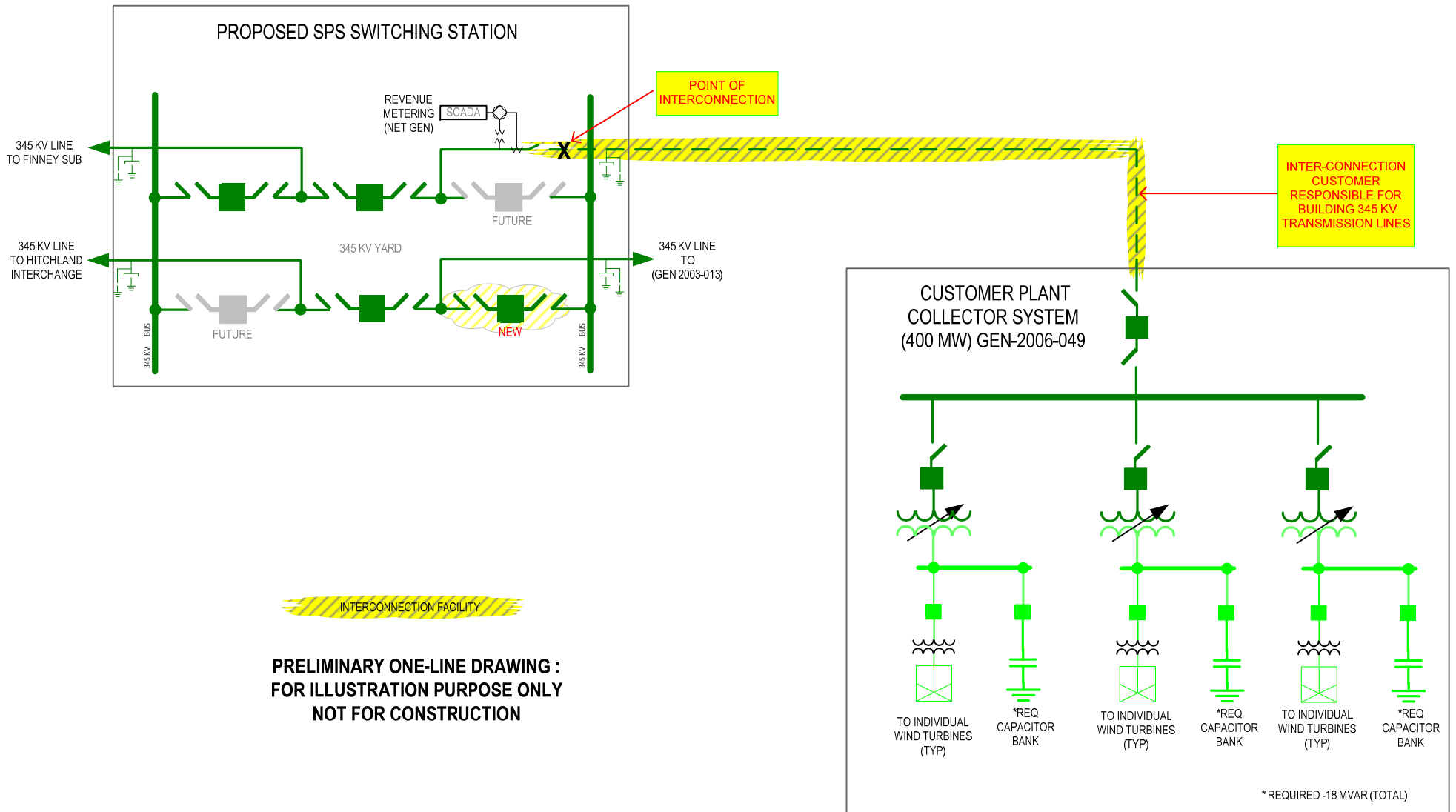
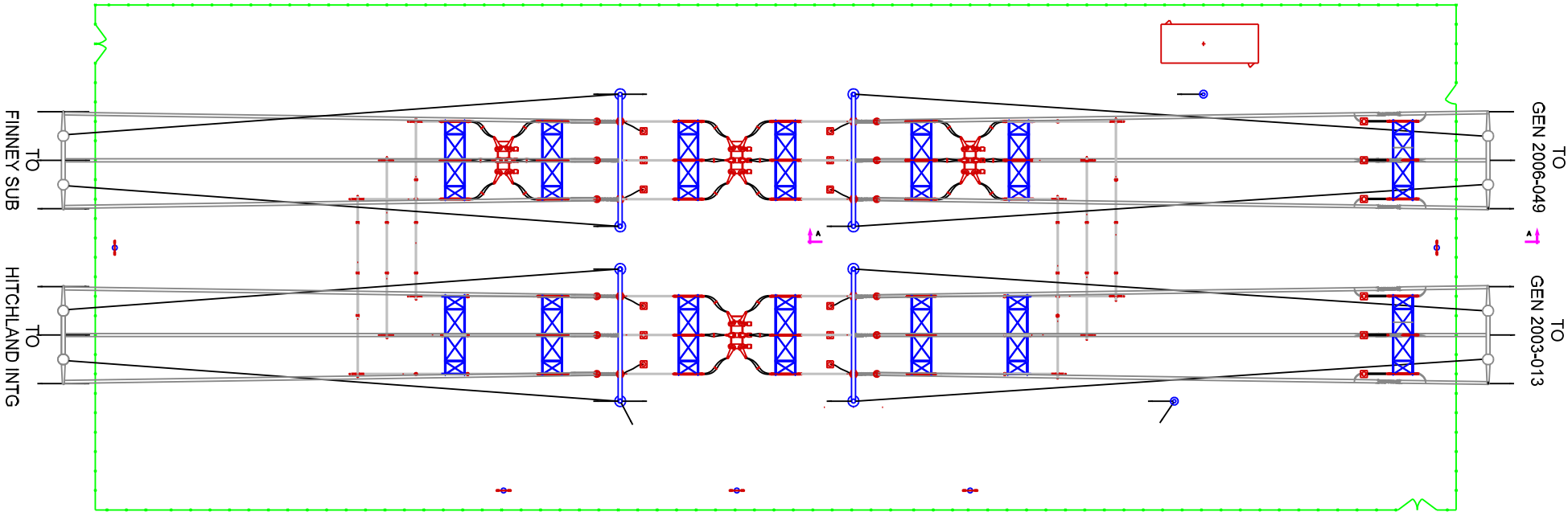


Figure A- 2 One-line Diagram of Proposed SPS Switching Station to Customer Interconnection Facility

PROPOSED SWITCHING STATION
345 KV SWITCHYARD



FOR ILLUSTRATION
PURPOSE ONLY,
NOT FOR
CONSTRUCTION

Figure A- 3 New Switching Station Interconnection Facility Preliminary Plan View

**NOTE: CUSTOMER SHALL
PROVIDE ALL MATERIAL
FOR DEAD ENDING PHASES
AND STATIC TO 345 kV
DEAD END TOWER.**

Customer's Responsibility

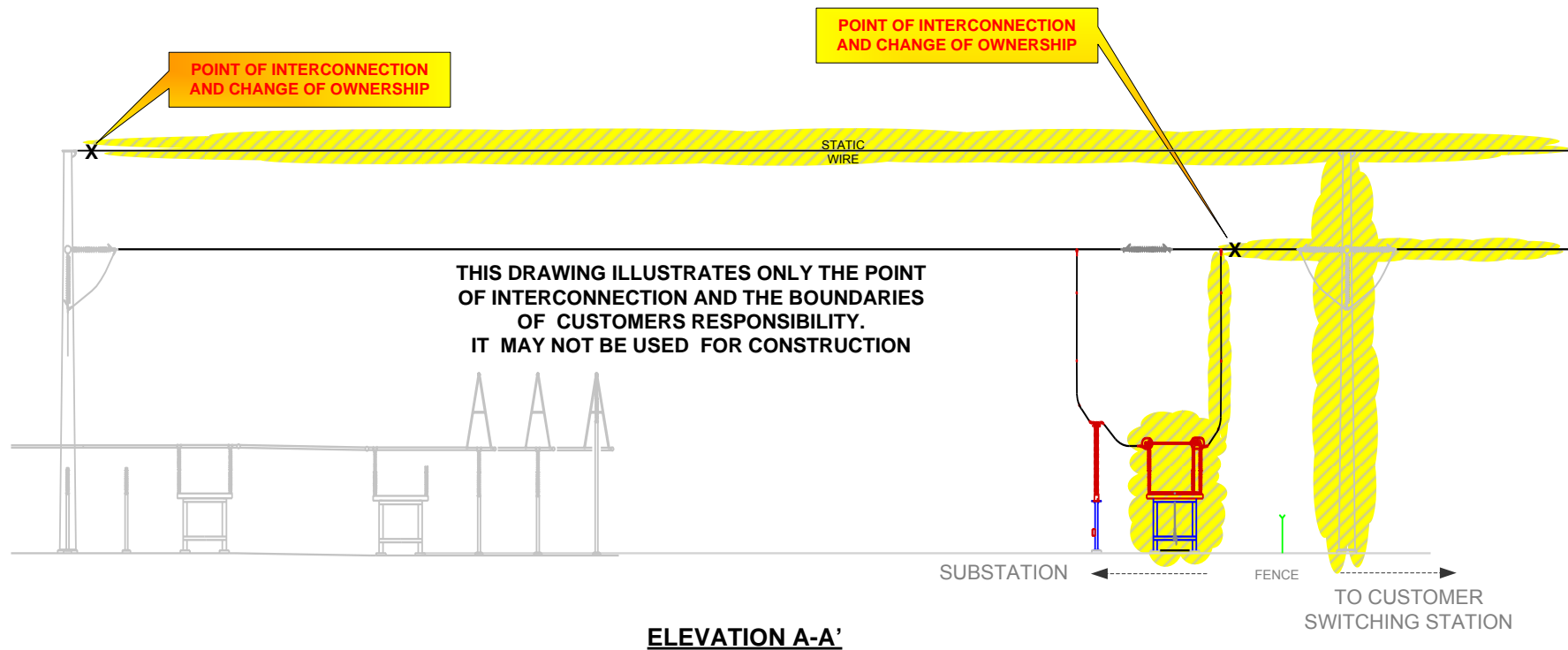


Figure A- 4 Point of Interconnection & Change of Ownership (Typical)

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