



***Facility Study  
For  
Generation Interconnection  
Request  
GEN-2006-037N01  
GEN-2006-044N  
GEN-2008-086N02***

***SPP Generation  
Interconnection  
Studies***

***July 2011***

## **Summary**

Nebraska Public Power District (NPPD) performed the following Study at the request of the Southwest Power Pool (SPP) for Generation Interconnection request Gen-2006-037N01, GEN-2006-044N, and GEN-2008-086N02. 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. This restudy was performed to evaluate a request for modification to the GEN-2006-037N1 interconnection request.

Pursuant to the tariff, NPPD was asked to perform a detailed Facility Study of the generation interconnection request to satisfy the Facility Study Agreement executed by the requesting customers and SPP.

## **Interconnection Customer Interconnection Facilities**

The Interconnection Customers will be responsible for the 115kV/230kV transmission facilities from the respective points of interconnection to its 230/34.5kV or 115/34.5kV substation that will contain its step down transformers and wind turbine collector feeders. In addition, the Customer will be required to maintain the power factor requirements as detailed in the DISIS-2009-001 Impact Study at their respective points of interconnection.

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

The interconnection customers were studied within the DISIS-2009-001 Impact Study. The Interconnection Customers are responsible for the costs shown on the next page. If a customer is not assigned the entire cost of a particular upgrade, that upgrade is considered a "shared upgrade". If higher queued interconnection customers withdraw from the queue, suspend or terminate their LGIA, restudies will have to be conducted to determine the Interconnection Customers' allocation of shared network upgrades.

# Cost Allocation Per Request (Revised)

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
<b>GEN-2006-037N01</b>			
GEN-2006-037N1 Interconnection Costs See Online Diagram	Current Study Allocation	\$700,000.00	\$700,000.00
	<b>Current Study Total</b>	<b>\$700,000.00</b>	
<b>GEN-2006-044N</b>			
GEN-2006-044N Interconnection Costs See Online Diagram - Costs includes the cost of increasing clearances replacing conductor and substatoin equipment to re-rate the Albion - Neligh 115kV line at 100 C.	Current Study Allocation	\$1,400,000.00	\$1,400,000.00
Albion - Petersburg - Petersburg North - Neligh 115KV CKT 1 Transmission line upgrades to accommodate a 100 Deg C facility rating	Current Study Allocation	\$900,000.00	\$900,000.00
	<b>Current Study Total</b>	<b>\$2,300,000.00</b>	
<b>GEN-2008-086N02</b>			
GEN-2008-086N02 Interconnection Costs See Online Diagram	Current Study Allocation	\$6,400,000.00	\$6,400,000.00
Ft Randall - Kelly 230KV CKT 1 Additional line work to accommodate the increased facility loading	Current Study Allocation	\$2,900,000.00	\$2,900,000.00
	<b>Current Study Total</b>	<b>\$9,300,000.00</b>	

\* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if necessary.

Monday, July 25, 2011



**DISIS-2009-001-4  
GENERATION INTERCONNECTION  
FACILITY RE-STUDY**

**SPP GEN-2006-044N      40.5 MW Wind Generation Facility at Petersburg N. 115 kV**  
**SPP GEN-2006-037N1    75.0 MW Wind Generation Facility at Broken Bow 115 kV**  
**SPP GEN-2008-086N02   200.0 MW Wind Generation Facility at Madison Co. 230 kV**

**JULY 2011**

**PREPARED FOR:  
SOUTHWEST POWER POOL**

**PREPARED BY:  
NEBRASKA PUBLIC POWER DISTRICT OPERATIONS  
TRANSMISSION ASSET PLANNING  
T&D ASSET MANAGEMENT  
T&D ENGINEERING**



**Nebraska Public Power District**

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# DISIS-2009-001-4 Re-Study Summary

## Introduction

The *NPPD DISIS-2009-001-4 Facility Re-Study* was performed to document the reliability impacts of three new wind generation facilities interconnected to the NPPD transmission system. Five wind generation interconnection projects were studied in the original DISIS-2009-001 facility study and two of these wind generation projects have subsequently withdrawn from the SPP GI queue. This DISIS-2009-001-4 re-study is being performed to evaluate a modified generator lead for GEN-2006-037N1 at Broken Bow. The GEN-2006-037N1 project has proposed to share the generator lead with a previously-queued generation interconnection project at the same Broken Bow 115 kV substation. The remaining three wind generation projects in DISIS-2009-001 are listed below:

<u>Project</u>	<u>MW</u>	<u>Point-of-Interconnection</u>	<u>Cluster</u>
GEN-2006-044N	40.5	New Sub on Neligh-Petersburg 115kV	9
GEN-2008-086N02	200.0	New Sub on Ft. Randall-Kelly 230 kV	9
GEN-2006-037N1	<u>75.0</u>	Broken Bow 115 kV	10
	315.5		

The following two projects are the upgrades required for interconnection of the remaining three DISIS-2009-001 generation projects:

- Upgrade of Neligh-Petersburg North – Petersburg – Albion 115 kV to 137 MVA facility rating
- Upgrade Ft. Randall – Kelly 230 kV line to 320 MVA facility rating.

## Evaluation

This facility re-study was performed to evaluate the impact of a proposed 75 MW wind project sharing the same generator lead as the existing 80 MW Broken Bow wind project at the Broken Bow 115 kV substation. To accomplish this, the equipment associated with the Broken Bow 115 kV Bay 1104 being utilized for the planned 80 MW Broken Bow wind project was assessed. The planned 115 kV generator lead from Broken Bow to the Broken Bow Wind site was also assessed in this evaluation.

The results of this evaluation show that terminal equipment upgrades would be required on the 115 kV Bay 1104 in the Broken Bow 115 kV substation. Disconnects, relays, and other auxiliary equipment would need to be replaced to accommodate the increased flow requirements. Also, additional upgrades to the remote wind collector substation would be required including metering CT's/PT's, RTU, and Fiber. The conductor being utilized for the generator lead from the Broken Bow to the Broken Bow Wind site would be adequate to accommodate the increased flow requirements.

## Summary

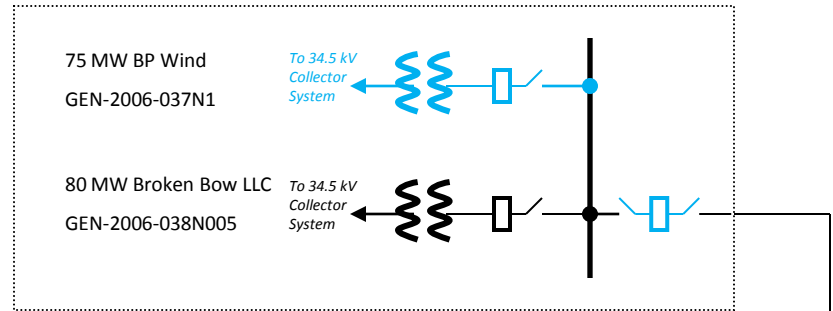
Overall, the *NPPD DISIS-2009-001-4 Facility Re-Study* evaluated the impact of the 75 MW GEN-2006-037N1 wind project sharing the same generator lead as the prior-queued 80 MW GEN-2006-038N005 wind project. The Facility Re-Study also re-documents the transmission plan required for interconnection for the three remaining DISIS-2009-001 projects and these details are listed below.

### **DISIS-2009-001-4 Generation Interconnection Plan**

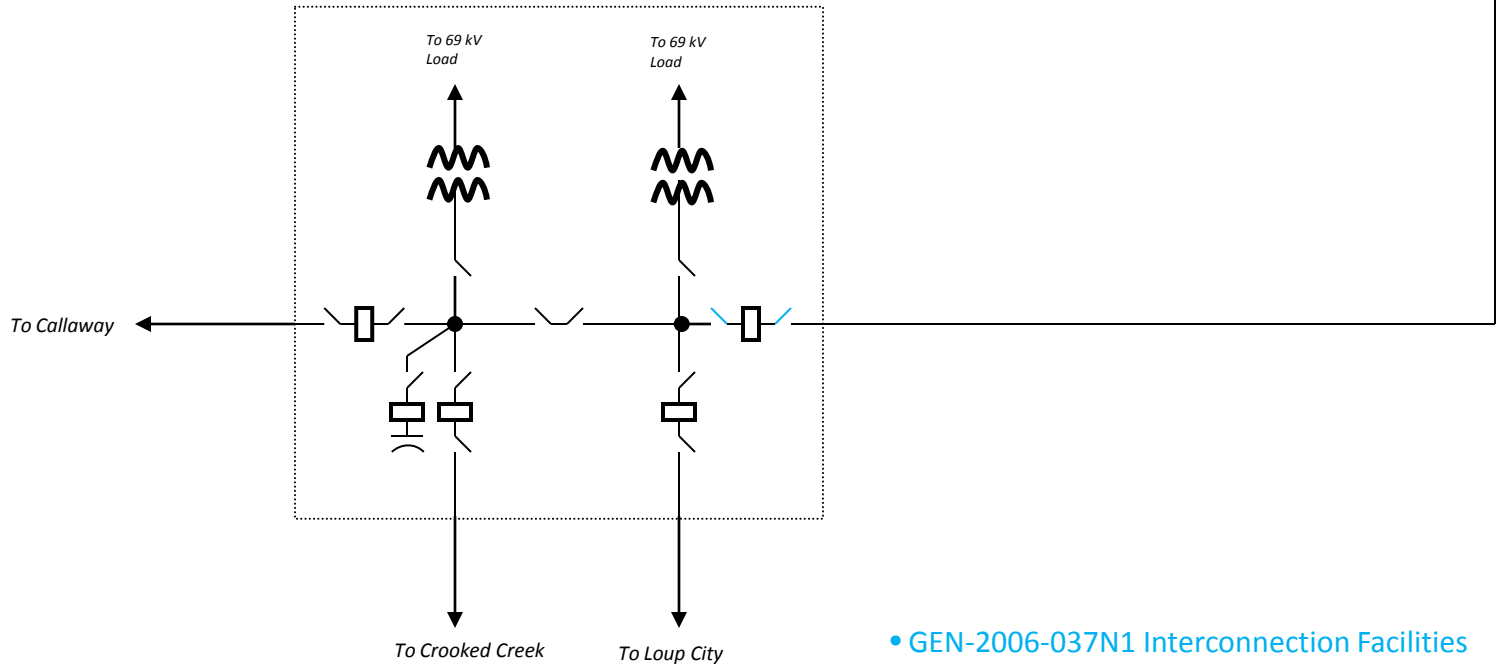
- GEN-2006-044N Interconnection Facilities – Petersburg North 115 kV substation expansion to accommodate new 115 kV interconnection. **\$ 1.3 Million**
- GEN-2008-086N02 Interconnection Facilities – Development of new Madison County 230 kV substation to accommodate new 230 kV interconnection. **\$ 6.4 Million**
- Ft. Randall – Kelly 230 kV line uprate – Detailed engineering review of the Ft. Randall – Kelly 230 kV line conductor clearances indicates additional line work would be required for interconnection to accommodate the increased loading on this facility. **\$ 2.9 Million**
- GEN-2006-037N1 Interconnection Facilities – Replacement of terminal equipment (disconnects, relays, etc.) at the Broken Bow 115 kV substation (Bay 1104) to accommodate increased flow requirements due to GEN-2006-037N1 project sharing same generator lead as prior-queued 80 MW Broken Bow project (GEN-2006-038N005). **\$ 0.2 Million**
- GEN-2006-037N1 Wind Collector Substation – Additional upgrades would be required at the remote wind collector substation (Broken Bow Wind 115 kV) due to the sharing of the generator lead. These additional upgrades are separate from the necessary expansion of the Broken Bow Wind 115 kV substation to accommodate the additional 115/34.5 kV transformer (PCB's, disconnects, bus, etc.) for GEN-2006-037N1. These additional upgrades would be metering CT's/PT's, RTU and Fiber at Broken Bow Wind. **\$ 0.5 Million**
- Creighton 607-D2 Replacement – Replace 607-D2 fuse at Creighton due to increased fault duty. **\$ 0.1 Million**
- Albion – Petersburg – Petersburg North – Neligh 115 kV line uprate – Upgrades to the Albion – Petersburg – Petersburg North – Neligh 115 kV lines to accommodate a 100 Deg C facility rating. The work required to upgrade these facilities to 100 Deg C include increasing line clearances, replacing bus conductor, miscellaneous substation upgrades and protection system modifications. **\$ 0.9 Million**

**Total Interconnection & Network Upgrades: \$12.3 Million**

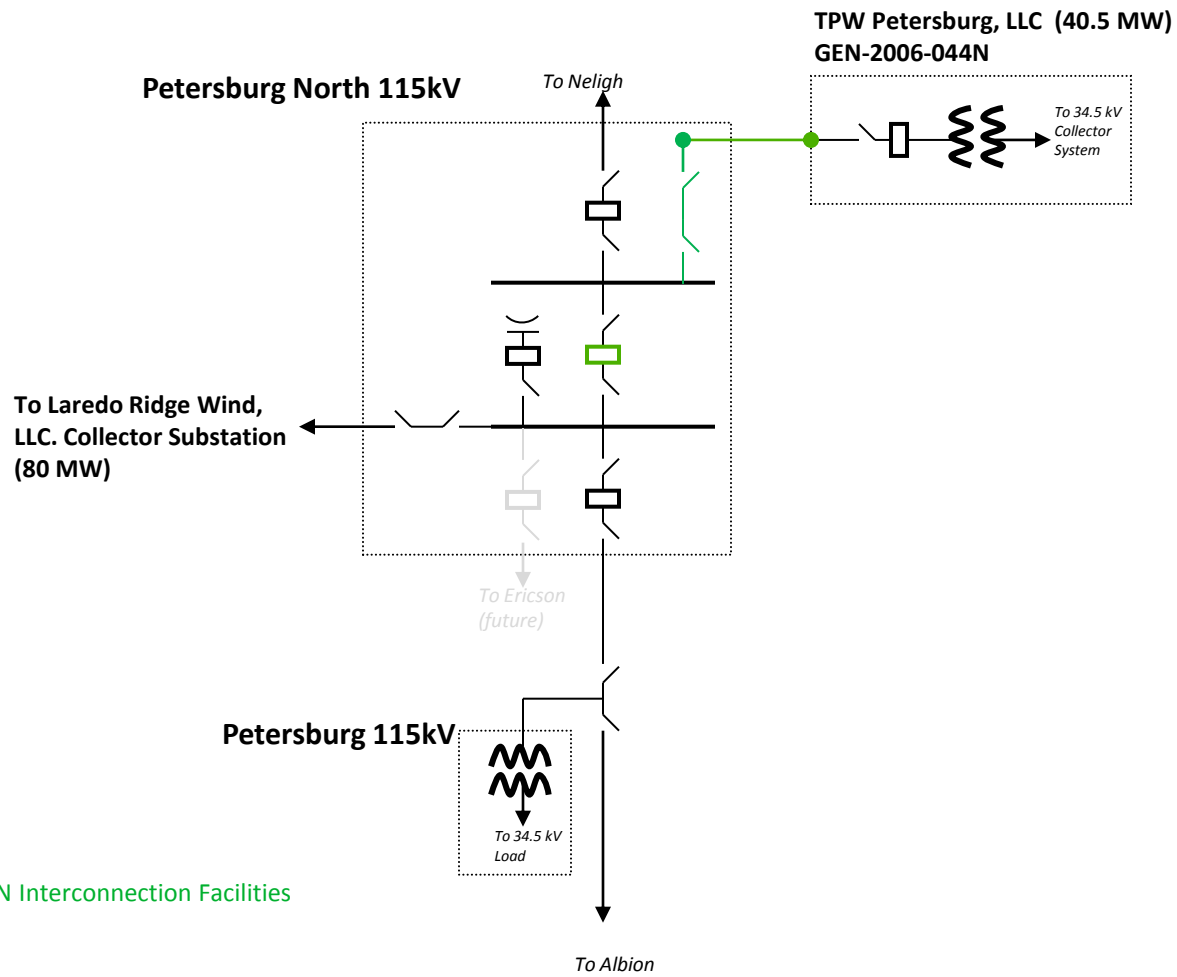
### Broken Bow Wind 115kV



### Broken Bow 115kV



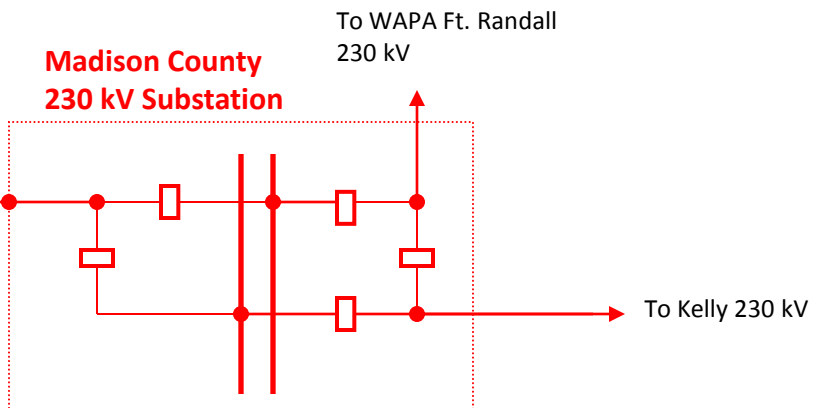
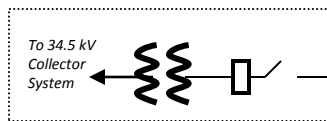
- GEN-2006-037N1 Interconnection Facilities



- GEN-2006-044N Interconnection Facilities



**Prairie Breeze 200 MW**  
**GEN-2008-086N02**



- GEN-2008-086N02 Interconnection Facilities