



SPP *Southwest
Power Pool*

**Facility Study
For
Generation Interconnection
Request
GEN-2011-018
GEN-2011-027**

*SPP Generation
Interconnection Studies*

*(#GEN-2011-018)
(#GEN-2011-027)*

July 2012

Summary

Nebraska Public Power District (NPPD) performed a detailed Facility Study at the request of Southwest Power Pool (SPP) for Generation Interconnection requests GEN-2011-018 (73.6MW/Wind) and GEN-2011-027 (120MW/Wind). The originally proposed in-service date for GEN-2011-018 was December 1, 2013 and the originally proposed in-service date for GEN-2011-027 was December 31, 2012, however SPP has proposed a new in-service date that will be after the assigned Network Upgrades are completed. 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.

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 Customers will be responsible for all of the transmission facilities connecting the customers owned substation to the Point of Interconnection (POI). The Point of Interconnection (POI) for GEN-2011-018 will be at the existing Steele City 115kV substation. The Point of Interconnection (POI) for GEN-2011-027 will be at the new Dixon County substation on the Hoskins – Twin Church 230kV transmission line. The Customers will also be responsible for any equipment located at the Customers 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 for GEN-2011-018 the Transmission Owner will need to construct an additional circuit breaker at the existing Steele City 115kV substation and construct any associated equipment for acceptance of the Interconnection Customer's Interconnection Facilities. To allow interconnection for GEN-2011-027 the Transmission Owner will need to construct an additional circuit breaker at Dixon County 115kV substation (GEN-2010-051 Tap) and construct any associated equipment for acceptance of the Interconnection Customer's Interconnection Facilities. At this time the Customer, GEN-2011-018 is responsible for \$900,000 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time the Customer, GEN-2011-027 is responsible for \$2,800,000 of Transmission Owner Interconnection Facilities and \$500,000 of Non-Shared Network Upgrades.

Shared Network Upgrades

The interconnection customers, GEN-2011-018 and GEN-2011-027, were studied within the DIS-2011-001 Impact Study. At this time, the Interconnection Customers, GEN-2011-018 and GEN-2011-027 are 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.

Other Network Upgrades

Certain Other Network Upgrades are not the cost responsibility of the Customer, GEN-2011-018, but will be required for full Interconnection Service. This Network Upgrade is:

1. Sheldon – Folsom & Pleasant Hill 115kV circuit 2, rebuild, assigned to SPP ITP NT 2011 (NRIS Only)

Certain Other Network Upgrades are not the cost responsibility of the Customer, GEN-2011-027, but will be required for full Interconnection Service. These Network Upgrades include:

1. Albion – Petersburg 115kV circuit 1, rerate, assigned to DISIS-2009-001 Customers
2. Twin Church – Dixon County 230kV, conductor clearance increase, assigned to DISIS-2010-002 Customers

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.

Affected System Facilities

There were possible Western Area Power Administration (WAPA) and MidAmerican Energy Company (MEC) Affected System Facilities were identified in the Phase 1 through Phase 4 Load flow Analysis of the Facility Study.

Conclusion

Interconnection Service for GEN-2011-018 will be delayed until the Transmission Owner Interconnection Facilities are constructed. Interconnection Service for GEN-2011-027 will be delayed until the Transmission Owner Interconnection Facilities and Non-Shared Upgrades are constructed. The Customer, GEN-2011-018 is responsible for \$900,000 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. The Customer, GEN-2011-027 is responsible for \$2,700,000 of Transmission Owner Interconnection Facilities and \$500,000 for Non-Shared Network Upgrades. At this time, the Interconnection Customers, GEN-2011-018 and GEN-2011-027 are allocated \$0 for Shared Network Upgrades. After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for GEN-2011-018 (73.6 MW) and GEN-2011-027 (120MW) can be allowed. At this time the total allocation of costs of Interconnection Service for GEN-2011-018 are estimated at \$900,000 and total allocation costs of Interconnection Service for GEN-2011-027 are estimated at \$3,300,000.

Appendix E. Cost Allocation Per Request

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2011-018			
GEN-2011-018 Interconnection Costs See Online Diagram.	Current Study	\$900,000.00	\$900,000.00
	Current Study Total	\$900,000.00	
GEN-2011-027			
GEN-2011-027 Interconnection Costs See Online Diagram.	Current Study	\$2,800,000.00	\$2,800,000.00
Hoskins - Dixon County - Twin Church 230kV Rerate per NPPD Facility Study	Current Study	\$500,000.00	\$500,000.00
	Current Study Total	\$3,300,000.00	
TOTAL CURRENT STUDY COSTS:		\$4,200,000.00	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

**DISIS-2011-001-2
GENERATION INTERCONNECTION
FACILITY RE-STUDY**

SPP GEN-2011-018 73.6 MW Wind Generation Facility at Steele City 115 kV
SPP GEN-2011-027 120.0 MW Wind Generation Facility at Dixon Co. 230 kV

JUNE 2012

**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-2011-001-2 Re-Study Summary

Introduction

The *NPPD DISIS-2011-001-2 Facility Re-Study* was performed to document the impact of the withdrawal of a wind generation interconnection request from the SPP Definitive Generation Interconnection Queue. Two wind generation interconnection projects were studied in the original DISIS-2011-001 facility study and a previously-queued wind generation project (GEN-2010-047 in DISIS-2010-002) has withdrawn from the SPP GI queue. This DISIS-2011-001-2 re-study is being performed to evaluate the withdrawal of GEN-2010-047 at Gage County and associated transmission upgrades from the queue. The remaining two wind generation projects in DISIS-2011-001 are listed below:

<u>Project</u>	<u>MW</u>	<u>Point-of-Interconnection</u>
GEN-2011-018	73.6	Steele City 115 kV
GEN-2011-027	<u>120.0</u> 193.6	New Dixon Co. Sub on Twin Church–Hoskins 230kV

The following three projects are the upgrades required for interconnection of the remaining two DISIS-2011-001-2 generation projects:

- Steele City 115 kV substation expansion
- Dixon County 230 kV substation expansion
- Hoskins-DixonCounty-Twin Church 230 kV upgrade

Originally, the DISIS-2011-001 facility study required the addition of a new Gage County – Crete 115 kV line due to GEN-2011-018. Withdrawal of the previously-queued GEN-2010-047 from the GI queue has removed the need for this network upgrade for GEN-2011-018.

Evaluation

This facility re-study was performed to re-evaluate the interconnection of the 73.6 MW wind project (GEN-2011-018) at Steele City 115 kV without the Gage County – Crete 115 kV line. Each of the original DISIS-2011-001 study models utilized for the initial facility study were modified to remove the previously-queued GEN-2010-047 project and the Gage County – Crete 115 kV network upgrade. The contingency analysis was re-ran to validate that there would be no post-contingency loading or voltage violations as a result of removing the Gage County – Crete 115 kV line as a required network upgrade for the 73.6 MW wind project at Steele City. Based on the results of the new study work, there were no new loading or bus voltage issues discovered due to the GEN-2011-018 wind project interconnected at Steele City 115 kV for system intact or N-1 conditions.

However, the re-evaluation analysis did discover a few independent N-2 contingencies that would result in loading issues as a result of the GEN-2011-018 wind project at Steele City. The results of this N-2 contingency analysis are summarized in the following table.

From Bus	From Bus Name	To Bus	To Bus Name	CKT	CONTINGENCY	RATING	%
640088	BPS SUB7 115.00	640111	CLATONA7 115.00	1	DOUBLE 95	137	102.2
640088	BPS SUB7 115.00	640111	CLATONA7 115.00	1	DOUBLE 387	137	100.0
640169	FAIRBRY7 115.00	640208	HARBINE7 115.00	1	DOUBLE 507	99	107.0
DOUBLE 95 : OPEN LINE FROM BUS 533332 [KNOB HL3 115.00] TO BUS 640426 [STEELEC7 115.00] CKT 1 : OPEN LINE FROM BUS 640088 [BPS SUB7 115.00] TO BUS 640278 [SHELDON7 115.00] CKT 1 DOUBLE 387 : OPEN LINE FROM BUS 640076 [BEATRCE7 115.00] TO BUS 640361 [STEINER7 115.00] CKT 1 : OPEN LINE FROM BUS 640088 [BPS SUB7 115.00] TO BUS 640278 [SHELDON7 115.00] CKT 1 DOUBLE 507 : OPEN LINE FROM BUS 640105 [CARLJCT7 115.00] TO BUS 640218 [HEBRN N7 115.00] CKT 1 : OPEN LINE FROM BUS 640313 [PAULINE7 115.00] TO BUS 643050 [ROSEMONT 7115.00] CKT 1							

In order to mitigate these post-contingency loading issues, prior outage generation limitations may be necessary for the following prior outage conditions.

Prior Outage Facilities

- Steel City – Knob Hill 115 kV
- Beatrice Power Station – Sheldon 115 kV
- Beatrice – Steinauer 115 kV
- Hebron North – Carleton Junction 115 kV
- Pauline – Rosemont 115 kV

More detailed operational studies and guides will be required to address these issues if this project proceeds and is constructed.

Summary

Overall, the *NPPD DISIS-2011-001-2 Facility Re-Study* evaluated the impact of the interconnection of the 73.6 MW GEN-2011-018 wind project at Steele City 115 kV without the Gage County – Crete 115 kV line and GEN-2010-047. The Facility Re-Study documents the transmission plan required for interconnection for the DISIS-2011-001-2 projects and these details are listed below.

DISIS-2011-001-2 Generation Interconnection Plan

- GEN-2011-018 Interconnection Facilities – Steele City 115 kV substation expansion to accommodate new 115 kV interconnection.

\$ 0.9 Million

- GEN-2011-027 Interconnection Facilities – Dixon County 230 kV substation expansion to accommodate new 230 kV interconnection.

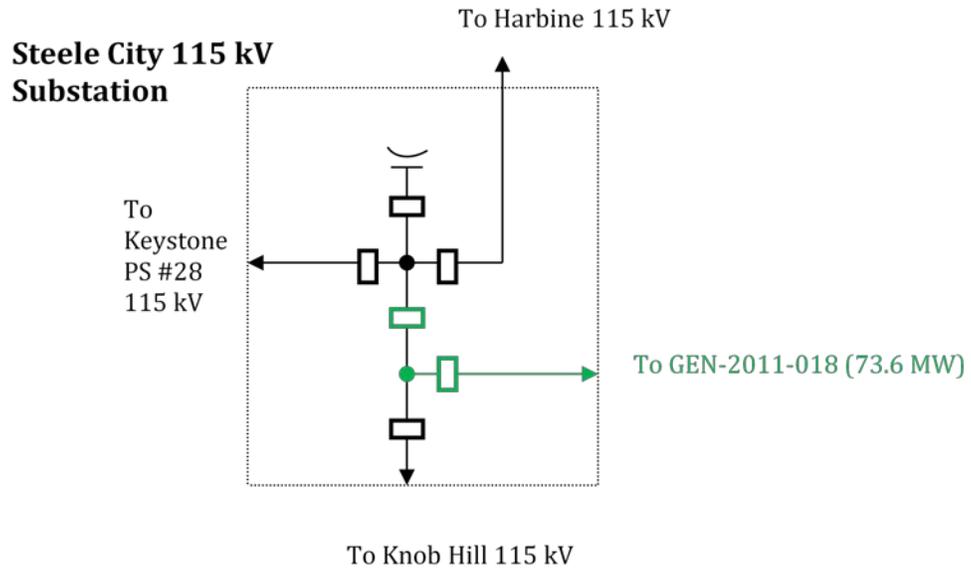
\$ 2.8 Million

- Hoskins – Dixon County – Twin Church 230 kV Line Upgrade – Increase clearances on Hoskins – Dixon County – Twin Church 230 kV line and terminal upgrades to accommodate increased facility rating to address N-1 contingency loading issues identified in DISIS-2011-001 Facility Study.

\$ 0.5 Million

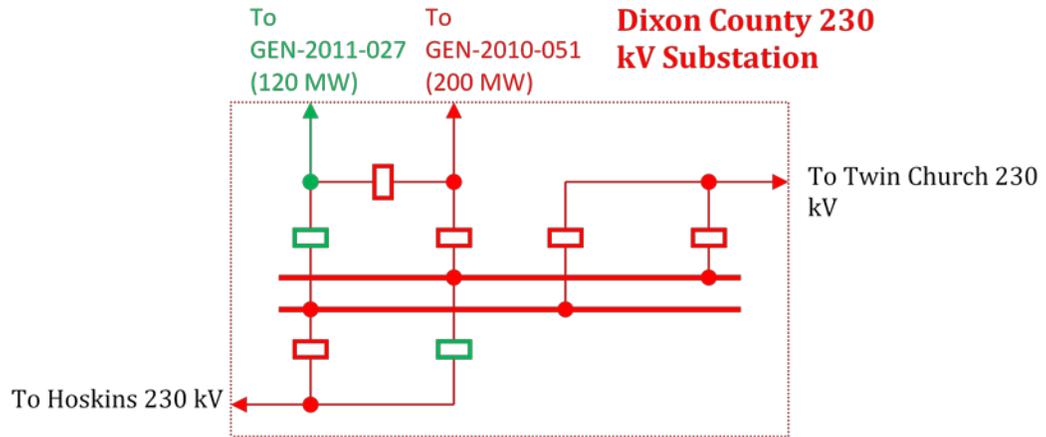
Total Interconnection & Network Upgrades: \$4.2 Million

GEN-2011-018



- GEN-2011-018 Interconnection Facility

GEN-2011-027



- GEN-2010-051 Interconnection Facilities
- GEN-2011-027 Interconnection Facilities