Interconnection Facilities Study

GEN-2015-007/IFS-2015-001-01
GEN-2015-023/IFS-2015-001-08

September 2021

Generator Interconnection

SPP Southwest Power Pool

Revision History

Date	Author	Change Description
06/09/2016	SPP	Draft Interconnection Facilities Study Report Revision 0 Issued
7/11/2016	SPP	Final Interconnection Facilities Study Report Revision 0 & GEN-2015-023 Interconnection Customer Comments Issued
08/19/2021	SPP	Updated final report to include planned changes to the turbine configuration and funding for the Holt County substation
09/15/2021	SPP	Updated final report to reflect Modification Impact Report

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Interconnection Facilities Study Summary

Interconnection Facilities Study Introduction

This Interconnection Facilities Study (IFS) for the Generator Interconnection Request(s) (GIRs) listed in **Table 1**.

Table 1: IFS-2015-001 NPPD Interconnection Facilities Request(s)

Request Number	Location	Service Type	Fuel Source	Amount (MW)	Original Customer Proposed In-Service Date
GEN-2015-007 IFS-2015-001-01	Antelope County, Nebraska	ERIS	Wind	160.00	12/1/2016
GEN-2015-023 IFS-2015-001-08	Antelope & Wheeler County, Nebraska	ERIS/NRIS	Wind	299.36	12/31/2019

The Interconnection Requests were studied in the DISIS-2015-001 Impact Study and DISIS-2015-001-1 Impact Restudy as an Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS) requests. The Interconnection Requests were provided updated Cost Allocations in DISIS-2015-001-2 Impact Restudy. Since the posting of the DISIS-2015-001 Impact Study the Interconnection Customers has executed the Interconnection Facilities Study Agreements per Appendix 4 or Appendix 4A and provided deposit securities as required by the Section 8.9 of the Generator Interconnection Produce (GIP) to proceed to the Interconnection Facilities Study. The GIP is covered under Attachment V of the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT). The request for interconnection was placed with SPP by the requesting customer (Interconnection Customer) in accordance with OATT, which covers new generation interconnections on SPP's transmission system.

Nebraska Public Power District (NPPD) performed a detailed Interconnection Facilities Study at the request of SPP for the Interconnection Request. SPP has proposed the full Interconnection Service will be available after the assigned Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s) are completed. Full interconnection service will require Network Upgrade(s) listed in the "Other Network Upgrade(s)" section.

The primary objective of the Interconnection Facilities Study (IFS) is to identify necessary Transmission Owner Interconnection Facilities, network upgrade(s), other direct assigned upgrade(s), and associated upgrade lead times needed for the additional of the requested Interconnection Service into the SPP Transmission System at the specific Point of Interconnection (POI).

Phase(s) of Interconnection Service

It is not expected that Interconnection Service will occur in phases. However, 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 either credits or potentially Long Term Congestion Rights (LTCR), otherwise known as compensation, in accordance with Attachment Z2 of the SPP Tariff for any Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, and not refunded to the Interconnection Customer.

Interconnection Customer Interconnection Facilities

The Generator Interconnection Request(s) listed in **Table 1** were studied in the Interconnection Facilities Study for the proposed Point of Interconnection (POI) listed in **Table 2** for the NPPD transmission system.

Table 2: GI Requests Point of Interconnection

G.I. Request Number	Point of Interconnection (POI)
GEN-2015-007 IFS-2015-001-01	Hoskins 345kV
GEN-2015-023 IFS-2015-001-08	Holt County 345kV

GEN-2015-007/IFS-2015-001-01

The GEN-2015-007/IFS-2015-001-01, (GEN-2015-007) Interconnection Customer's generator facility consists of eighty (80) General Electric (G.E.) 2.0 MW wind generators with +/- 0.90 power factor generator capabilities for a total generating nameplate of 160.00 MW. The 34.5kV collector system for this wind farm is planned to be connect to one (1) 345/34.5/13kV 114/152/190 MVA (ONAN/ONAF/ONAF) Interconnection Customer, GEN-2015-007, owned and maintained transformer at the Interconnection Customer owned substation. A sixteen (16) mile overhead 345kV transmission circuit will connect the Generating Facility from the Interconnection Customer GEN-2015-007, owned substation to the Point of Interconnection (POI) at the existing Nebraska Public Power District (NPPD) owned and maintained 345kV bus at the Hoskins Substation. The Interconnection Customer, GEN-2015-007, will be responsible for all of the transmission facilities connecting the Interconnection Customer owned substation to the Point of Change of Ownership (PCO).

The Interconnection Customer, GEN-2015-007, will 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 Point of Change of Ownership (PCO), including approximately 16.7 Mvars[1] of reactors to compensate for injection of reactive power into the transmission system under reduced generating conditions. Also, the Interconnection Customer, GEN-2015-007, will need to coordinate with the Transmission Owner for relay, protection, control, and communication system configurations.

GEN-2015-023/IFS-2015-001-08

The GEN-2015-023/IFS-2015-001-08, (GEN-2015-023) Interconnection Customer's generator facility consists of ninety-eight (98) General Electric 2.82 MW and ten (10) General Electric 2.3 MW wind generators for a total nameplate capacity of 299.36 MW.

[1] This approximate minimum reactor amount is needed for the current configuration of the wind farm as studied in the DISIS-2015-001 Impact Study and DISIS-2015-001-1 Impact Restudy.

The 34.5kV collector system for this wind farm is planned to be connect to two (2) 345/34.5/13kV 100/133/166 MVA (ONAN/ONAF/ONAF) Interconnection Customer, GEN-2015-023, owned and maintained transformer at the Interconnection Customer owned substation. .387 mile overhead 345kV transmission circuit will connect the Generating Facility from the Interconnection Customer, GEN-2015-023, owned substation to the Point of Interconnection (POI) at the planned Nebraska Public Power District (NPPD) owned and maintained 345kV bus at the Holt County Substation. The Interconnection Customer, GEN-2015-023, will be responsible for the build- out of the Holt County substation necessary to accommodate the interconnection of the Generating Facility, including the 55 Mvar line reactor referenced in the NPPD one-line diagram.

The Interconnection Customer, GEN-2015-023, will 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 Point of Change of Ownership (PCO), including approximately 17.2 Mvars[2] of reactors to compensate for injection of reactive power into the transmission system under reduced generating conditions. Also, the Interconnection Customer, GEN-2015-023, will need to coordinate with the Transmission Owner for relay, protection, control, and communication system configurations.

Transmission Owner Interconnection Facilities and Non-Shared Network Upgrade(s)

GEN-2015-007/IFS-2015-001-01

To facilitate the GEN-2015-007 interconnection, the interconnecting Transmission Owner, NPPD, will need to expand the existing Hoskins 345kV Substation, construct a new line terminal which includes four (4) 345kV circuit breakers, disconnect switches, structure, and any associated terminal equipment for the acceptance of the Interconnection Customer's Interconnection Facilities. Currently, NPPD estimates an Engineering and Construction (E&C) lead time of approximately twenty-four (24) to thirty-six (36) months after a fully executed Generator Interconnection Agreement (GIA) for the completion of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

At this time, Interconnection Customer is responsible for $5,300,000 of NPPD Transmission Owner Interconnection Facilities (TOIF) and Non-Shared Network Upgrade(s). **Table 3** displays the estimated costs for TOIF and Non-Shared Network Upgrade(s).

Table 3: GEN-2015-007/IFS-2015-001-01 TOIF and Non-Shared Network Upgrade(s)

TOIF and Non-Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
NPPD Interconnection Substation: Transmission Owner Interconnection Facilities 345kV Substation work for one (1) new line terminal, line switch, dead end structure, line relaying, communications, revenue metering, and line arrestor.	$700,000	100%	$700,000

[2] This approximate minimum reactor amount is needed for the current configuration of the wind farm as studied in the DISIS-2015-001 Impact Study and DISIS-2015-001-1 Impact Restudy.

NPPD Interconnection Substation - Non-Shared Network Upgrades 345kV Substation work for the existing 345kV bus, one (1) new line terminal, four (4) circuit breakers, control panel, line relaying, disconnect switches, and associated equipment.	$4,600,000	100%	$4,600,000
Total	$5,300,000	100%	$5,300,000

GEN-2015-023/IFS-2015-001-08

To facilitate the GEN-2015-023 interconnection, the interconnecting Transmission Owner, NPPD, will need to complete the build-out of the Holt County substation and construct 345kV substation to interconnect GEN-2015-023 and R-Project on WAPA Ft. Thompson – Grand Prairie Wind – Grand Island 345kV line. Currently, NPPD estimates an Engineering and Construction (E&C) lead time of approximately twenty-four (24) to thirty-six (36) months after a fully executed Generator Interconnection Agreement (GIA) for the completion of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades.

At this time, Interconnection Customer is responsible for $17,900,000 of NPPD Transmission Owner Interconnection Facilities (TOIF) and Non-Shared Network Upgrade(s). **Table 4** displays the estimated costs for TOIF and Non-Shared Network Upgrade(s).

Table 4: GEN-2015-023/IFS-2015-001-08 TOIF and Non-Shared Network Upgrade(s)

TOIF and Non-Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
NPPD Interconnection Substation: Transmission Owner Interconnection Facilities 345kV Substation work for one (1) new line terminal, line switch, dead end structure, line relaying, communications, revenue metering, and line arrestorline arrestor.	$700,000	100%	$700,000
NPPD Interconnection Substation - Non-Shared Network Upgrades Construct 345kV substation to interconnect GEN-2015-023 and R-Project on WAPA Ft. Thompson – Grand Prairie Wind – Grand Island 345kV line	$17,200,000	100%	$17,200,000
Total	$17,900,000	100%	$17,900,000

Shared Network Upgrade(s)

The Interconnection Requests GEN-2015-007 and GEN-2015-023 were studied in the DISIS-2015-001 Impact Study and DISIS-2015-001-1 Impact Restudy as an Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS) requests. The Interconnection Request was provided updated Cost Allocations in DISIS-2015-001-2 Impact Restudy. At this time, the Interconnection Customers are allocated $0 for Shared Network Upgrades. If higher queued Interconnection Request(s) 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 Request(s) and the Network Upgrade(s) associated with those higher queued

Interconnection Requests being placed in service. At this time, the Interconnection Customer is allocated the following cost listed in **Table 5** for Shared Network Upgrade.

Table 5: Interconnection Customer Shared Network Upgrades

Shared Network Upgrades Description	Allocated Cost ($)	Allocated Percent (%)	Total Cost ($)
Currently not allocated Shared Network Upgrades for GEN-2015-007 or GEN-2015-023	$0	n/a	$0
Total	$0	n/a	$0

Affected System Identified Network Upgrade(s)

The Mid-Continent Independent System Operator (MISO) performed an Affected System Study for the Interconnection Requests. That study is attached. MISO identified constraints at the Raun 345kV substation owned by Mid-American Energy (MEC). The constraints were estimated at $50,000 to mitigate. These upgrades are assignable to GEN-2015-007 as the Interconnection Request that impacts the constraint. The Interconnection Customer for GEN-2015-007 will be required to enter into a separate agreement with MISO and/or MEC to effect the construction of these upgrades.

Table 6: Affected System Network Upgrades

Shared Network Upgrades Description	GEN-2015-007 Allocation($)	GEN-2015-023 Allocation ($)	Total Cost ($)
Raun 345kV Substation (MEC) – Replace Wave Trap	$50,000	$0	$50,000

NPPD Facility Study Identified Network Upgrade(s)

During the NPPD Facility Study impact review, NPPD identified potential constraints for two elements on the Western Area Power Administration (WAPA) transmission system. The two thermal constraints are Fort Randall – Utica Junction 230kV circuit #1 for the contingency of Kelly (Columbus) – Meadow Grove 230kV circuit #1 and Holt County – Grand Island 345kV circuit #1 for the contingency of Grand Prairie – Fort Thompson 345kV circuit #1 in the 2016 Winter Peak model developed by NPPD. SPP is unable to verify the potential constraints meet the criteria for interconnection upgrades with the GGS-Thedford 345kV line in service. (100% rating of Rate B with all planned Network Upgrades in service and impact factor of 20% OTDF for ERIS and 3% OTDF for NRIS).

Other Network Upgrade(s)

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

Currently, the following Other Network Upgrades are required for GEN-2015-007:

1) Hoskins – Neligh East (Antelope) 345/115kV Project build assigned in the SPP 2014 Integrated Transmission Plan- Near Term Assessment (2014 ITP NT) per SPP-200253. The current anticipated in-serivce for this project is6/1/2016.
2) Gentleman – Cherry County (Thedford) – Holt County 345kV Project ("R-Project") and Thedford 345/115/13kV transformer assigned in the SPP 2012 Integrated Transmission Plan – 10 Yea Assessment (2012 ITP10) per SPP-200220. The current anticipated in-service for this project is 4/1/2024
3) Twin Church – Dixon County 230kV circuit #1 increase conductor clearances assigned to DISIS-2010-002 and DISIS-2011-001 Interconnection Customer(s)

Currently, the following Other Network Upgrades are required for GEN-2015-023:

1) Battle Creek – County Line – Neligh East (Antelope) 115kV circuit #1 build assigned to DISIS-2013-002 Interconnection Customer(s)
2) Hoskins – Neligh East (Antelope) 345/115kV Project build assigned in the SPP 2014 Integrated Transmission Plan- Near Term Assessment (2014 ITP NT) per SPP-200253. The current anticipated in-serivce for this project is6/1/2016.
3) Gentleman – Cherry County (Thedford) – Holt County 345kV Project ("R-Project") and Thedford 345/115/13kV transformer assigned in the SPP 2012 Integrated Transmission Plan – 10 Year Assessment (2012 ITP10) per SPP-200220. The current anticipated in-service for this project is 4/1/2024
4) Twin Church – Dixon County 230kV circuit #1 increase conductor clearances assigned to DISIS-2010-002 and DISIS-2011-001 Interconnection Customer(s)

Depending upon the status of higher or equally queued customers, the Interconnection Request'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-2015-007/IFS-2015-001-01 will be delayed until the Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades are constructed. Full interconnection service will require Network Upgrade(s) listed in the "Other Network Upgrade(s)" section. The Interconnection Customer GEN-2015-007, is responsible for $5,300,000 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, the Interconnection Customer GEN-2015-007 is allocated $0 for Shared Network Upgrades. After all Interconnection Facilities and Non-Shared Network Upgrades have been placed into service, Interconnection Service for 160.00 MW, as requested by the Interconnection Customer GEN-2015-007 can be allowed. At this time the total allocation of costs assigned to Interconnection Customer GEN-2015-007 for interconnection Service are estimated at$5,300,000.

Interconnection Service for GEN-2015-023/IFS-2015-001-08 will be delayed until the Transmission Owner Interconnection Facilities, Non-Shared Network Upgrades, and Holt County Substation are constructed. Full interconnection service will require Network Upgrade(s) listed in the "Other Network Upgrade(s)". The Interconnection Customer GEN-2015-023, is responsible for $17,900,000 of Transmission Owner Interconnection Facilities and Non-Shared Network Upgrades. At this time, the Interconnection Customer GEN-2015-023 is allocated $0 for Shared Network

Upgrades. After all Interconnection Facilities and Non-Shared Network Upgrades have been placed into service, Interconnection Service for 299.36 MW, as requested by the Interconnection Customer GEN-2015-023 can be allowed. At this time the total allocation of costs assigned to Interconnection Customer GEN-2015-023 for interconnection Service are estimated at $17,900,000.

Appendices

MISO SPP DISIS-2015-001

Affected System Impact Study

May 2, 2016

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1. Executive Summary

This report documents the Affected System Impacts of three projects in the SPP generator interconnection queue on the Midcontinent Independent System Operator ("MISO") transmission system. The projects are listed in Table 1-1.

Table 1-1 List of SPP Group Generation Interconnection Projects

GI_Number	Capacity	Type	Service	POI_Bus
GEN-2015-005	200.1	Wind	ER	Tap Nebraska City - Sibley 345kV
GEN-2015-007	160	Wind	ER	Hoskins 345kV
GEN-2015-023	300.7	Wind	ER/NR	Holt County 345kV

The total cost of network upgrades is listed in Table 1-2 as shown below. The costs for Network Upgrades are planning level estimates and subject to be revised in the facility studies.

Table 1-2 Constrained Facility and Mitigation Costs

Project	Facility Owner	Constraint	Mitigation Required	Cost Estimate
G007	MEC	635200 RAUN 3 345 - 645451 S3451 3 345 1	Replace the wave trap at Raun and adjust relay settings. This will increase MidAmerican's rating of its section of the Raun-Ft. Calhoun line to above 1107 MVA for a new MidAmerican rating of 1195 MVA	$50,000

2. Study Methodology & Assumptions

2.1. Study Criteria

All interconnection requirements are based on the applicable MISO Interconnection Planning Criteria and in accordance with the NERC Reliability Standards. Steady state violations of applicable planning criteria were attributed to the SPP group generation requests by the usage of MISO injection criteria, and applicable local planning criteria.

2.2. Contingency Criteria

A comprehensive list of contingencies was considered for steady-state analysis:

- NERC Category A with system intact (no contingencies)
- NERC Category B contingencies
  - Single element outages, at buses with a nominal voltage of 69 kV and above in the following areas: CWLD (area 333), AMMO (area 356), AMIL (area357), WEC (area 295), WEC MI (area 296), XCEL (area 600), MP (area 608),SMMPA (area 613), GRE (area 615), OTP (area 620), ITCM (area 627),MPW (area 633), MEC (area 635), MDU (area 661), MHEB (area 667), DPC(area 680), ALTE (area 694), WPS (area 696), MGE (area 697), UPPC (area 698), CE(area 222), NPPD (area 640), OPPD (area 645), LES (area 650),WAPA (area 652), AECI (area 330), MIPU(area 540), KCPL (area 541),KACY (area 542), INDN (area 545).
  - Multiple-element outages initiated by a fault with normal clearing such as multi-terminal lines, in the Dakotas, Illinois, Iowa, Manitoba, Minnesota, Missouri, and Wisconsin.
- NERC Category C
  - Selected NERC Category C events in the study region of the Dakotas, Illinois, Iowa, Manitoba, Minnesota, Missouri, and Wisconsin.

2.3. Monitored Elements

Table 2-1 Monitored Area

Area #	Voltage	Area ID	Area Name
295	69kV and above	WEC	Wisconsin Electric Power Company (ATC)
296	69kV and above	MIUP	Michigan Upper Peninsula (ATC)
333	69kV and above	CWLD	Columbia, MO Water and Light
356	100kV and above	AMMO	Ameren Missouri
357	100kV and above	AMIL	Ameren Illinois
600	69kV and above	XEL	Xcel Energy North
608	69kV and above	MP	Minnesota Power & Light
613	69kV and above	SMMPA	Southern Minnesota Municipal Power Association
615	69kV and above	GRE	Great River Energy

620	69kV and above	OTP	Otter Tail Power Company
627	69kV and above	ALTW	Alliant Energy West
633	69kV and above	MPW	Muscatine Power & Water
635	69kV and above	MEC	MidAmerican Energy
661	69kV and above	MDU	Montana-Dakota Utilities Co.
680	69kV and above	DPC	Dairyland Power Cooperative
694	69kV and above	ALTE	Alliant Energy East (ATC)
696	69kV and above	WPS	Wisconsin Public Service Corporation (ATC)
697	69kV and above	MGE	Madison Gas and Electric Company (ATC)
698	69kV and above	UPPC	Upper Peninsula Power Company (ATC)

2.4. Model Development

The following MTEP base case load profiles were used for the study:

- 2017 Shoulder
- 2017 Summer Peak
- 2024 Shoulder
- 2024 Summer Peak

The study cases were built by adding and dispatching the appropriate queue projects to the base cases. The detail of each SPP interconnection request is listed in Table 1-1. The study projects were dispatched per MISO criteria to the entire SPP footprint, where generators were scaled in proportion to the available reserve.

2.5. Study Assumptions

This affected system impact study was conducted with all the participating generators operating together as a group. Analysis was not performed on individual generating units or subsets of the generating units unless specifically noted otherwise. Higher queued SPP projects were modeled as outlined in Appendix A of the report. The results obtained in this analysis may change if any of the data or assumptions made during the development of the study models is revised.

3. Steady State Analysis

3.1. Near Term (2017) Analysis

The following constraints were identified in the near term analysis for the off peak scenario. No violations were identified in the summer peak scenario. The following table lists the constraints identified.

Table 3-1 Near-Term Constraint

Scenario	Constraint	Contflow MVA	Rating MVA	Loading%	Contingency	G005 DF	G007 DF	G023 DF
2017SH	635200 RAUN 3 345 645451 S3451 3 345 1	1106.7	956	115.8	640226 HOSKINS3 345 640342 SHELCRK3 345 1	-4.0%	24.0%	-2.8%
2017SH	635200 RAUN 3 345 645451 S3451 3 345 1	961.5	956	100.6	** BASE CASE **	-3.7%	14.0%	-1.0%

3.2. Out Year(2024) Analysis

The following constraints were identified in the out year analysis for the off peak scenario. No violations were identified in the summer peak scenario. The following table lists the constraints identified.

Table 3-2 Out-Year Constraint

Scenario	Constraint	Contflow MVA	Rating MVA	Loading%	Contingency	G005 DF	G007 DF	G023 DF
2024SH	635200 RAUN 3 345 645451 S3451 3 345 1	1103.8	956	115.5	640226 HOSKINS3 345 640342 SHELCRK3 345 1	-3.9%	23.6%	-2.9%
2024SH	635200 RAUN 3 345 645451 S3451 3 345 1	964.6	956	100.9	** BASE CASE **	-3.7%	13.8%	-1.0%

4. Conclusion

The Affected system study identified Steady State thermal violations associated with the interconnection of the three SPP projects. These included injection constraints in the off peak scenario under both the Near-term (2017) and the Out-year (2024) analysis for SPP project number G007.

5. Appendix A

Table 5-1 SPP High Queued Projects

SPP Queue	Capacity MW	Area	Proposed Point of Interconnection	Fuel Type	SP output	SH output
GEN-2003-021N	75	NPPD	Ainsworth Wind Tap 115kV	Wind	20%	100%
GEN-2004-023N	75	NPPD	Columbus Co 115kV	Coal	100%	100%
GEN-2006-020N	42	NPPD	Bloomfield 115kV	Wind	20%	100%
GEN-2006-037N1	75	NPPD	Broken Bow 115kV	Wind	20%	100%
GEN-2006-038N005	80	NPPD	Broken Bow 115kV	Wind	20%	100%
GEN-2006-038N019	80	NPPD	Petersburg North 115kV	Wind	20%	100%
GEN-2006-044N	40.5	NPPD	North Petersburg 115kV	Wind	20%	100%
GEN-2007-011N08	81	NPPD	Bloomfield 115kV	Wind	20%	100%
GEN-2008-086N02	201	NPPD	Meadow Grove 230kV	Wind	20%	100%
GEN-2008-119O	60	OPPD	S1399 161kV	Wind	20%	100%
GEN-2008-123N	89.7	NPPD	Tap Pauline - Hildreth (Rosemont) 115kV	Wind	20%	100%
GEN-2008-129	80	GMO	Pleasant Hill 161kV	CT	100%	0%
GEN-2009-040	73.8	WERE	Marshall 115kV	Wind	20%	100%
GEN-2010-036	4.6	WERE	6th Street 115kV	Hydro	100%	100%
GEN-2010-041	10.5	OPPD	S1399 161kV	Wind	20%	100%
GEN-2010-051	200	NPPD	Tap Twin Church - Hoskins 230kV	Wind	20%	100%
GEN-2011-011	50	KCPL	Iatan 345kV	Coal	100%	100%
GEN-2011-018	73.6	NPPD	Steele City 115kV	Wind	20%	100%

SPP Queue	Capacity MW	Area	Proposed Point of Interconnection	Fuel Type	SP output	SH output
GEN-2011-027	120	NPPD	Tap Hoskins - Twin Church 230kV	Wind	20%	100%
GEN-2011-056	3.6	NPPD	Jeffrey 115kV	Hydro	100%	100%
GEN-2011-056A	3.6	NPPD	John 1 115kV	Hydro	100%	100%
GEN-2011-056B	4.5	NPPD	John 2 115kV	Hydro	100%	100%
GEN-2012-021	4.8	LES	Terry Bundy Generating Station 115kV	Gas	100%	100%
GEN-2013-002	50.6	LES	Tap Sheldon - Folsom & Pleasant Hill (GEN-2013-002 Tap) 115kV CKT 2	Wind	20%	100%
GEN-2013-008	1.2	NPPD	Steele City 115kV	Wind	20%	100%
GEN-2013-014	25.5	NPPD	Tap Guide Rock - Pauline (Rosemont) 115kV	Wind	20%	100%
GEN-2013-019	73.6	LES	Tap Sheldon - Folsom & Pleasant Hill (GEN-2013-002 Tap) 115kV CKT 2	Wind	20%	100%
GEN-2013-032	204	NPPD	Antelope 115kV	Wind	20%	100%
GEN-2014-004	4	NPPD	Steele City 115kV (GEN-2011-018 POI)	Wind	20%	100%
GEN-2014-013	73.5	NPPD	Meadow Grove (GEN-2008-086N2 Sub) 230kV	Wind	20%	100%
GEN-2014-021	300	GMO	Tap Nebraska City - MullinCreek 345kV	Wind	20%	100%
GEN-2014-031	35.8	NPPD	Meadow Grove 230kV	Wind	20%	100%
GEN-2014-032	10.2	NPPD	Meadow Grove 230kV	Wind	20%	100%
GEN-2014-039	73.4	NPPD	Friend 115kV	Wind	20%	100%

DISIS-2015-001-2
GENERATION INTERCONNECTION FACILITY STUDY

SPP GEN-2015-023 **300.7 MW at Holt County 345 kV Substation**

June 2021

PREPARED FOR:
SOUTHWEST POWER POOL

PREPARED BY:
NEBRASKA PUBLIC POWER DISTRICT
DELIVERY

Nebraska Public Power District
"Always there when you need us"

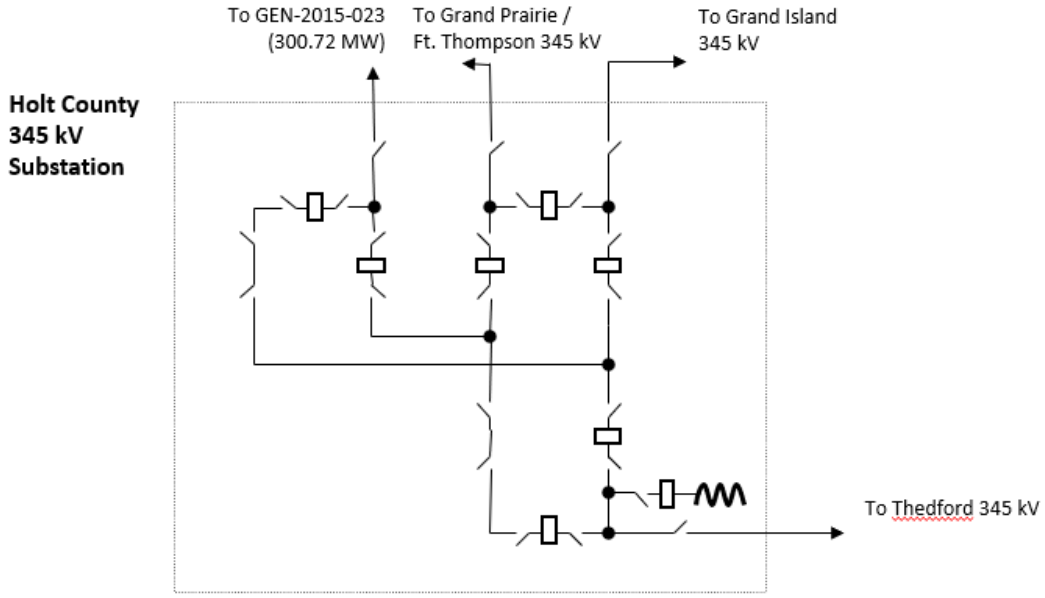
The *NPPD DISIS-2015-001-2 Facility Study* was performed to document the modification to the proposed interconnection of GEN-2015-023 per the request of the GI customer. The GI customer has requested to advance installation of the Holt County substation to enable interconnection of GEN-2015-023. The R-Project (GGS-Thedford-Holt County 345 kV) remains a required network upgrade for the interconnection of GEN-2015-023, however, the R-Project is currently delayed due to US District Court action regarding permitting of the R-Project. The construction of the Holt County 345 kV substation was well underway prior to the action of the US District Court. The GI customer has requested NPPD complete the installation of the Holt County 345 kV substation for GEN-2015-023 and has agreed to fund the substation construction to enable interconnection of GEN-2015-023. To support this effort, this facility study was performed to update the cost estimate associated with the construction of the Holt County 345 kV substation for inclusion in an updated GIA for GEN-2015-023. The previous studywork performed for GEN-2015-023 was reviewed and this review is documented below:

Powerflow Analysis – The powerflow analysis performed for *NPPD DISIS-2015-001-1* is sufficient and not needed to be updated for *NPPD DISIS-2015-001-2*.

Short Circuit Analysis – The short circuit analysis performed for *NPPD DISIS-2015-001-1* is sufficient and not needed to be updated for *NPPD DISIS-2015-001-2*.

Stability Analysis – The stability analysis performed for *NPPD DISIS-2015-001-1* is sufficient and not needed to be updated for *NPPD DISIS-2015-001-2*.

A one-line diagram of the Holt County 345 kV substation with the wind project generation interconnection request is below:



NPPD has reviewed and prepared the following updated cost estimate for the Holt County 345 kV substation:

Holt County 345 kV substation: Construct 345 kV substation to interconnect GEN-2015-023 and R-Project on WAPA Ft. Thompson – Grand Prairie Wind – Grand Island 345 kV line.

$ 17.9 Million