GEN-2009-040 Impact Restudy for Generator Modification (Turbine Change)

February 2014
Generator Interconnection

Executive Summary

The GEN-2009-040 interconnection customer has requested a system impact restudy to determine the effects of changing wind turbine generators from the previously studied Vestas V90 1.8MW wind turbine generators. The customer requested that two different wind turbine vendors be studied:

1. Nordex N100 2.5MW wind turbine generators
2. Siemens VS 2.0MW wind turbine generators.

The customer documentation indicated that the Vestas wind turbine generators would be replaced by either all Nordex wind turbine generators or all Siemens wind turbine generators. That is, there will be no mixing of wind turbine generator models within GEN-2009-040. Therefore, the analysis of the two wind turbine generator models was conducted separately, but the results were presented in one report. Power-tek Global, Inc. (Power-tek) was commissioned to perform this restudy, and its report of the results is attached.

The customer project is located near Summerfield in Marshall County, Kansas, and the point of interconnection (POI) is the proposed Westar Energy, Inc. (WRI) Marshall 115kV substation on the Knob Hill to South Seneca 115kV transmission line. The following table shows for each wind turbine generator studied the number of generators, the total power, and the reactive capability.

Generator Model	Size (MW)	Reactive Capability	
		Lagging power factor (Providing VARS)	**Leading power factor** (Absorbing VARS)
Nordex K08 N100 2.5MW (29 machines)	72.5	0.957	0.957
Siemens VS 2.3MW (32 machines)	73.6	0.900	0.900

The restudy showed that no stability problems were found during the 2014 winter peak, the 2015 summer peak and the 2024 summer peak conditions as a result of changing to either the Nordex 2.5MW wind turbine generator or the Siemens 2.3MW wind turbine generator. Additionally, the project wind farm was found to stay connected during the contingencies that were studied and, therefore, will meet the Low Voltage Ride Through (LVRT) requirements of FERC Order #661A.

A power factor analysis for each wind turbine model was performed in this study. The facility will be required to maintain a 95% lagging (providing VARs) and 95% leading (absorbing VARs) power factor at the POI. The Nordex machine will need external reactive equipment in order for the facility to meet the power factor requirement at the POI. The Siemens machine may need external reactive equipment in order for the facility to meet the power factor requirement at the POI.

It should be noted that although this study analyzed many of the most probable contingencies, it is not an all-inclusive list that can account for every operational situation. Additionally, the generator[s] may not be able to inject any power onto the Transmission System due to constraints that fall below the threshold of mitigation for a Generator Interconnection request. Because of this, it is likely that the **Customer may be required to reduce their generation output to 0 MW under certain system conditions** to allow system operators to maintain the reliability of the transmission network.

With the assumptions outlined in this report and with all the required network upgrades from the GEN-2009-040 GIA in place, GEN-2009-040 should be able to reliably interconnect to the SPP transmission grid.

Nothing in this study should be construed as a guarantee of transmission service. If the customer wishes to obtain deliverability to a specific customer, a separate request for transmission service shall be requested on Southwest Power Pool's OASIS by the Customer.

Southwestern Power Pool Inc. (SPP)

Definitive Impact Study

GEN-2009-040 System Impact Restudy

(Nordex 2.5MW) and (Siemens 2.3MW)

Final Report Submitted to
Southwest Power Pool Inc.
February-2014

POWER-tek Global Inc.
2 Robert Speck Parkway, Suite 750, Mississauga, Ontario, L4Z 1H8 Canada
647 300 3160
info@powertek-usa.com, www.powertek-usa.com

TABLE OF CONTENTS

1. Executive Summary

This report presents the results of impact study comprising of power factor and stability analyses of the proposed interconnection projects under GEN-2009-040 (the Project) while separately testing both Nordex 2.5MW as well as Siemens 2.3MW machines as described in the following table.

Table 1.1: Interconnection Request

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2009-040	72.5	Nordex 2.5MW (29 machines for a total of 72.5MW) (575064)	Tap on the Knob Hill – Smittyville 115kV line. Marshall 115kV (533349)
	73.6	Siemens 2.3MW (32 machines for a total of 73.6MW) (575064)	

Power factor analysis and transient stability simulations were performed for the Project in service at its full output. SPP provided three base cases for Winter-2014, Summer-2015, and Summer-2024, each comprising of a power flow and corresponding dynamics database. The previous queued request projects are already modeled in the base cases.

The power factor analysis consists of running all N-1, three phase contingencies shown in the Fault Definitions table (Table 3 in the RFP) in power flow to advise the necessary power factor at the point of interconnection (POI) for each contingency.

The power factor analysis indicates that interconnection request GEN-2009-040 is required to provide reactive power as indicated in Tables 3.2.2 through 3.2.4. In case of selection of Nordex Machine, GEN-2009-040 will need additional means of providing reactive power as the Nordex machines have 0.957 lagging (supplying vars) and 0.957 leading (absorbing vars) var capability. However, in case of selection of Siemens machine, as the Siemens machines have 0.90 lagging (supplying vars) and 0.90 leading (absorbing vars) var capability, the Interconnection Customer will need to determine if additional reactive equipment is required to maintain the power factor requirements at the Point of Interconnection.

Per the SPP OATT, the Interconnection Customer will be required to provide 95% lagging (supplying vars) and 95% leading (absorbing vars) at the POI.

There are no impacts on the stability performance of the SPP system for the contingencies simulated on the supplied base cases. The study Project stayed on-line and stable for all simulated faults. The Project stability simulations with thirty nine (39) specified test disturbances did not show instability problems in the SPP system and oscillations were damped out.

2. Introduction

2.1. Project Overview and Assumptions

The GEN-2009-040 Impact Study is a generation interconnection study performed by POWER-tek Global Inc. for Southwest Power Pool (SPP). This report presents the results of impact study comprising of power factor and stability analyses of the proposed interconnection project under GEN-2009-040 ("The Project") while separately testing both Nordex 2.5MW as well as Siemens 2.3MW machines as described in Table 2.1.1 below:

Table 2.1.1: Interconnection Requests

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2009-040	72.5	Nordex 2.5MW (29 machines for a total of 72.5MW) (575064)	Tap on the Knob Hill – Smittyville 115kV line. Marshall 115kV (533349)
	73.6	Siemens 2.3MW (32 machines for a total of 73.6MW) (575064)	

Figure 2.1.1 shows the single line diagram for the interconnection of the Project to present and planned system of SPP. This arrangement was modeled and studied for both machines in power flow cases for this Project.

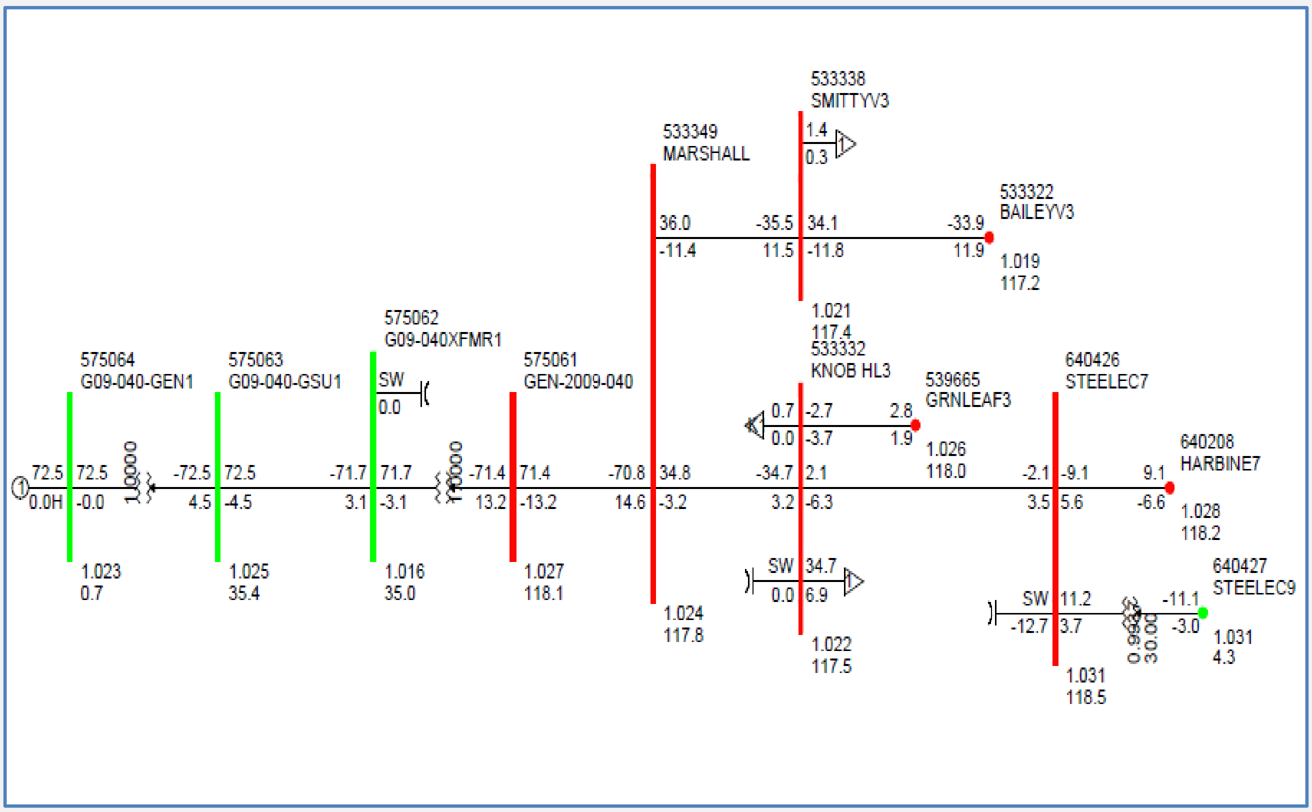

Figure 2.1.1: Power Flow Single Line Diagram for GEN-2009-040 and surrounding system components

Appendix-D contains the Nordex and Siemens machines, interconnection, and machine user model parameters. Table 2.1.2 below shows the list of prior queued projects modeled in the base case.

Table 2.1.2: List of previous queued request projects

Request	Size (MW)	Wind Turbine Model	Point of Interconnection
GEN-2003-021N	75	GE 1.5MW	Tap on the Ainsworth – Calamus 115kV line (640050)
GEN-2004-005N	30	GE 1.5MW	St Francis 115kV (640351)
GEN-2004-023N	75	GENROU	Columbus 115kV (640119)
GEN-2006-020N	42	Vestas 3.0MW	Bloomfield 115kV (640084)
GEN-2006-037N1	75	GE 1.5MW	Broken Bow 115kV (640089)
GEN-2006-038N005	79.5	GE 1.5MW	Broken Bow 115kV (640089)
GEN-2006-038N019	79.5	GE 1.5MW	Petersburg 115kV (640444)
GEN-2006-044N	40.5	GE 1.5MW	Petersburg 115kV (640444)
GEN-2007-011N08	81	Vestas 3.0MW	Bloomfield 115kV (640084)
GEN-2008-086N02	199.5	GE 1.5MW	Tap on the Columbus – Ft Randall 230kV line (560006)
GEN-2008-119O	60	GE 1.5MW	S1399 161kV (646399)
GEN-2008-123N	89.7	SMK203	Tap on the Pauline – Guide Rock 115kV (560137)

ATC (Available Transfer Capability) studies were not performed as part of this study. These studies will be required at the time transmission service is actually requested. Additional transmission upgrades may be required based on that analysis.

Study assumptions in general have been based on the specific information and data provided by SPP. The accuracy of the conclusions contained within this study is dependent on the assumptions made with respect to other generation additions and transmission improvements planned by other entities. Changes in the assumptions of the timing of other generation additions or transmission improvements may affect this study's conclusions.

2.2. Objectives

The objectives of the study are to conduct power factor analysis and to determine the impact on system stability of interconnecting the proposed wind farm to SPP's transmission system.

2.3. Models and Simulations Tools Used

Version 32 of the Siemens, PSS/E™ power system simulation program was used in this study.

SPP provided its latest stability database cases for winter-2014, summer-2015, and summer-2024 peak seasons. The Project's PSS/E model had been developed prior to this study and was included in the power flow case and the dynamics database. Machine, interconnection and dynamic model data for the Project plant (both Nordex and Siemens) is provided in Appendix D.

Power flow single line diagram of the projects in summer-2015 peak condition is shown in Figure 2.1.1 This Figure shows that wind farm model includes representation of the radial transmission line, the substation transformer from transmission voltage to 34.5V and 115 kV respectively. The remainder of each wind farm is represented by lumped equivalents including a generator, a step-up transformer, and collector system impedance.

No special modeling is required of line relays in these cases, except for the special modeling related to the wind-turbine tripping.

All generators in Areas 531, 534, 536, 540, 541, 640, 645, 650, and 652 were monitored. Additionally, adjacent generating units in the WAPA system have been monitored.

3. Power Factor Analysis

3.1. Methodology

Power factor analysis was conducted for the Project using the following methodology:

1. Replace the wind farm by a generator at the high side bus 345 kV, 138 kV, 115kV, or 69 kV bus, as applicable, with the MW of the wind farms at that point of interconnection.
2. Turn off the wind farm as modeled (as well as previous queued projects at the same point of interconnection).
3. Model a var generator at the Project's high voltage side, 345 kV, 138 kV, 115kV, or 69kV bus, as applicable. The var generator is set to hold a voltage schedule at the POI consistent with the voltage schedule in the provided power flow cases for summer and winter or 1.0 pu voltage, whichever is higher.
4. Perform the steady state contingency analysis to determine the power factor necessary at the POI for each contingency.
5. If the required power factor at the POI is beyond the capability of the studied wind turbines to meet (at the POI) capacitor banks may be considered for the stability analysis. The preference is to locate the capacitance banks on the 34.5 kV customer side. Factors to sizing capacitor banks include:
   5.1. The ability of the wind farm to meet FERC Order 661A (low voltage ride through) with and without capacitor banks.
   5.2. The ability of the wind farm to meet FERC Order 661A (wind farm recovery to pre-fault voltage).
   5.3. If wind farms trips on high voltage, power factor lower than unity may be required.

3.2. Analysis

Analysis was performed for the proposed Project with all prior queued projects in service. A var generator was modeled at the point of interconnection and was set to hold a voltage schedule at the POI consistent with the voltage schedule in the provided power flow cases. These voltages for this Project are summarized in Table 3.2.1. All upgrades and instructions were made in the base cases. No other changes were made in the base cases provided, other than the addition of the var generators. Contingency analysis was run for provided list of contingencies.

Table 3.2.1: POI voltages for the summer and winter peak cases

Request	Point of Interconnection	Size (MW)	Base Case Voltage (p.u.)		
			Winter 2014 Peak	Summer 2015 Peak	Summer 2024 Peak
GEN-2009-040	Tap on the Knob Hill – Smittyville 115kV line. Marshall 115kV (533349)	73.6	1.0219	1.024	1.0337

POI: (533349) – Tap on the Knob Hill – Smittyville 115kV line

The details of the var requirement during contingencies are highlighted in Table 3.2.2, 3.2.3 and 3.2.4. The highest and the lowest values obtained are highlighted in these tables.

1. For 2014 winter case, the maximum var generator supply is 17.6 MVARs at 0.97 (lagging power factor) for the outage of 533217 [KELLY 3 115.0] TO BUS 533337 [SENECA 3 115.0] CKT outage. The minimum var requirement is -0.1 MVAR at 1.0 (leading power factor) for outage of 533332 [KNOB HL3 115.0] TO BUS 539665 [GRNLEAF3 115.0] CKT outage.

Table 3.2.2: Var Generator Output in 2014 Winter Peak Case for GEN-2009-040

2014 Winter Peak Case Power Factor Study:

	Rated MW of Wind Farms OR at POI (MW) Rated MVAR of Wind Farms OR at POI (MVAR)					Analysis for NORDEX Machine		Analysis for SIEMENS Machine	
						GEN MW at POI 72.5		GEN MW at POI 73.6	
Cont. Name	**From Bus (# & Name)**		**To Bus (# & Name)**		**ID**	**MVAR at POI**	**P.F at POI**	**MVAR at POI**	**P.F at POI**
	Base Case MVAR Flow				N/A	2.9	1.00	2.9	1.00
FLT01-3PH	533349	MARSHALL 115.00	533338	SMITTYV3 115.00	CKT 1	2.7	1.00	2.7	1.00
FLT02-3PH	533217	KELLY 3 115.00	533337	SENECA 3 115.00	CKT 1	17.6	0.97	17.6	0.97
FLT03-3PH	640278	SHELDON7 115.00	640088	BPS SUB7 115.00	CKT 1	3.0	1.00	3.0	1.00
FLT04-3PH	640278	SHELDON7 115.00	640111	CLATONA7 115.00	CKT 1	2.9	1.00	2.9	1.00
FLT05-3PH	640278	SHELDON7 115.00	640153	CRETE__7 115.00	CKT 1	3.6	1.00	3.6	1.00
FLT06-3PH	640278	SHELDON7 115.00	640171	FIRTH 7 115.00	CKT 1	3.8	1.00	3.8	1.00
FLT07-3PH	650242	FOLSM&PHIL 7 115.00	650238	20PIONEERS7 115.00	CKT 1	2.9	1.00	2.9	1.00
FLT08-3PH	650242	FOLSM&PHIL 7 115.00	650290	ROKEBY 7 115.00	CKT 1	2.9	1.00	2.9	1.00
FLT09-3PH	640076	BEATRCE7 115.00	640088	BPS SUB7 115.00	CKT 1	3.5	1.00	3.5	1.00
FLT10-3PH	640076	BEATRCE7 115.00	640208	HARBINE7 115.00	CKT 1	9.5	0.99	9.5	0.99
FLT11-3PH	640076	BEATRCE7 115.00	640361	STEINER7 115.00	CKT 1	2.7	1.00	2.7	1.00
FLT12-3PH	640235	HUMBOLT7 115.00	640361	STEINER7 115.00	CKT 1	2.7	1.00	2.7	1.00
FLT13-3PH	640208	HARBINE7 115.00	640169	FAIRBRY7 115.00	CKT 1	1.1	1.00	1.1	1.00
FLT14-3PH	640426	STEELEC7 115.00	640208	HARBINE7 115.00	CKT 1	4.7	1.00	4.7	1.00

	Rated MW of Wind Farms OR at POI (MW) Rated MVAR of Wind Farms OR at POI (MVAR)					Analysis for NORDEX Machine		Analysis for SIEMENS Machine	
						GEN MW at POI 72.5		GEN MW at POI 73.6	
Cont. Name	**From Bus (# & Name)**			**To Bus (# & Name)**	**ID**	**MVAR at POI**	**P.F at POI**	**MVAR at POI**	**P.F at POI**
FLT15-3PH	640426	STEELEC7 115.00	533332	KNOB HL3 115.00	CKT 1	14.7	0.98	14.7	0.98
FLT16-3PH	533332	KNOB HL3 115.00	539665	GRNLEAF3 115.00	CKT 1	-0.1	1.00	-0.1	1.00
FLT17-3PH	533332	KNOB HL3 115.00	533349	MARSHALL 115.00	CKT 1	0.3	1.00	0.3	1.00
FLT18-3PH	533217	KELLY 3 115.00	533331	KING HL3 115.00	CKT 1	1.8	1.00	1.8	1.00
FLT19-3PH	539656	CLIFTON3 115.00	539657	CONCORD3 115.00	CKT 1	3.4	1.00	3.4	1.00
FLT20-3PH	539657	CONCORD3 115.00	539650	BELOIT 3 115.00	CKT 1	3.5	1.00	3.5	1.00
FLT21-3PH	539657	CONCORD3 115.00	539669	JEWELL 3 115.00	CKT 1	3.7	1.00	3.7	1.00
FLT22-3PH	640277	MOORE 3 345.00	640139	COOPER 3 345.00	CKT 1	2.9	1.00	2.9	1.00
FLT23-3PH	640277	MOORE 3 345.00	640271	MCCOOL 3 345.00	CKT 1	3.2	1.00	3.2	1.00
FLT24-3PH	640277	MOORE 3 345.00	640312	PAULINE3 345.00	CKT 1	3.7	1.00	3.7	1.00
FLT25-3PH	640277	MOORE 3 345.00	650114	NW68HOLDRG 3 345.00	CKT 1	3.0	1.00	3.0	1.00
FLT26-3PH	640277	MOORE 3 345.00	650189	103&ROKEBY3 345.00	CKT 1	3.0	1.00	3.0	1.00
FLT27-3PH	640218	HEBRN N7 115.00	640169	FAIRBRY7 115.00	CKT 1	3.9	1.00	3.9	1.00
FLT28-3PH	640218	HEBRN N7 115.00	640105	CARLJCT7 115.00	CKT 1	3.6	1.00	3.6	1.00
FLT29-3PH	539639	ELMCREK6 230.00	539658	CONCRD6 230.00	CKT 1	12.0	0.99	12.0	0.99
FLT30-3PH	539639	ELMCREK6 230.00	532865	NMANHT6 230.00	CKT 1	2.5	1.00	2.5	1.00
FLT31-3PH	532766	JEC N 7 345.00	532765	HOYT 7 345.00	CKT 1	5.3	1.00	5.3	1.00
FLT32-3PH	532766	JEC N 7 345.00	532770	MORRIS 7 345.00	CKT 1	4.3	1.00	4.3	1.00
FLT33-3PH	532766	JEC N 7 345.00	532767	GEARY 7 345.00	CKT 1	4.4	1.00	4.4	1.00
FLT34-3PH	533163	HOYT 3 115.00	532765	HOYT 7 345.00	T/F	3.7	1.00	3.7	1.00
FLT35-3PH	640277	MOORE 3 345.00	640278	SHELDON7 115.00	T/F	2.9	1.00	2.9	1.00

	Rated MW of Wind Farms OR at POI (MW) Rated MVAR of Wind Farms OR at POI (MVAR)					Analysis for NORDEX Machine GEN MW at POI 72.5		Analysis for SIEMENS Machine GEN MW at POI 73.6	
Cont. Name	**From Bus (# & Name)**		**To Bus (# & Name)**		**ID**	**MVAR at POI**	**P.F at POI**	**MVAR at POI**	**P.F at POI**
FLT36-3PH	640235	HUMBOLT7 115.00	640234	HUMBOLT5 161.00	T/F	2.5	1.00	2.5	1.00
FLT37-3PH	533217	KELLY 3 115.00	532913	KELLY 5 161.00	T/F	13.0	0.98	13.0	0.98
FLT38-3PH	539657	CONCORD3 115.00	539658	CONCRD6 230.00	T/F	12.0	0.99	12.0	0.99
FLT39-3PH	539805	ELMCREEK7 345.00	539639	ELMCREK6 230.00	T/F	N/A	N/A	N/A	N/A

2. For 2014 summer case, the maximum var generator supply is 12.7 MVARs at 0.99 (lagging power factor) for the outage of 640076 [BEATRCE7 115.0] TO BUS 640208 [HARBINE7 115.0] CKT outage. The minimum var requirement is -1.5 MVAR at 1.0 (leading power factor) for outage of 640208 [HARBINE7 115.0] TO BUS 640169 [FAIRBRY7 115.0] CKT outage.

Table 3.2.3: Var Generator Output in 2015 Summer Peak Case for GEN-2009-040

2015 Summer Peak Case Power Factor Study

	Rated MW of Wind Farms OR at POI (MW) Rated MVAR of Wind Farms OR at POI (MVAR)					Analysis for NORDEX Machine GEN MW at POI 72.5		Analysis for SIEMENS Machine GEN MW at POI 73.6	
Cont. Name	**From Bus (# & Name)**		**To Bus (# & Name)**		**ID**	**MVAR at POI**	**P.F at POI**	**MVAR at POI**	**P.F at POI**
	Base Case MVAR Flow				N/A	2.2	1.00	2.2	1.00
FLT01-3PH	533349	MARSHALL 115.00	533338	SMITTYV3 115.00	CKT 1	4.2	1.00	4.2	1.00
FLT02-3PH	533217	KELLY 3 115.00	533337	SENECA 3 115.00	CKT 1	9.3	0.99	9.3	0.99
FLT03-3PH	640278	SHELDON7 115.00	640088	BPS SUB7 115.00	CKT 1	2.6	1.00	2.6	1.00
FLT04-3PH	640278	SHELDON7 115.00	640111	CLATONA7 115.00	CKT 1	2.4	1.00	2.4	1.00
FLT05-3PH	640278	SHELDON7 115.00	640153	CRETE__7 115.00	CKT 1	2.7	1.00	2.7	1.00

	Rated MW of Wind Farms OR at POI (MW) Rated MVAR of Wind Farms OR at POI (MVAR)					Analysis for NORDEX Machine GEN MW at POI 72.5		Analysis for SIEMENS Machine GEN MW at POI 73.6	
Cont. Name	**From Bus (# & Name)**		**To Bus (# & Name)**		**ID**	**MVAR at POI**	**P.F at POI**	**MVAR at POI**	**P.F at POI**
FLT06-3PH	640278	SHELDON7 115.00	640171	FIRTH 7 115.00	CKT 1	3.2	1.00	3.2	1.00
FLT07-3PH	650242	FOLSM&PHIL7 115.00	650238	20PIONEERS7 115.00	CKT 1	2.4	1.00	2.4	1.00
FLT08-3PH	650242	FOLSM&PHIL7 115.00	650290	ROKEBY 7 115.00	CKT 1	2.3	1.00	2.3	1.00
FLT09-3PH	640076	BEATRCE7 115.00	640088	BPS SUB7 115.00	CKT 1	2.8	1.00	2.8	1.00
FLT10-3PH	640076	BEATRCE7 115.00	640208	HARBINE7 115.00	CKT 1	12.7	0.99	12.7	0.99
FLT11-3PH	640076	BEATRCE7 115.00	640361	STEINER7 115.00	CKT 1	2.1	1.00	2.1	1.00
FLT12-3PH	640235	HUMBOLT7 115.00	640361	STEINER7 115.00	CKT 1	2.1	1.00	2.1	1.00
FLT13-3PH	640208	HARBINE7 115.00	640169	FAIRBRY7 115.00	CKT 1	-1.5	1.00	-1.5	1.00
FLT14-3PH	640426	STEELEC7 115.00	640208	HARBINE7 115.00	CKT 1	1.7	1.00	1.7	1.00
FLT15-3PH	640426	STEELEC7 115.00	533332	KNOB HL3 115.00	CKT 1	9.1	0.99	9.1	0.99
FLT16-3PH	533332	KNOB HL3 115.00	539665	GRNLEAF3 115.00	CKT 1	8.0	0.99	8.0	0.99
FLT17-3PH	533332	KNOB HL3 115.00	533349	MARSHALL 115.00	CKT 1	-1.5	1.00	-1.5	1.00
FLT18-3PH	533217	KELLY 3 115.00	533331	KING HL3 115.00	CKT 1	1.1	1.00	1.1	1.00
FLT19-3PH	539656	CLIFTON3 115.00	539657	CONCORD3 115.00	CKT 1	-0.9	1.00	-0.9	1.00
FLT20-3PH	539657	CONCORD3 115.00	539650	BELOIT 3 115.00	CKT 1	2.2	1.00	2.2	1.00
FLT21-3PH	539657	CONCORD3 115.00	539669	JEWELL 3 115.00	CKT 1	2.7	1.00	2.7	1.00
FLT22-3PH	640277	MOORE 3 345.00	640139	COOPER 3 345.00	CKT 1	2.3	1.00	2.3	1.00
FLT23-3PH	640277	MOORE 3 345.00	640271	MCCOOL 3 345.00	CKT 1	2.3	1.00	2.3	1.00
FLT24-3PH	640277	MOORE 3 345.00	640312	PAULINE3 345.00	CKT 1	2.3	1.00	2.3	1.00
FLT25-3PH	640277	MOORE 3 345.00	650114	NW68HOLDRG3 345.00	CKT 1	2.0	1.00	2.0	1.00

	Rated MW of Wind Farms OR at POI (MW) Rated MVAR of Wind Farms OR at POI (MVAR)					Analysis for NORDEX Machine GEN MW at POI 72.5		Analysis for SIEMENS Machine GEN MW at POI 73.6	
Cont. Name	**From Bus (# & Name)**		**To Bus (# & Name)**		**ID**	**MVAR at POI**	**P.F at POI**	**MVAR at POI**	**P.F at POI**
FLT26-3PH	640277	MOORE 3 345.00	650189	103&ROKEBY3 345.00	CKT 1	2.1	1.00	2.1	1.00
FLT27-3PH	640218	HEBRN N7 115.00	640169	FAIRBRY7 115.00	CKT 1	2.5	1.00	2.5	1.00
FLT28-3PH	640218	HEBRN N7 115.00	640105	CARLJCT7 115.00	CKT 1	1.4	1.00	1.4	1.00
FLT29-3PH	539639	ELMCREK6 230.00	539658	CONCRD6 230.00	CKT 1	8.7	0.99	8.7	0.99
FLT30-3PH	539639	ELMCREK6 230.00	532865	NMANHT6 230.00	CKT 1	2.0	1.00	2.0	1.00
FLT31-3PH	532766	JEC N 7 345.00	532765	HOYT 7 345.00	CKT 1	3.3	1.00	3.3	1.00
FLT32-3PH	532766	JEC N 7 345.00	532770	MORRIS 7 345.00	CKT 1	2.9	1.00	2.9	1.00
FLT33-3PH	532766	JEC N 7 345.00	532767	GEARY 7 345.00	CKT 1	3.2	1.00	3.2	1.00
FLT34-3PH	533163	HOYT 3 115.00	532765	HOYT 7 345.00	T/F	5.3	1.00	5.3	1.00
FLT35-3PH	640277	MOORE 3 345.00	640278	SHELDON7 115.00	T/F	2.2	1.00	2.2	1.00
FLT36-3PH	640235	HUMBOLT7 115.00	640234	HUMBOLT5 161.00	T/F	2.0	1.00	2.0	1.00
FLT37-3PH	533217	KELLY 3 115.00	532913	KELLY 5 161.00	T/F	11.0	0.99	11.0	0.99
FLT38-3PH	539657	CONCORD3 115.00	539658	CONCRD6 230.00	T/F	8.8	0.99	8.8	0.99
FLT39-3PH	539805	ELMCREEK7 345.00	539639	ELMCREK6 230.00	T/F	N/A	N/A	N/A	N/A

3. For 2024 summer case, the maximum var generator supply is 11.4 MVARs at 0.99 (lagging power factor) for the outage of 640076 [BEATRCE7 115.0] TO BUS 640208 [HARBINE7 115.0] CKT outage. The minimum var requirement is -0.6 MVAR at 1.0 (leading power factor) for outage of 533349 [MARSHALL 115.0] TO BUS 533338 [SMITTYV3 115.0] CKT outage.

Table 3.2.4: Var Generator Output in 2024 Summer Peak Case for GEN-2009-040

2024 Summer Peak Case Power Factor Study

	Rated MW of Wind Farms OR at POI (MW) Rated MVAR of Wind Farms OR at POI (MVAR)					Analysis for NORDEX Machine GEN MW at POI 72.5		Analysis for SIEMENS Machine GEN MW at POI 73.6	
Cont. Name	**From Bus (# & Name)**		**To Bus (# & Name)**		**ID**	**MVAR at POI**	**P.F at POI**	**MVAR at POI**	**P.F at POI**
	Base Case MVAR Flow				N/A	3.2	1.00	3.2	1.00
FLT01-3PH	533349	MARSHALL 115.00	533338	SMITTYV3 115.00	CKT 1	-0.6	1.00	-0.6	1.00
FLT02-3PH	533217	KELLY 3 115.00	533337	SENECA 3 115.00	CKT 1	6.5	1.00	6.5	1.00
FLT03-3PH	640278	SHELDON7 115.00	640088	BPS SUB7 115.00	CKT 1	3.3	1.00	3.3	1.00
FLT04-3PH	640278	SHELDON7 115.00	640111	CLATONA7 115.00	CKT 1	3.2	1.00	3.2	1.00
FLT05-3PH	640278	SHELDON7 115.00	640153	CRETE__7 115.00	CKT 1	3.5	1.00	3.5	1.00
FLT06-3PH	640278	SHELDON7 115.00	640171	FIRTH 7 115.00	CKT 1	4.4	1.00	4.4	1.00
FLT07-3PH	650242	FOLSM&PHIL7 115.00	650238	20PIONEERS7 115.00	CKT 1	3.3	1.00	3.3	1.00
FLT08-3PH	650242	FOLSM&PHIL7 115.00	650290	ROKEBY 7 115.00	CKT 1	3.2	1.00	3.2	1.00
FLT09-3PH	640076	BEATRCE7 115.00	640088	BPS SUB7 115.00	CKT 1	3.7	1.00	3.7	1.00
FLT10-3PH	640076	BEATRCE7 115.00	640208	HARBINE7 115.00	CKT 1	11.4	0.99	11.4	0.99
FLT11-3PH	640076	BEATRCE7 115.00	640361	STEINER7 115.00	CKT 1	2.9	1.00	2.9	1.00
FLT12-3PH	640235	HUMBOLT7 115.00	640361	STEINER7 115.00	CKT 1	3.0	1.00	3.0	1.00
FLT13-3PH	640208	HARBINE7 115.00	640169	FAIRBRY7 115.00	CKT 1	2.1	1.00	2.1	1.00
FLT14-3PH	640426	STEELEC7 115.00	640208	HARBINE7 115.00	CKT 1	11.1	0.99	11.1	0.99
FLT15-3PH	640426	STEELEC7 115.00	533332	KNOB HL3 115.00	CKT 1	4.3	1.00	4.3	1.00
FLT16-3PH	533332	KNOB HL3 115.00	539665	GRNLEAF3 115.00	CKT 1	7.7	0.99	7.7	0.99
FLT17-3PH	533332	KNOB HL3 115.00	533349	MARSHALL 115.00	CKT 1	4.2	1.00	4.2	1.00
FLT18-3PH	533217	KELLY 3 115.00	533331	KING HL3 115.00	CKT 1	1.5	1.00	1.5	1.00
FLT19-3PH	539656	CLIFTON3 115.00	539657	CONCORD3 115.00	CKT 1	1.2	1.00	1.2	1.00

	Rated MW of Wind Farms OR at POI (MW) Rated MVAR of Wind Farms OR at POI (MVAR)					Analysis for NORDEX Machine GEN MW at POI 72.5		Analysis for SIEMENS Machine GEN MW at POI 73.6	
Cont. Name	From Bus (# & Name)		To Bus (# & Name)		ID	MVAR at POI	P.F at POI	MVAR at POI	P.F at POI
FLT20-3PH	539657	CONCORD3 115.00	539650	BELOIT 3 115.00	CKT 1	3.2	1.00	3.2	1.00
FLT21-3PH	539657	CONCORD3 115.00	539669	JEWELL 3 115.00	CKT 1	3.5	1.00	3.5	1.00
FLT22-3PH	640277	MOORE 3 345.00	640139	COOPER 3 345.00	CKT 1	3.1	1.00	3.1	1.00
FLT23-3PH	640277	MOORE 3 345.00	640271	MCCOOL 3 345.00	CKT 1	3.2	1.00	3.2	1.00
FLT24-3PH	640277	MOORE 3 345.00	640312	PAULINE3 345.00	CKT 1	3.3	1.00	3.3	1.00
FLT25-3PH	640277	MOORE 3 345.00	650114	NW68HOLDRG3 345.00	CKT 1	3.1	1.00	3.1	1.00
FLT26-3PH	640277	MOORE 3 345.00	650189	103&ROKEBY3 345.00	CKT 1	3.1	1.00	3.1	1.00
FLT27-3PH	640218	HEBRN N7 115.00	640169	FAIRBRY7 115.00	CKT 1	4.9	1.00	4.9	1.00
FLT28-3PH	640218	HEBRN N7 115.00	640105	CARLJCT7 115.00	CKT 1	0.8	1.00	0.8	1.00
FLT29-3PH	539639	ELMCREK6 230.00	539658	CONCRD6 230.00	CKT 1	9.7	0.99	9.7	0.99
FLT30-3PH	539639	ELMCREK6 230.00	532865	NMANHT6 230.00	CKT 1	2.2	1.00	2.2	1.00
FLT31-3PH	532766	JEC N 7 345.00	532765	HOYT 7 345.00	CKT 1	4.2	1.00	4.2	1.00
FLT32-3PH	532766	JEC N 7 345.00	532770	MORRIS 7 345.00	CKT 1	3.3	1.00	3.3	1.00
FLT33-3PH	532766	JEC N 7 345.00	532767	GEARY 7 345.00	CKT 1	4.6	1.00	4.6	1.00
FLT34-3PH	533163	HOYT 3 115.00	532765	HOYT 7 345.00	T/F	6.4	1.00	6.4	1.00
FLT35-3PH	640277	MOORE 3 345.00	640278	SHELDON7 115.00	T/F	2.8	1.00	2.8	1.00
FLT36-3PH	640235	HUMBOLT7 115.00	640234	HUMBOLT5 161.00	T/F	2.5	1.00	2.5	1.00
FLT37-3PH	533217	KELLY 3 115.00	532913	KELLY 5 161.00	T/F	10.3	0.99	10.3	0.99
FLT38-3PH	539657	CONCORD3 115.00	539658	CONCRD6 230.00	T/F	9.9	0.99	9.9	0.99
FLT39-3PH	539805	ELMCREEK7 345.00	539639	ELMCREK6 230.00	T/F	4.1	N/A	4.1	N/A

3.3. Conclusions

The power factor analysis indicates the GEN-2009-040 interconnection request is required to maintain the SPP standard power factor at the point of interconnection i.e., Tap on the Knob Hill – Smittyville 115kV line, Marshall 115kV BUS 533349 based on the contingencies studied. It has been observed that for Nordex Machine, GEN-2009-040 will need additional means of providing reactive power as the Nordex machines have 0.957 lagging (supplying vars) and 0.957 leading (absorbing vars) var capability. However, in case of selection of Siemens machine, as the Siemens machines have 0.90 lagging (supplying vars) and 0.90 leading (absorbing vars) var capability, the Interconnection Customer will need to determine if additional reactive equipment is required to maintain the power factor requirements at the Point of Interconnection.

Per the SPP OATT, the Interconnection Customer will be required to provide 95% lagging (supplying vars) and 95% leading (absorbing vars) at the POI.

4. Stability Analysis

4.1. Faults Simulated

Thirty Nine (39) faults were considered for the transient stability simulations, at the locations defined by SPP. Concurrently and previously queued projects as respectively shown in Table-1 and Table-2 of the study request i.e., (GEN-2003-021N, GEN-2004-005N, GEN-2004-023N, GEN-2006-020N, GEN-2006-037N1, GEN-2006-038N005, GEN-2006-038N019, GEN-2006-044N, GEN-2007-011N08, GEN-2008-086N02, GEN-2008-119O, GEN-2008-123N) other neighboring machines, as well as areas number 531, 534, 536, 540, 541, 640, 645, 650, and 652 were monitored during all the simulations. Table 4.1.1 shows the list of simulated contingencies. This table also shows the fault clearing time and the time delay before re-closing for all the study contingencies if any.

Simulations were performed with a 0.1-second steady-state run followed by the appropriate disturbance as described in Table 4.1.1. Simulations were run for minimum 15-second duration to confirm proper machine damping.

Table 4.1.1 summarizes the overall results for all faults simulations for both Nordex and Siemens Machines.
Complete sets of plots in case of Nordex machines in service for winter-2014, summer-2015, and summer-2024 peak seasons for each fault are included in Appendices A, B and C respectively.
Similarly complete sets of plots in case of Siemens machines in service for winter-2014, summer-2015, and summer-2024 peak seasons for each fault are included in Appendices E, F and G respectively.

Table 4.1.1: List of simulated faults for stability analysis for both Nordex and Siemens Machines

Cont. #	Contingency Name	Description	2014 Winter Results	2015 Summer Results	2024 Summer Results
1	FLT01-3PH	3 phase fault on the Marshall (533349) to Smittyville (533338) 115kV near Marshall. a. Apply fault at Marshall 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
2	FLT02-3PH	3 phase fault on the Kelly (533217) to Seneca (533337) 115kV near Kelly. a. Apply fault at Kelly 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
3	FLT03-3PH	3 phase fault on the Sheldon (640278) to BPS Sub (640088) 115kV near Sheldon. a. Apply fault at Sheldon 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
4	FLT04-3PH	3 phase fault on the Sheldon (640278) to Clatonia (640111) 115kV near Sheldon. a. Apply fault at Sheldon 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
5	FLT05-3PH	3 phase fault on the Sheldon (640278) to Crete (640153) 115kV near Sheldon. a. Apply fault at Sheldon 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
6	FLT06-3PH	3 phase fault on the Sheldon (640278) to Firth (640171) 115kV near Sheldon. a. Apply fault at Sheldon 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
7	FLT07-3PH	3 phase fault on the Folsom (650242) to Pioneers (650238) 115kV near Folsom. a. Apply fault at Folsom 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
8	FLT08-3PH	3 phase fault on the Folsom (650242) to Rokeby (650290) 115kV near Folsom. a. Apply fault at Folsom 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
9	FLT09-3PH	3 phase fault on the Beatrice (640076) to BPS Sub (640088) 115kV near Beatrice. a. Apply fault at Beatrice 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable

Cont. #	Contingency Name	Description	2014 Winter Results	2015 Summer Results	2024 Summer Results
10	FLT10-3PH	3 phase fault on the Beatrice (640076) to Harbine (640208) 115kV near Beatrice. a. Apply fault at Beatrice 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
11	FLT11-3PH	3 phase fault on the Beatrice (640076) to Steiner (640361) 115kV near Beatrice. a. Apply fault at Beatrice 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
12	FLT12-3PH	3 phase fault on the Humboldt (640235) to Steiner (640361) 115kV near Humboldt. a. Apply fault at Humboldt 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
13	FLT13-3PH	3 phase fault on the Harbine (640208) to Fairbury (640169) 115kV near Harbine. a. Apply fault at Harbine 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
14	FLT14-3PH	3 phase fault on the Steele City (640426) to Harbine (640208) 115kV near Harbine. a. Apply fault at Harbine 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
15	FLT15-3PH	3 phase fault on the Steele City (640426) to Knob Hill (533332) 115kV near Harbine. a. Apply fault at Harbine 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
16	FLT16-3PH	3 phase fault on the Knob Hill (533332) to Green Leaf (539665) 115kV near Knob Hill. a. Apply fault at Knob Hill 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
17	FLT17-1PH	3 phase fault on the Knob Hill (533332) to Marshall (533349) 115kV near Knob Hill. a. Apply fault at Knob Hill 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
18	FLT18-3PH	3 phase fault on the Kelly (533217) to King Hill (533331) 115kV near Kelly. a. Apply fault at Kelly 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
19	FLT19-1PH	3 phase fault on the Clifton (539656) to Concordia (539657) 115kV near Clifton. a. Apply fault at Clifton 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable

Cont. #	Contingency Name	Description	2014 Winter Results	2015 Summer Results	2024 Summer Results
20	FLT20-3PH	3 phase fault on the Concordia (539657) to Beloit (539650) 115kV near Concordia. a. Apply fault at Concordia 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
21	FLT21-3PH	3 phase fault on the Concordia (539657) to Jewell (539669) 115kV near Concordia. a. Apply fault at Concordia 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
22	FLT22-3PH	3 phase fault on the Moore (640277) to Cooper (640139) 345kV line, near Moore. a. Apply fault at the Moore 345kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.	Stable	Stable	Stable
23	FLT23-3PH	3 phase fault on the Moore (640277) to McCool (640271) 345kV line, near Moore. a. Apply fault at the Moore 345kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.	Stable	Stable	Stable
24	FLT24-3PH	3 phase fault on the Moore (640277) to Pauline (640312) 345kV line, near Moore. a. Apply fault at the Moore 345kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.	Stable	Stable	Stable
25	FLT25-3PH	3 phase fault on the Moore (640277) to NW68Holdrg (650114) 345kV line, near Moore. a. Apply fault at the Moore 345kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.	Stable	Stable	Stable
26	FLT26-3PH	3 phase fault on the Moore (640277) to 103&Rokeby (650189) 345kV line, near Moore. a. Apply fault at the Moore 345kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.	Stable	Stable	Stable
27	FLT27-3PH	3 phase fault on the Hebron North (640218) to Fairbury (640169) 115kV near Hebron North. a. Apply fault at Hebron North 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
28	FLT28-3PH	3 phase fault on the Hebron North (640218) to Carlton Jct (640105) 115kV near Hebron North. a. Apply fault at Hebron North 115kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
29	FLT29-3PH	3 phase fault on the Elm Creek (539639) to Concordia (539658) 230kV near Elm Creek. a. Apply fault at Elm Creek 230kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable

Cont. #	Contingency Name	Description	2014 Winter Results	2015 Summer Results	2024 Summer Results
30	FLT30-3PH	3 phase fault on the Elm Creek (539639) to N. Manhattan (532865) 230kV near Elm Creek. a. Apply fault at Elm Creek 230kV bus. b. Clear fault after 6.5 cycles by tripping faulted line.	Stable	Stable	Stable
31	FLT31-3PH	3 phase fault on the JEC N (532766) to Hoyt (532765) 345kV line, near JEC N. a. Apply fault at the JEC N 345kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.	Stable	Stable	Stable
32	FLT32-3PH	3 phase fault on the JEC N (532766) to Morris (532770) 345kV line, near JEC N. a. Apply fault at the JEC N 345kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.	Stable	Stable	Stable
33	FLT33-3PH	3 phase fault on the JEC N (532766) to Summit (532773) 345kV line, near JEC N. a. Apply fault at the JEC N 345kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line. For 2024 Case: 3 phase fault on the JEC N (532766) to *GEARY 7* (532767) 345kV line, near JEC N. a. Apply fault at the JEC N 345kV bus. b. Clear fault after 6.5 cycles by tripping the faulted line.	Stable	Stable	Stable
34	FLT34-3PH	3 phase fault on the Hoyt (533163) 115kV to Hoyt (532765) 345kV/(532804) 14.4kV transformer at the 115kV bus. a. Apply fault at the Hoyt 115kV bus. b. Clear fault after 5.5 cycles by tripping the transformer	Stable	Stable	Stable
35	FLT35-3PH	3 phase fault on the Moore (640277) 345kV to Sheldon (640278) 115kV/(640280) 13.8kV transformer at the 345kV bus. a. Apply fault at the Moore 345kV bus. b. Clear fault after 5.5 cycles by tripping the transformer	Stable	Stable	Stable
36	FLT36-3PH	3 phase fault on the Humboldt (640235) 115kV to Humboldt (640234) 161kV/(643087) 13.8kV transformer at the 115kV bus. a. Apply fault at the Humboldt 115kV bus. b. Clear fault after 5.5 cycles by tripping the transformer	Stable	Stable	Stable

Cont. #	Contingency Name	Description	2014 Winter Results	2015 Summer Results	2024 Summer Results
37	FLT37-3PH	3 phase fault on the Kelly (533217) 115kV to Kelly (532913) 161kV/(532942) 13.8kV transformer at the 115kV bus. a. Apply fault at the Kelly 115kV bus. b. Clear fault after 5.5 cycles by tripping the transformer	Stable	Stable	Stable
38	FLT38-3PH	3 phase fault on the Concordia (539657) 115kV to Concordia (539658) 230kV/(539904) 13.8kV transformer at the 115kV bus. a. Apply fault at the Concordia 115kV bus. b. Clear fault after 5.5 cycles by tripping the transformer	Stable	Stable	Stable
39	FLT39-3PH (2024 Summer only)	3 phase fault on the Elm Creek (539639)230kV to Elm Creek (539805) 345kV/(539806) 13.8kV transformer at the 345kV bus. a. Apply fault at the Pauline 345kV bus. b. Clear fault after 5.5 cycles by tripping the transformer	N/A	N/A	Stable

4.2. Simulation Results

There are no impacts on the stability performance of the SPP system for the contingencies tested on the SPP provided base cases.

5. Conclusions

The findings of the impact study for the proposed interconnection projects under GEN-2009-040 (Restudy) considered at 100% of their proposed installed capacity is as follows:

1. The power factor analysis indicates that GEN-2009-040 interconnection request is required to maintain the SPP standard power factor at the point of interconnection i.e., (Tap on the Knob Hill – Smittyville 115kV line, Marshall 115kV 533349) based on the contingencies studied. It has been observed that for Nordex Machine, GEN-2009-040 will need additional means of providing reactive power as the Nordex machines have 0.957 lagging (supplying vars) and 0.957 leading (absorbing vars) var capability. However, in case of selection of Siemens machine, as the Siemens machines have 0.90 lagging (supplying vars) and 0.90 leading (absorbing vars) var capability, the Interconnection Customer will need to determine if additional reactive equipment is required to maintain the power factor requirements at the Point of Interconnection. Per the SPP OATT, the Interconnection Customer will be required to provide 95% lagging (supplying vars) and 95% leading (absorbing vars) at the POI.

2. There are no impacts on the stability performance of the SPP system for the contingencies tested on the provided base cases for both Nordex and Siemens Machines. The study machines stayed on-line and stable for all simulated faults. The Project stability simulations with thirty nine (39) specified test disturbances did not show instability problems in the SPP system. Any oscillations were damped out.

6. Appendix A: 2014 Winter Peak Case Stability Run Plots (Nordex)

7. Appendix B: 2015 Summer Peak Case Stability Run Plots (Nordex)

8. Appendix C: 2024 Summer Peak Case Stability Run Plots (Nordex)

9. Appendix D: Project Model Data (Nordex and Siemens)

10. Appendix E: 2014 Winter Peak Case Stability Run Plots (Siemens)

11. Appendix F: 2015 Summer Peak Case Stability Run Plots (Siemens)

12. Appendix G: 2024 Summer Peak Case Stability Run Plots (Siemens)