

GEN-2012-040
Impact Restudy for
Generator Modification
(Turbine Change)

August 2015
Generator Interconnection



Revision History

Date	Author	Change Description
8/26/2015	SPP	GEN-2012-040 Impact Restudy for Generator Modification (Turbine Change) issued.

Executive Summary

The GEN-2012-040 Interconnection Customer has requested a modification to its Generator Interconnection Request to change from forty-five (45) GE 1.7MW wind turbine generators (aggregate power of 76.5MW) to thirty-one (31) GE 2.3MW wind turbine generators (aggregate power of 71.3MW). Since the GE 2.3MW wind turbine generator has identical electrical characteristics as the GE 1.7MW wind turbine generator, a stability analysis assessment was not performed for this change request. The results of the system impact study¹ performed for GEN-2012-040 are still valid for this generation interconnection request. As the original request for interconnection is for 76.5MW, the requested change is not considered a Material Modification.

Power factor requirements for GEN-2012-040 can be found in the previous system impact study and are still valid for this change request. A short circuit analysis was performed and has been included in this report.

With the assumptions outlined in this report and with all required network upgrades shown in the previous system impact study in place, GEN-2012-040 with the GE 2.3MW wind turbine generators 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.

¹ *Group 8 System Impact Study Report* performed by Mitsubishi Electric Power Products, Inc. (MEPPI) in the Southwest Power Pool (SPP) *Definitive Interconnection System Impact Study DISIS-2012-002* posted 2/8/2013.

Table of Contents

Revision History	i
Executive Summary.....	ii
Table of Contents.....	iii
1. Introduction	1
2. Facilities	2
Generating Facility	2
3. Stability Analysis.....	3
4. Power Factor Analysis	4
5. Reduced Generation Analysis.....	5
6. Short Circuit Analysis	6
7. Conclusion	7

1. Introduction

The GEN-2012-040 Interconnection Customer has requested a modification to its Generator Interconnection Request to change from the GE 1.7MW wind turbine generators to the GE 2.3MW wind turbine generators. In a previous system impact study, GEN-2012-040 was studied with forty-five (45) GE 1.7MW wind turbine generator (aggregate power of 76.5MW). The requested change is to use thirty-one (31) GE 2.3MW wind turbine generators (aggregate power of 71.3MW). Since the GE 2.3MW wind turbine generator has identical electrical characteristics as the GE 1.7MW wind turbine generator, a restudy of the stability analysis was not performed for this change request. The results of the previous system impact study performed for GEN-2012-040 are still valid for this generation interconnection request. As the original request for interconnection is for 76.5MW, the requested change is not considered a Material Modification.

Nothing in this study constitutes a request for transmission service or grants the Interconnection Customer any rights to transmission service.

2. Facilities

Generating Facility

The point of interconnection (POI) for the GEN-2012-040 interconnection request is the Chilocco 138kV substation.

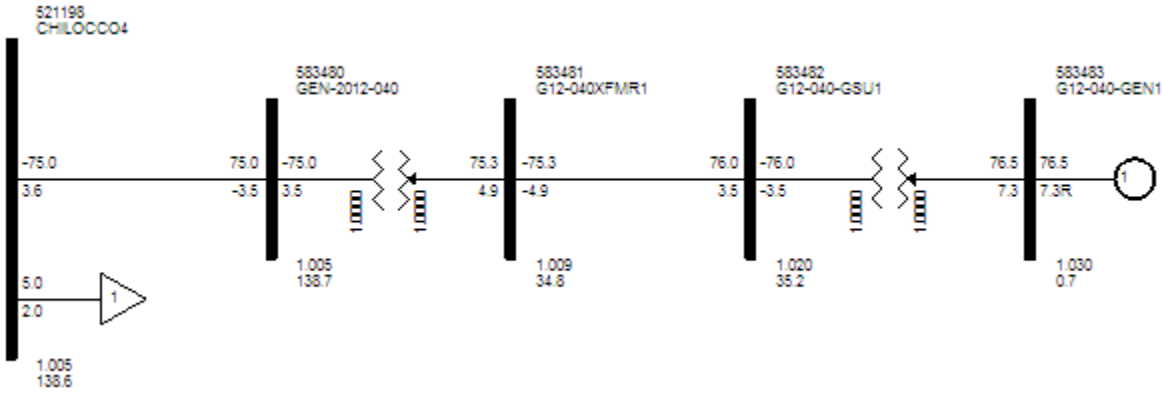


Figure 2-1 depicts the one-line diagram of the POI and the power flow model representing the request.

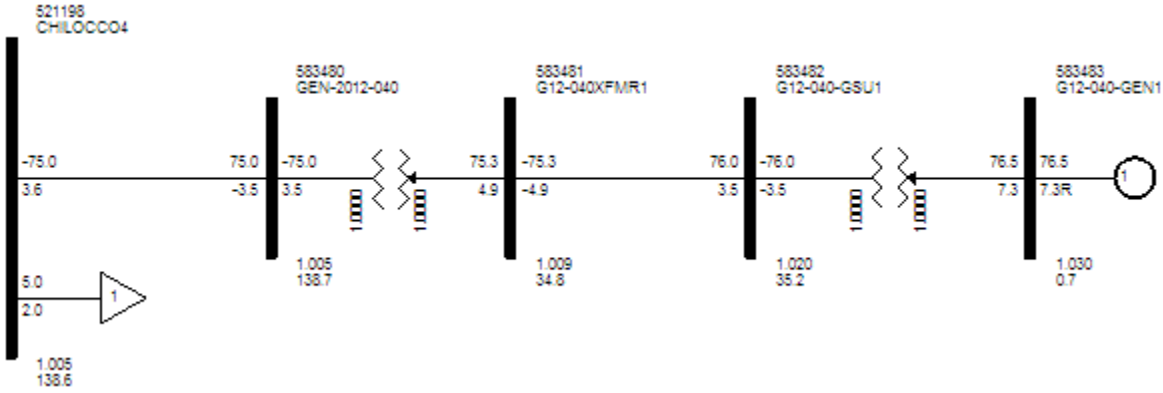


Figure 2-1: Proposed POI and Power Flow Model for GEN-2012-040

3. Stability Analysis

Transient stability analysis is used to determine if the transmission system can maintain angular stability and ensure bus voltages stay within planning criteria bandwidth during and after a disturbance while considering the addition of a generator interconnection request. Since the GE 2.3MW wind turbine generator is electrically identical to the GE 1.7MW wind turbine generator, a stability analysis was not performed. The analysis performed in the previous study is still valid.

4. Power Factor Analysis

The power factor analysis was not performed for this change request. The power factor analysis performed in the previous study is still valid. The final power factor requirement for GEN-2012-040 will be the pro-forma 95% lagging to 95% leading at the POI.

5. Reduced Generation Analysis

Interconnection requests for wind generation projects that interconnect to a 345kV or 230kV bus on the SPP system are analyzed for the capacitive charging effects during reduced generation conditions (due to unsuitable wind speeds, curtailment, etc.) at the generation site. From the data provided by the customer it is estimated that the collector system and generator lead capacitances will inject 3MVAR to the POI during reduced generation conditions.

6. Short Circuit Analysis

A short circuit analysis was performed and the results are shown in Table 6-1. The PSSE ASCC utility was used to find the short circuit currents of busses up to five levels away from the POI.

PSS(R)E-32.2.2 ASCC SHORT CIRCUIT CURRENTS TUE, AUG 25 2015

9:49
 2014 MDWG PASS 8 WITH 2013 MMWG
 MDWG 2025S WITH MMWG 2024S

OPTIONS USED:
 - FLAT CONDITIONS
 - BUS VOLTAGES SET TO 1 PU AT 0 PHASE ANGLE
 - GENERATOR P=0, Q=0
 - TRANSFORMER TAP RATIOS=1.0 PU and PHASE ANGLES=0.0
 - LINE CHARGING=0.0 IN +/- /0 SEQUENCE
 - LOAD=0.0 IN +/- SEQUENCE, CONSIDERED IN ZERO SEQUENCE
 - LINE/FIXED/SWITCHED SHUNTS=0.0 AND MAGNETIZING ADMITTANCE=0.0 IN +/- /0 SEQUENCE
 - DC LINES AND FACTS DEVICES BLOCKED
 - TRANSFORMER ZERO SEQUENCE IMPEDANCE CORRECTIONS IGNORED

X----- BUS -----X		THREE PHASE FAULT	
		/I+/ AMP	AN(I+) -
521198	[CHILOCCO4 138.00] AMP	6379.0	-77.92
514804	[MIDLTNT4 138.00] AMP	8106.1	-80.01
583480	[GEN-2012-040138.00] AMP	5916.4	-78.39
515381	[PECKHMT4 138.00] AMP	8585.7	-79.46
532981	[CRESWLN4 138.00] AMP	8036.9	-81.93
583481	[G12-040XFMR134.500] AMP	8413.0	-85.67
514759	[NEWKIRK4 138.00] AMP	8923.3	-79.35
532982	[OXFORD 4 138.00] AMP	9018.8	-82.84
533080	[CRESW1 1 13.200] AMP	12645.4	-86.22
533081	[CRESW2 1 13.200] AMP	19197.7	-87.97
533543	[CRESWLN2 69.000] AMP	10678.9	-83.85
583170	[GEN-2011-057138.00] AMP	5628.5	-79.20
583482	[G12-040-GSU134.500] AMP	7991.8	-83.64
514764	[NWKRKAT4 138.00] AMP	10429.9	-79.46
529290	[OMNUKRK4 138.00] AMP	8827.3	-79.34
532984	[SUMNER 4 138.00] AMP	9895.4	-82.75
533547	[OAK 2 69.000] AMP	7575.7	-82.20
533548	[PARIS 2 69.000] AMP	6542.1	-82.37
533553	[SC4ROME2 69.000] AMP	5358.5	-83.85
533555	[SC7CRES2 69.000] AMP	10545.1	-83.92
583171	[G11-057XFMR134.500] AMP	11788.7	-85.05
514760	[KILDARE4 138.00] AMP	10762.9	-79.54
532992	[TIMBJCT4 138.00] AMP	5612.6	-83.23
533063	[SC10BEL4 138.00] AMP	9567.7	-81.60
533075	[VIOLA 4 138.00] AMP	20632.9	-85.86
533542	[ARKCITY2 69.000] AMP	6230.4	-81.80
533549	[RAINBOW2 69.000] AMP	5680.2	-77.69
533556	[STROTHR2 69.000] AMP	5893.7	-81.09
533560	[WELLING2 69.000] AMP	4686.0	-84.17
533563	[PRAIRIJ2 69.000] AMP	6714.5	-81.93
583172	[G11-057-GSU134.500] AMP	11249.6	-83.57

Table 6-1: Short Circuit Currents for Busses up to Five Levels Away from the POI

7. Conclusion

The GEN-2012-040 Interconnection Customer has requested a modification to its Generator Interconnection request to change from GE 1.7MW wind turbine generators to the GE 2.3MW wind turbine generator. The GE 2.3MW wind turbine generator is electrically identical to the GE 1.7MW wind turbine generator. Since GEN-2012-040 was studied previously using the GE 1.7MW wind turbine generators, the results of that study are still applicable to GEN-2012-040 using the GE 2.3MW wind turbine generators.

A short circuit analysis for the POI and busses up to five levels away was performed.

Power factor requirements for GEN-2012-040 from the previous impact study are still valid. The interconnection request will be required to maintain the pro-forma +/- 0.95 power factor at the POI.

Nothing in this study should be construed as a guarantee of delivery or transmission service. If the customer wishes to sell power from the facility, a separate request for transmission service must be requested on Southwest Power Pool's OASIS by the Customer.