



Interconnection Feasibility Study Report Request # GI-2013-5

200 MW Wind Generator
Missile Site 345 kV Substation, Colorado

Public Service Company of Colorado
Transmission Planning
October 24, 2013

Executive Summary

Public Service Company of Colorado (PSCo) received an interconnection request (GI-2013-5) for a 200 MW wind facility on July 16, 2013. The facility will consist of one hundred and eighteen GE 1.7 MW wind turbines. This facility will be an extension of the existing wind plant at Limon windpark located approximately 35 miles from the Missile Site Substation. GI-2013-5 will be located 9.5 miles east of the existing Limon II wind plant and connect to the Missile Site 345 kV Substation using the existing 345 kV tie line and the existing point of interconnection (POI).

The existing POI at Missile Site 345 kV Substation was requested to be studied as the primary POI; no secondary POI has been specified. The proposed facility is planned to be in-service in October 2014. A Back feed date doesn't apply to this GI as the POI is existing and already backfed. PSCo only evaluated the system beyond the POI, it is the responsibility of the Customer to make sure the tie line is rated for the extended capacity. The GI was requested to be studied as both a Network Resource and Energy Resource. Studies were performed using a 2015 heavy summer power flow case. The study includes steady state power flow and short circuit analyses. The case has been stressed to simulate heavy wind generation in the Pawnee and Missile Site areas, and heavy North-South flows in the system. The TOT3 path flow has been set at 896 MW.

The steady state power flow studies included several single and double contingency outages. This request was studied as a stand-alone project only, with no evaluations made of other potential new generation requests that may exist in the Generator Interconnection Request queue, other than the generation projects that are already approved and planned to be in service by July 2015. The main purpose of this Feasibility Study was to evaluate the potential impact on the PSCo transmission infrastructure as well as that of neighboring utilities when an additional 200 MW of generation is injected into the Missile Site 345 kV Substation, and delivering the additional generation to native PSCo loads. There are no affected parties for this study.

Energy Resource (ER) and Network Resource (NR)

N-1 analysis: Refer to Table 5 for detailed study results. The proposed generation interconnection caused increased overloads on the Buckley – Smoky Hill 230 kV Line (overload increased from 100% to 106%), Buckley – Tollgate 230 kV Line (overload increased from 100% to 105%), Smoky Hill 230/345 kV transformer # T4 (overload increased from 99% to 115%), Smoky Hill 230/345 kV transformer # T5 (overload increased from 99% to 115%) and Clark – Jordan 230 kV line (overload increased from 89% to 103%) under certain single contingency outage conditions.

The study simulated wind percentages of 75% in the Pawnee area and 96% in the Missile site area to study a worst case scenario. Refer to Table 7 for MW dispatched at each machine. Typically PSCo has seen high wind percentages in the winter season and modeling the heavy wind conditions in a summer case would simulate extremely stressed scenario for the study area. Since the summer wind speeds are lower, generation would be lower and the overloads are not likely to be caused in summer conditions.

The Buckley – Smoky Hill 230 KV and Buckley – Tollgate 230 kV lines have been temporarily derated to 386 MVA; PSCo expects the ratings to increase to 506 MVA in fourth quarter of 2013 which should mitigate the overloads on these lines. The Smoky Hill 230/345 kV # T4 and # T5 transformers have an 8 hour emergency rating of 644 MVA, PSCo intends to operate these transformers at emergency rating if the overload occurs; at 644 MVA rating these transformers are not overloaded. Overload on the Clark – Jordan 230 kV line is due to generation sunk in the Comanche area as part of the North – South stress modeling, which reduces flows from Daniels Park Substation. Overloads on this line were further analyzed with a different dispatch scenario (Table 8) in which generation was sunk at Fort Saint Vrain and Arapahoe units, and Comanche generation is at full output; the overloads were not seen in this scenario. In the new dispatch scenario, the worst case contingency overload seen on the Clark – Jordan 230 kV line is 96% for the loss of Smoky Hill – Buckley – Tollgate – Jewell – Leetsdale 230 kV line, when GI-2013-5 is modeled at Missile Site 345 kV Substation. Since typically generation in the Comanche area is maintained at full output under heavy summer conditions, the Clark – Jordan 230 kV line is not going to be overloaded.

The proposed generation addition caused no new voltage range violations or voltage deviations. With the addition of GI-2013-5, none of the existing voltage range violations exceeded the 0.9-1.05 per unit range and none of the existing voltage deviations increased by more than 5%.

N-2 analysis: Refer to Table 6 for detailed study results. The proposed generation caused increased overloads on the Buckley – Smoky Hill 230 kV line (overload increased from 100% to 106%), Buckley – Tollgate 230 kV line (overload increased from 100% to 106%), Clark – Greenwood 230 kV line (overload increased from 86% to 100%), Clark – Jordan 230 kV line (worst case contingency overload increased from

113% to 130%), Coors – Ft. Lupton 115 kV line (worst case overload increased from 103% to 105%), Meadow – Smoky Hill 230 kV line (overload increased from 96% to 104%), Pawnee – Story 230 kV line (104% to 121%), Smoky Hill – Peakview 115 kV line (overload increased from 105% to 108%).

The Buckley – Smoky Hill 230 KV and Buckley – Tollgate 230 kV lines have been temporarily derated to 386 MVA; PSCo expects the ratings to increase to 506 MVA in fourth quarter of 2013 which should mitigate the overloads on these lines. Overload on the Clark – Greenwood 230 kV line is at 100% of the normal rating of the line so no mitigation plan is needed. Overload on the Coors – Ft.Lupton 115 kV line is within the emergency rating (144 MVA) on this line, so no mitigation plan is needed. Overload on the Smoky Hill – Meadow 230 kV line is within the emergency rating (625 MVA) on this line so no mitigation plan is needed.

Under any of the double contingency outage conditions, the proposed generation addition caused no new voltage range violations or voltage deviations. With the addition of GI-2013-5, none of the existing voltage range violations exceeded the 0.9-1.05 per unit. range and none of the existing voltage deviations increased by more than 5%.

The proposed GI caused no voltage violations on PSCo system and the thermal violations can be mitigated, so Energy resource capability of the proposed generation is 200 MW and Network Resource capability of the proposed generation is 200 MW

ER = 200 MW (at Missile Site 345 kV POI)

NR = 200 MW (at Missile Site 345 kV POI)

Short Circuit

The short circuit study results showed no new circuit breakers overdutied due to the proposed solar generation facility. See Table 1 for short circuit data.

Cost Estimates

The cost for the transmission interconnection (in 2013 dollars):

Transmission Proposal

The total estimated cost of the recommended system improvements to interconnect the project is approximately **\$0.15 Million** and includes:

- \$ 0.15 million for PSCo-Owned, Customer-Funded Interconnection Facilities
- \$ 0 million for PSCo-Owned, PSCo-Funded Network Upgrades for Interconnection
- \$ 0 million for PSCo Network Upgrades for Delivery to PSCo Loads

This work can be completed in 6 months following receipt of authorization to proceed.

The Interconnection Agreement (IA) requires that certain conditions be met, as follows:

- 1 The conditions of the Large Generator Interconnection Guidelines (LGIG) are met.
- 2 PSCO will require testing of the full range of 0 MW to 200 MW operational capability of the facility to verify that the facility can safely and reliably operate within required power factor and voltage ranges.
- 3 A single point of contact needs to be provided to PSCo Operations to facilitate reliable management of the transmission system.

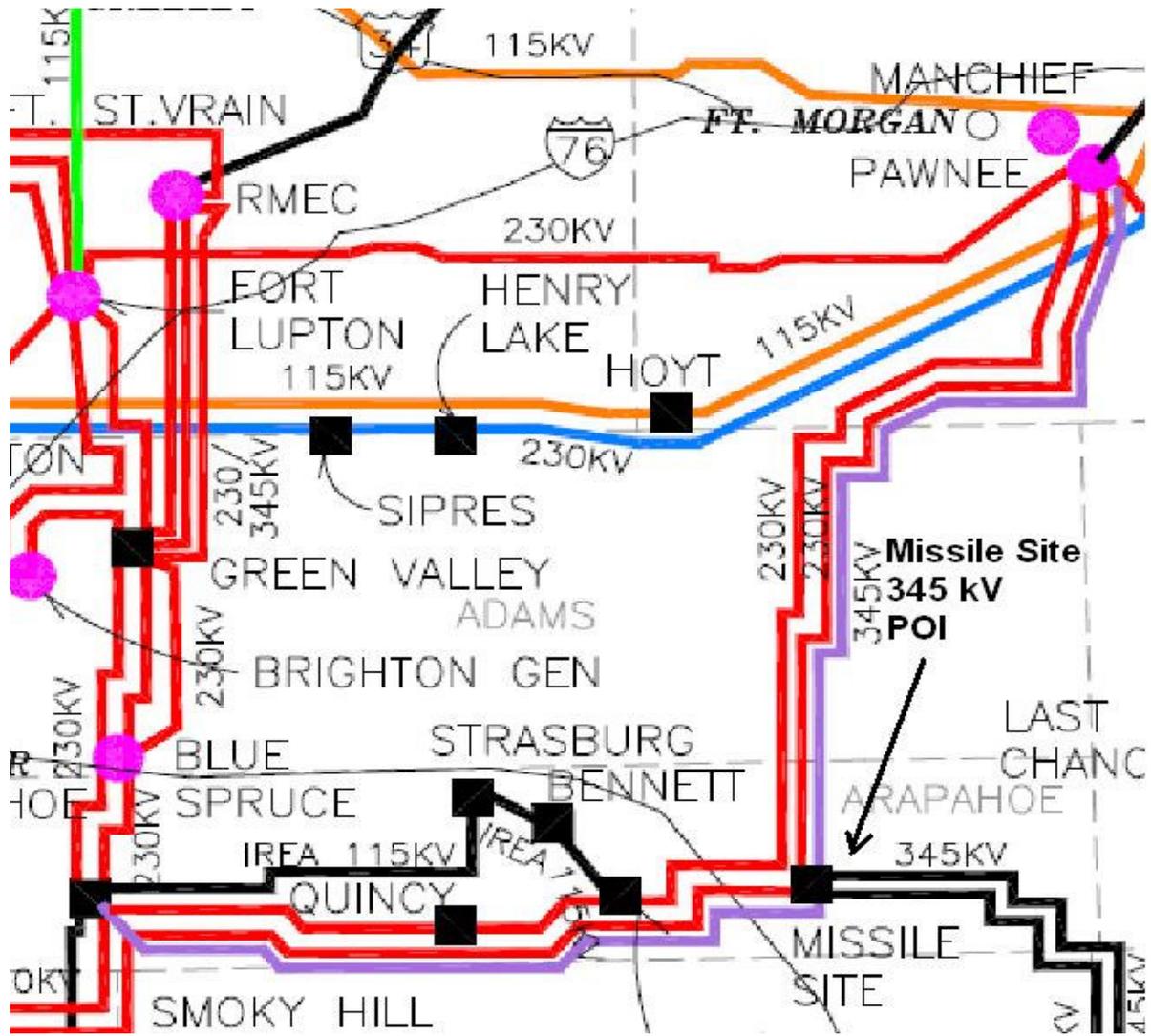


Figure 1 Missile Site Transmission System

Introduction

Public Service Company of Colorado (PSCo) received an interconnection request (GI-2013-5) for a 200 MW wind generation facility near Missile Site 345 kV Substation in Colorado. The generation facility will be located approximately 9.5 miles east of the existing Limon wind park which is approximately 35 miles from the Missile Site Substation. The interconnection request was received on July 16, 2013. The facility will consist of one hundred and eighteen GE 1.7 MW wind turbines. This facility will be an extension of the existing wind plant at Limon windpark. GI 2013-5 will connect to the Missile Site 345 kV Substation using the existing 345 kV tie line and the existing point of interconnection (POI).

The Customer has specified the existing POI at Missile Site 345 kV Substation as the primary POI, no secondary POI has been specified. The proposed POI is shown in Figure 1 above. The proposed facility has a planned in-service date of October 2014. A Back feed date doesn't apply to this GI as the POI is existing and already backfed. The study has only evaluated the system beyond the POI; it is the responsibility of the Customer to make sure the tie line is rated for the extended capacity.

Study Scope and Analysis

The Feasibility Study evaluated the potential impacts on the PSCo transmission infrastructure as well as that of neighboring utilities when an additional 200 MW of generation is injected into the Missile Site 345 kV Substation, and delivering the additional generation to native PSCo loads. It consisted of power flow and short circuit analyses. The power flow analysis identified any thermal or voltage limit violations resulting from the installation of the proposed generation and identification of network upgrades required to deliver the proposed generation to PSCo loads. Several single and double contingencies were studied. The short circuit analysis identified any new circuit breakers overdutied due to the proposed generation and the short circuit current levels at the POI.

PSCo adheres to NERC & WECC Reliability Criteria, as well as internal Company criteria for planning studies. During system intact conditions, criteria are to maintain transmission system bus voltages between 0.95 and 1.05 per unit of nominal and steady-state power flows below the thermal ratings of all facilities. Operationally, PSCo tries to maintain a transmission system voltage profile ranging from 1.02-1.03 per unit at regulating (generator) buses and 1.0-1.03 per unit at transmission load buses in the study area. Following a single or double contingency, transmission system steady state bus voltages must remain within 0.90 - 1.05 per unit, and power flows must remain within 100% of the facility's continuous thermal ratings. Also, voltage deviations should not exceed 5%. PSCo devises mitigation plans for violations caused by single contingencies, double contingencies are studied as a critical analysis of the system and no mitigation plans would be developed.



The proposed facility was requested to be studied as both an Energy Resource and Network Resource. Energy Resource Interconnection Service shall mean an Interconnection Service that allows the Interconnection Customer to connect its Generating Facility to the Transmission Provider's Transmission System to be eligible to deliver the Generating Facility's electric output using the existing firm or non-firm capacity of the Transmission Provider's Transmission System on an as available basis. Energy Resource Interconnection Service in and of itself does not convey transmission service.

Network Resource Interconnection Service shall mean an Interconnection Service that allows the Interconnecting Customer to integrate its Large Generating Facility with the Transmission Provider's Transmission System (1) in a manner comparable to that in which the Transmission Provider integrates its generating facilities to serve native load customers; or (2) in an RTO or ISO with market based congestion management, in the same manner as all other Network Resources. Network Resource Interconnection Service in and of itself does not convey transmission service.

There are no affected parties for this study.

Power Flow Study Models

The proposed facility interconnection was studied using 2015 heavy summer loading conditions. The 2015HS case was built using the WECC approved 2017HS1 base case. PSCo loads in the case were adjusted to reflect the most recent (March 2013) load forecast for 2013. The topology was also updated to reflect current project plans, and rating changes were updated using the August 28th FAC8-3 release. Updates were included for CSU, TSGT, BHE, WAPA per the review comments received from the utilities.

The power flow case was stressed to create heavy North – South flows in the system. Wind generation in the Missile Site area is dispatched at 96% of the name plate rating such that generation at Missile Site 230 kV POI is 240 MW and generation at Missile Site 345 kV POI is 384 MW. Due to losses in the collector system, generation at the Customer site was dispatched at more than 96%. Wind in the Pawnee area was dispatched such that generation at the POI is 75% of the name plate capacity. Also TOT3 was stressed to a path flow of 896 MW in the benchmark case. Refer to Table 7 for detailed dispatch by generator. Typically PSCo has seen high wind percentages in the winter season and modeling the heavy wind conditions in a summer case would simulate extremely stressed scenario for the study area.

Limon I and Limon II generator model in the case was replaced by the data provided by the Customer in the .raw file. The tie line data provided by the Customer was inconsistent with the tie line data provided in the .raw PSSE files. As stated in the Feasibility study agreement, the raw data provided by the Customer is used for the

studies. Generation increase due to the proposed GI addition was sunk at Comanche by decreasing Comanche # 3 from 804 MW to 604 MW.

Power Flow Study Process

Contingency power flow studies were completed on the reference power flow case (benchmark) and the power flow case with GI 2013-5 using PTI's PSSE Ver. 32.1.0 program. Results from each of the two cases were compared and new overloads or existing overloads which increased by at least 1% in the case with the GI were noted. Any new voltage range violations or voltage deviations that increased by 5% or more are also noted. PSSE's ACCC activity was used to perform the study. Contingencies were run on both areas 70 and 73, breaker-breaker outages were run in PSCo system, bus-bus contingencies were run for all other utilities in area 70 and area 73; Zones 700,703,704,705,706,710,752,753,754 and 757 were monitored for thermal and voltage violations.

For double contingency analysis, outages were run in the PSCo system only which is the major system affected by the proposed generation facility addition; zones 700, 705 and 706 were monitored for thermal and voltage violations. These zones were selected based on the results of single contingency outage study and knowledge of flows in the area.

Power Flow Results

N-1 analysis: The 200 MW generation addition at Missile Site 345 kV Substation caused increased overloads on the Buckley – Smoky Hill 230 kV line, Buckley – Tollgate 230 kV line, Smoky Hill 230/345 kV #T4 transformer, Smoky Hill 230/345 kV #T5 transformer and Clark – Jordan 230 kV line under certain single contingency conditions. Refer to Table 5 for detailed study results.

The Buckley – Smoky Hill 230 KV and Buckley – Tollgate 230 kV lines have been temporarily derated to 386 MVA; PSCo expects the rating to increase to 506 MVA in fourth quarter of 2013 which should mitigate the overloads on these lines. The Smoky Hill 230/345 kV # T4 and # T5 transformers have an 8 hour continuous emergency rating of 644 MVA, PSCo intends to operate these transformers at emergency rating if the overload occurs; at 644 MVA rating these transformers are not overloaded.

Overload on the Clark – Jordan 230 kV line is within the emergency rating of the line. Overload on this line is due to generation sunk in the Comanche area, which reduces flows from Daniels Park Substation. Overloads on this line were further analyzed with a different dispatch scenario (Table 8) in which Comanche generation is at full output and the overloads were not seen in this scenario. In the new dispatch scenario, generation increase due to GI-2013-5 is sunk at Fort Saint Vrain unit # 1. The worst case contingency overload seen on the Clark – Jordan 230 kV line is 96% for the loss of Smoky Hill – Buckley – Tollgate – Jewell – Leetsdale 230 kV line, when GI-2013-5 is modeled at Missile Site 345 kV Substation. Since typically generation in the Comanche



area is maintained at full output under heavy summer conditions, the Clark – Jordan 230 kV line may not be overloaded.

The proposed facility addition caused no new voltage range violations or voltage deviations. None of the existing voltage range violations exceeded the 0.90-1.05 per unit range and none of the voltage existing voltage deviations increased by more than 5%.

N-2 Analysis: The 200 MW generation addition at Missile Site 345 kV Substation caused increased overloads on the Buckley – Smoky Hill 230 kV line, Buckley – Tollgate 230 kV line, Clark – Greenwood 230 kV line, Clark – Jordan 230 kV line, Coors – Ft.Lupton 230 kV line, Meadow – Smoky Hill 230 kV line and Smoky Hill – Peakview 115 kV line for certain double contingency outage conditions. Detailed study results can be found in Table 6.

The proposed facility addition caused no new voltage range violations or voltage deviations. . With the addition of GI-2013-5, none of the existing voltage range violations exceeded the 0.9-1.05 per unit range and none of the existing voltage deviations increased by more than 5%.

The Buckley – Smoky Hill 230 KV and Buckley – Tollgate 230 kV lines have been temporarily derated to 386 MVA; PSCo expects the rating to increase to 506 MVA in fourth quarter of 2013 which should mitigate the overloads on these lines. Overload on the Clark – Greenwood 230 kV line is within 100% of the normal rating of the line so no mitigation plan is needed. Overload on the Coors – Ft.Lupton 115 kV line is within the emergency rating (144 MVA) on this line, so no mitigation plan is needed. Overload on the Smoky Hill – Meadow 230 kV line is within the emergency rating (625 MVA) on this line so no mitigation plan is needed.

Addition of GI 2013-5 at Missile Site 345 kV Substation caused no voltage range violations or voltage deviations, and the thermal overloads under N-1 can be mitigated. So the Energy Resource capacity of the GI is 200 MW. Also, the Network Resource capacity of the GI is 200 MW.

ER = 200 MW (at Missile Site 345 kV POI)

NR = 200 MW (at Missile Site 345 kV POI)

Short Circuit

For the Customer proposed interconnection at the Missile Site 345 kV POI, no new circuit breakers are expected to exceed their capabilities following installation of the new generation. The calculated short circuit parameters for the POI are shown in Table 1 below.



Table 1 – Short Circuit Parameters at the Missile Site 345 kV POI

System Condition	Three-Phase Fault Level (Amps)	Single-Line-to-Ground Fault Level (Amps)	SLG X/R	3 Phase X/R
Fault Currents for 2014	10,911	11,347	11.216	13.850
Fault Currents with GI2013-5	11,311	11,881	110.744	13.341

Costs Estimates and Assumptions

GI-2013-5 (Feasibility Study Report)

Scoping level cost estimates for Interconnection Facilities and Network/Infrastructure Upgrades for Delivery (+/- 30% accuracy) were developed by Xcel Energy/PSCo Engineering. The cost estimates are in 2013 dollars with escalation and contingencies applied (AFUDC is not included) and are based upon typical construction costs for previously performed similar construction. These estimated costs include all applicable labor and overheads associated with the siting support, engineering, design, material/equipment procurement and construction of these new PSCo facilities. This estimate does not include the cost for any other Customer owned equipment and associated design and engineering.

The estimated total cost for the required upgrades for is **\$150,000**. These estimates do not include costs for any other Customer owned equipment and associated design and engineering. The following tables list the improvements required to accommodate the interconnection and the delivery of the Project generation output. The cost responsibilities associated with these facilities shall be handled as per current FERC guidelines. System improvements are subject to change upon a more detailed and refined design.

Table 2 – PSCo Owned; Customer Funded Transmission Provider Interconnection Facilities

Element	Description	Cost Est. (Millions)
PSCo's Missile Site 345kV Transmission Substation	Interconnect/Upgrade Customer to the 345kV bus (7103) at the Missile Site Substation. The new activities include: <ul style="list-style-type: none"> • Relay settings changes • Drawing revisions 	\$0.150
Time Frame	Design	6 Months

Table 3: PSCo Owned; PSCo Funded Interconnection Network Facilities

Element	Description	Cost Estimate (Millions)
PSCo's Missile Site 345kV Transmission Substation	<ul style="list-style-type: none"> • Not Applicable 	\$0
	Total Cost Estimate for PSCo-Owned, PSCo-Funded Interconnection Facilities	\$0
Time Frame	Site, design, procure and construct	

Table 4 – PSCo Network Upgrades for Delivery

Element	Description	Cost Est. (Millions)
	Not Applicable	
	Total Cost Estimate for PSCo Network Upgrades for Delivery	\$0
Time Frame	Site, design and procure	
	Total Project Estimate	\$0.150

Cost Estimate Assumptions

- Scoping level cost estimates for Interconnection Facilities and Network/Infrastructure Upgrades for Delivery (+/- 30% accuracy) were developed by Xcel Energy/PSCo Engineering.
- Estimates are based on 2013 dollars (appropriate contingency and escalation applied).
- AFUDC has been excluded.
- Engineering will be contracted out to a Design Consultant.
- Work scope is limited to Missile 345kV Substation and no evaluation of adequacy of proposed interconnection increase of 200 MW's.
- No new substation facility upgrades required.
- Changes are limited to relay settings and drawing revisions.
- The Wind Generation Facility is not PSCo's retail service territory.
- PSCo (or it's Contractor) crews will perform all construction, wiring, testing and commissioning for PSCo owned and maintained facilities.
- Labor is estimated for straight time only – no overtime included.
- The estimated time to design and construct the interconnection facilities is approximately 6 months after authorization to proceed has been obtained.
- This project is completely independent of other queued projects and their respective ISD's.
- A CPCN will not be required for the interconnection facilities construction.
- No line or substation outages will be required.



GI-2013-5

A. Load Flow Thermal Results

Table 5 – Summary Listing of Differentially Overloaded Facilities (Missile Site 345 kV Substation POI)¹

				Branch N-1 Loading Without GI-2013-5		Branch N-1 Loading With GI-2013-5			
Monitored Facility (Line or Transformer)	Type	Owner	Branch Rating MVA	N-1 Flow in MVA	N-1 Flow in % of Rating	N-1 Flow in MVA	N-1 Flow in % of Rating	% Change	N-1 Contingency Outage
Buckley – Smoky Hill 230 kV	Line	PSCo	386	384.46	99.6	407.23	105.50	5.9	Smoky – Meadow – Orchard – Jordan 230 kV
Buckley – Tollgate 230 kV	Line	PSCo	386	384.07	99.5	406.84	105.40	5.9	Smoky – Meadow – Orchard – Jordan 230 kV
Smoky Hill 230/345 kV # T4	Xfmr	PSCo	560	554.96	99.1	641.2	114.50	15.4	Smoky Hill 230/345 kV # T5
Smoky Hill 230/345 kV # T5	Xfmr	PSCo	560	554.96	99.1	641.2	114.50	15.4	Smoky Hill 230/345 kV # T4
Clark – Jordan 230 kV	Line	PSCo	331	295.58	89.30	339.94	102.7	13.4	Missile Site – Daniels Park 230 kV

¹ Detailed thermal violations due to the proposed 200 MW generation increase at Missile Site 345 kV Substation



Table 6 – Double contingency outage summary Listing of Differentially Overloaded Facilities (Missile Site 345 kV Substation POI)²

Monitored Facility (Line or Transformer)	Type	Owner	Branch Rating MVA	Branch N-2 Loading Without GI-2013-5		Branch N-2 Loading With GI-2013-5		% Change	N-2 Contingency Outage
				N-2 Flow in MVA	N-2 Flow in % of Rating	N-2 Flow in MVA	N-2 Flow in % of Rating		
Buckley – Smoky Hill 230 kV	Line	PSCo	386	384.46	99.90	410.70	106.40	6.5	Smoky-Murphy-Homestead-Sulphur 230kV & Missile Sit e-Daniels park 230 kV (double tower outage)
Buckley – Tollgate 230 kV	Line	PSCo	386	385.23	99.80	410.32	106.30	6.5	Smoky-Murphy-Homestead-Sulphur 230kV & Missile Sit e-Daniels park 230 kV (double tower outage)
Clark – Greenwood 230 kV	Line	PSCo	367	316.35	86.20	366.63	99.90	13.7	Smoky-Buckley-Jewell-Sullivan 230 kV & Smoky-Buckley-Tollgate-Jewell-Leetsdale 230 kV (Double tower and Breaker Failure outage)
Clark – Jordan 230 kV	Line	PSCo	331	375.02	113.30	430.96	130.20	16.9	Smoky-Murphy-Homestead-Sulphur 230kV & Missile Sit e-Daniels park 230 kV (double tower outage)
Clark – Jordan 230 kV	Line	PSCo	331	312.46	94.40	369.06	111.50	17.1	Daniels Park-Surrey Rige-Lemon Gulch-Sulphur 230 kV & Missile Site – Daniels Park 230 kV (double tower outage)
Coors Rec – Ft.Lupton 230 kV	Line	PSCo	120	123.84	103.20	125.52	104.60	1.4	St.Vrain – Isabelle 230 kV & St.Vrain – Spindle 230 kV (double tower outage)
Coors Rec – Ft.Lupton 230 kV	Line	PSCo	120	123.84	103.20	125.52	104.60	1.4	St.Vrain – Isabelle 230 kV & Valmont – Spindle 230 kV (double tower outage)
Coors Rec – Ft.Lupton 230 kV	Line	PSCo	120	123.12	102.60	124.80	104.0	1.4	Niwot – Isabelle 230 kV & Valmont – Spindle 230 kV (double tower outage)
Meadow – Smoky Hill 230 kV	Line	PSCo	568	544.71	95.90	592.99	104.40	8.5	Smoky-Buckley-Jewell-Sullivan 230 kV & Smoky-Buckley-Tollgate-Jewell-Leetsdale 230 kV (Double tower and Breaker Failure outage)
Pawnee – Story 230 kV	Line	PSCo/TSGT	648	672.62	103.80	784.73	121.10	17.3	Missile Sit e- Daniels Park 230 kV & Missile Site – Smoky Hill 345 kV
Smoky Hill – Peakview 115 kV	Line	IREA	159	166.95	104.70	171.72	107.8	3.1	Paker-Sulphur 230 kV # 1,2 & Sulphur 230/115 kV # T1,T2

² Detailed thermal violations due to the proposed 200 MW generation increase at Missile Site 345 kV Substation

Table 7- Generation Dispatch of Major Generating Units in the Vicinity of GI-2013-5

<u>Bus</u>	<u>LF ID</u>	<u>MW</u>
Pawnee	C1	536
Peetz Logan Wind	W	460.4
Machief	G1	0
Machief	G2	0
Missile Site 230 kV	W1	240.192
Missile Site 345 kV	W2	198
Missile Site 345 kV	W3	198
Ft.Lupton	G1	0
Ft.Lupton	G2	0
Fort Saint Vrain	G1	298
Fort Saint Vrain	G2	127
Fort Saint Vrain	G3	132
Fort Saint Vrain	G4	132
Fort Saint Vrain	G5	0
Fort Saint Vrain	G6	0
Spruce	G1	0
Spruce	G2	0
Plains End	G	196.8
RMEC	G1	152
RMEC	G2	152
RMEC	G3	296
Spindle	G1	0
Spindle	G2	0
Cedar Creek	W	496.17
Ponnequin	W1	6.9
Colorado Green	W	49.8
Spring Canyon	W1	45
Ridge Crest	W1	22.275
Comanche 3	C3	804
Comanche 1	C1	360
Comanche 2	C2	242
Lamar DC tie	DC	0
Brighton	G1	0
Brighton	G2	0
Cherokee 3	C3	150
Cherokee 4	C4	383
Arapahoe 5,6&7	G	0
Arapahoe4	C4	115
QF_TC-T4	G4,G5	66
QF_TC-T3	G3,ST	84
QF_T1-T2	ST	51
QF_T1-T1	G1,G2	66



QF_BCP2T	G3,ST	66
QF_B4-4T	G4,G5	0
QF_CPP1T	G1,G2	0
QF_CPP3T	ST	0
QF_B4D4T	ST	0

Table 8 - Generation Dispatch changes from benchmark case for analyzing Clark – Jordan 230 kV Line Overload

Bus	LF ID	MW
Comanche 2	C2	363.5
Arapahoe4	C4	0