Xcel Energy

Grand Valley Power
Near Term Transmission Reliability Study
Request # NQ-2009-1
October 23, 2009

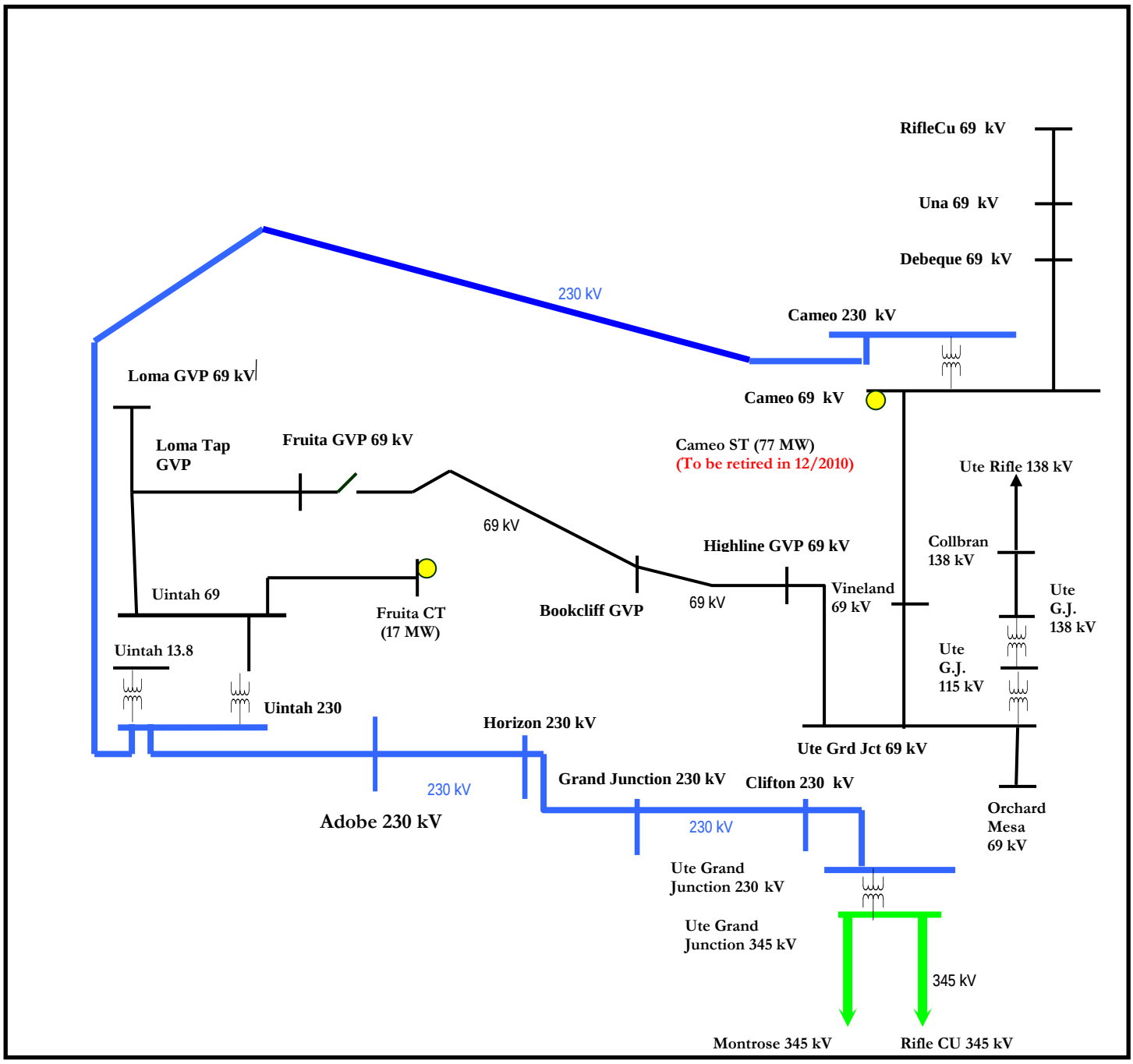
I. Executive Summary

The objective of this near term transmission reliability study (a three-year study for the years 2010 through 2012) is to examine the reliability of the transmission system that serves the Grand Valley Power loads and to identify system upgrades, if any, to maintain a reliable transmission system. The base case selected represents an on-peak summer condition in 2012. Grand Valley Power provided PSCo Transmission Planning with forecasted demand data for the summer of 2012. A model of the Grand Valley Power 69kV transmission system was added to the base case with the forecasted demands. The Grand Valley Power 69kV normal system condition and two prior outage conditions that could significantly impact Grand Valley Power were simulated along with outages of transmission lines in the study area. A TOT2A[1] sensitivity study was also conducted. A study that addresses issues that could affect the Grand Valley Power load at the Debeque Substation is included in the report.

The study determined that the Grand Valley Power 69kV system and the PSCo bulk transmission system can reliably serve the Grand Valley Power loads projected for the summer of 2012. For the Grand Valley Power normal configuration (FruitaGV-BookcliffGV 69kV line open) and Grand Valley Power prior outages (Uintah-LomaTapGV 69kV line open with FruitaGV-BookcliffGV 69kV line closed and the Ute Grand Junction-HighlineGV 69kV line open with the FruitaGV-BookcliffGV 69kV line closed) with TOT2A at a 185 MW north-to-south flow level and with TOT2A at a 300 MW north-to-south flow level, all line flows are within criteria. Bus voltages for the Grand Valley Power normal configuration (FruitaGV-BookcliffGV 69kV line open) are within criteria for TOT2A transfer levels of 185 MW north-to-south and 300 MW north-to-south for all system contingencies. Criteria violations were noted for the prior outage configurations at the 185 MW and 300 MW TOT2A north-to-south power transfer levels for some outage conditions; however, these scenarios (a prior outage and subsequent second outage) are similar to double contingencies[2]; however, these are not likely to occur. The Debeque Substation serves Grand Valley Power and PSCo Retail loads. The nearby Una Substation serves PSCo Retail loads. These substations are taps on the RifleCu-Cameo 69kV line. Studies demonstrate that as demand increases at the Debeque and Una substations, overloads can occur on the RifleCu 25 MVA 138-69kV transformer and low voltages can occur on the load busses at the Una and Debeque substations. PSCo will address these issues through its 2011-2015 Capital Budget Process. A one-line of the Grand Valley Power study area is found in Figure 1 below.

[1] A definition of TOT2A is provided in Appendix A of this study report.
[2] Double contingencies are addressed under NERC Standard TPL-003-0 for loss of two or more elements (Category C). Category C is outside the scope of this study. A prior outage is a line outage with subsequent system adjustment. Prior outage studies are operating studies not covered in this transmission planning study.

Figure No. 1 Grand Valley Power Study Area



II. Background

On March 6, 2009, Grand Valley Power requested assistance from PSCo in the preparation of a near term transmission plan requiring a three-year transmission reliability study for the years 2010 through 2012. PSCo agreed to conduct a study to analyze the Grand Valley Power transmission system and recommend transmission upgrades, if any, to ensure a reliable transmission system for Grand Valley Power for the study years 2010 through 2012. This study is one of many transmission studies that Grand Valley Power has undertaken to ensure that their system will be reliable for its customers at present and in the future. In March 2006, Grand Valley Power and PSCo completed a long-range transmission planning study to assess the long-range reliability of the Grand Valley Power and PSCo transmission systems to serve the Grand Valley Power loads and to identify system upgrades to maintain a reliable transmission system. The 2015 winter season and the 2025 winter season were studied. Enhancements were recommended that would be needed by 2015 and 2025 to maintain a reliable system. These included a 69kV transmission line from Adobe Substation to the FruitaGVP 69kV Substation, two 45 MVAR 230kV capacitor banks at the Uintah Substation, and a 230-69kV transformer bank with an on-load tap changer at the Uintah Substation. Two of the recommendations, a 45 MVAR 230kV capacitor bank at the Uintah Substation and a 75 MVA 230-69kV transformer bank with an on-load tap changer at the Uintah Substation were developed as projects by PSCo. The Uintah 45 MVAR 230kV capacitor bank has a scheduled in-service date of December 1, 2009 and the Uintah 75 MVA 230/69 kV transformer with on-load tap changer has a scheduled in-service date of April 14, 2010.

The Adobe-FruitaGV 69kV line addition was recommended based on Grand Valley Power load growth projections[3] developed in 2006. Since 2006, Grand Valley Power has refined their demand estimates. The 2012 heavy summer coincident peak demand is projected to be 51.9 MW and 14.9 MW. This demand level is lower than what was projected for Grand Valley Power in 2015 when the projection was developed in 2006. For this reason, the proposed Adobe-FruitaGV 69kV transmission line addition is not expected to be needed by 2012.

[3] The Grand Valley Power winter peak demand projection developed in 2006 was 63.4 MW and 20.9 MVAR in 2015 and 96.5 MW and 31.8 MVAR in 2025. The study completed in 2006 assumed that the Grand Valley Power loads would be served from the Adobe 230kV bus, the BookcliffGV 69kV bus, the Collbran 138kV bus, the Debeque 69kV bus, the FruitaGV 69kV bus, the Fruita 69kV bus, the HighlineGV 69kV bus, the LomaGV 69kV bus, the Orchard MesaGV 69kV bus, the Uintah 13.8kV bus, and the White River 115kV bus.

III. Methodology

A. STUDY CASE DEVELOPMENT

A power flow study case was developed to represent the 2012 summer on-peak demand conditions. The study case was created from the Western Electricity Coordinating Council (WECC) 2012 HS2A base case. The forecasted loads for Grand Valley Power system to reflect a 2012 on-peak summer condition were provided by Grand Valley Power. PSCo represented the forecasted loads for the 2012 on-peak summer season in the study case. Table 1 provides a list of the demands assumed in the study.

Table 1 Grand Valley Power Coincident Demands in the 2012 Heavy Summer Season

Bus Name	MW	MVAR	Bus Name	MW	MVAR
DEBEQUE 69.0	1.710	0.429	LOMA GV 69.0	2.123	0.619
FRUITA 69.0	3.613	1.185	BOOKCFGV 69.0	6.387	2.099
ADOBE 230.0	13.212	3.311	HIGHLNGV 69.0	7.085	1.776
ORCHMEGV 69.0	9.117	2.581	FRUITAGV 69.0	2.088	0.686
UINTAH 13.8	1.769	0.516	COLBRAN 138.0	4.838	1.659
			TOTAL	**51.942**	**14.861**

A power flow model was developed of the Grand Valley Power 69kV system that serves the Loma, Fruita, Bookcliff, Highline and Orchard Mesa loads. The PSCo bulk transmission system is used to serve Grand Valley Power loads at the Debeque, Adobe, Uintah, and Colbran substations. The representation of the Grand Valley Power 69kV transmission system and the bulk transmission system that serve Grand Valley Power loads is listed in Table 2 below. The Grand Valley Power 69kV model and Grand Valley Power loads were added to the base case to create a study case called “12HS_GVP69”.

Table No. 2 Transmission Facilities Serving Grand Valley Power Loads

Bus 1	Bus 2	ID	R	X	B	Rating
CAMEO 69.0	DEBEQUE 69.0	1	0.14219	0.24906	0.00524	55.9
UNA ORCH 69.0	DEBEQUE 69.0	1	0.04878	0.08544	0.00180	55.9
FRUITA 69.0	UINTAH 69.0	1	0.05000	0.04626	0.00100	32.3
GRANDJCT 69.0	ORCHMEGV 69.0	1	0.04925	0.09488	0.00146	44.0
GRANDJCT 69.0	HIGHLNGV 69.0	1	0.08026	0.15462	0.00238	44.0
HORIZON 230.0	ADOBE 230.0	1	0.00097	0.00855	0.01882	494.4
ADOBE 230.0	UINTAH 230.0	1	0.00097	0.00855	0.01882	494.4
UINTAH 69.0	LOMATPGV 69.0	1	0.01642	0.03163	0.00049	44.0
LOMATPGV 69.0	LOMA GV 69.0	1	0.04286	0.08258	0.00127	44.0
LOMATPGV 69.0	FRUITAGV 69.0	1	0.04469	0.08609	0.00132	44.0
BOOKCFGV 69.0	HIGHLNGV 69.0	1	0.04104	0.07907	0.00122	44.0
BOOKCFGV 69.0	FRUITAGV 69.0	0	0.09850	0.18976	0.00292	44.0
GRANDJCT 138.0	COLBRAN 138.0	1	0.02431	0.08782	0.02322	162.0
COLBRAN 138.0	RIFLE CU 138.0	1	0.04534	0.18330	0.04368	162.0

B. STUDY SCOPE AND ASSUMPTIONS

1. The study consisted of power flow analysis only. Angle or voltage stability studies were not conducted for this study. Short circuit studies were not conducted for this study.
2. A transmission model for the Grand Valley Power 69-kV transmission system was developed for the study based on information provided by Grand Valley Power.
3. Power flow diagrams were developed for this study.
4. Only Grand Valley Power load interconnection projects expected to be in-service by the summer of 2012 were evaluated in this study request.
5. The normal operating configuration of the Uintah-LomaTP-FruitaGV-BookcliffGV-HighlineGV-Ute Grand Junction 69kV line is with the FruitaGV-BookcliffGV 69kV line open. Sections of this 69kV system can be taken out of service and served from either end by closing the FruitaGV-BookcliffGV 69kV line. The worst case prior outages for the Grand Valley Power 69 kV system between the Ute Grand Junction and Uintah substations are an outage of the Ute Grand Jct-HighlineGV 69 kV line or an outage of the Uintah 69-Loma TapGV 69 kV line and these scenarios were evaluated in this study. For each prior outage, the normally open switch at FruitaGV 69 kV (to place the FruitaGV-BookcliffGV 69kV line in-service) is closed to restore load service.

C. TRANSMISSION SYSTEM UPGRADES

Transmission system upgrades were to be developed if required.

D. CRITERIA

PSCo adheres to NERC Reliability Standards and WECC Criteria as well as internal company criteria for planning studies. The Category A and Category B criteria were used for this study:

<u>Category A – System Normal</u>
"N-0" System Performance Under Normal (No Contingency) Conditions (Category A)
NERC Standard TPL-001-0

Voltage:	0.95 to 1.05 per unit
Line Loading:	100 percent of continuous rating
Transformer Loading:	100% of highest 65 °C rating

Manual or automatic system adjustments such as shunt capacitor or reactor switching, generator scheduling, or LTC tap adjustment are allowed. Area interchanges and phase shifter adjustments are allowed.

Category B – Loss of generator, line, or transformer (Forced Outage)
"N-1" System Performance Following Loss of a Single Element (Category B)
NERC Standard TPL-002-0

Voltage:	0.90 to 1.10 per unit
Line Loading:	100 percent of continuous rating
Transformer Loading:	100% of highest 65 °C rating

Manual system adjustments such as generation dispatch are not allowed. Area interchange adjustments are not be allowed. Adjustments of shunt capacitors or reactors, phase shifting transformers and load tap changing (LTC) transformers are not allowed.

IV. Costs

The study did not identify any upgrades required on the Grand Valley Power system; therefore, indicative planning cost estimates were not developed for this study.

V. Study Results – TOT2A at 185 MW North-to-south

The study case called "12HS_GVP69" study case was evaluated. The case includes the Grand Valley Power 69kV system with the 2012 summer coincident peak demands represented in the model as provided by Grand Valley Power. The Cameo generating station is out-of-service to reflect the retirement of the facility in December of 2010. The Fruita generation facility was placed out-of-service to reflect its normal operating condition. The case represents a TOT2A[4] north-to-south flow of 185 MVA. Contingencies (facility outages) were simulated and the results are listed in Table 3 below.

Table 3 Bus Voltage Range for Grand Valley Power Load Busses (TOT2A=185 MW)

Case: 12HS_GVP69	System Normal: Fruita-Bookclf Open			Uintah-LomaTp Open Fruita-Bookclf Closed			GndJct-Highln Open Fruita-Bookclf Closed		
Bus Serving GVP Loads	Low	Normal	High	Low	Normal	High	Low	Normal	High
ADOBE 230.0	0.922	0.996	1.022	0.926	0.997	1.024	0.900	0.993	1.013
BOOKCFGV 69.0	0.943	0.996	1.008	0.922	0.985	0.997	**0.892**	0.994	1.023
COLBRAN 138.0	0.994	1.009	1.020	0.993	1.008	1.020	0.996	1.012	1.020
DEBEQUE 69.0	0.928	1.000	1.034	0.928	0.993	1.033	0.928	1.003	1.038
FRUITA 69.0	0.948	1.026	1.058	0.952	1.025	1.058	0.925	1.024	1.052
FRUITAGV 69.0	0.952	1.030	1.062	0.915	0.979	0.991	0.915	1.015	1.043
HIGHLNGV 69.0	0.948	1.001	1.016	0.929	0.992	1.017	**0.887**	0.990	1.019
LOMA GV 69.0	0.952	1.030	1.062	0.912	0.976	0.989	0.925	1.024	1.052
LOMATPGV 69.0	0.954	1.031	1.063	0.914	0.978	0.990	0.927	1.026	1.053
ORCHMEGV 69.0	0.958	1.010	1.024	0.945	1.007	1.024	0.986	1.022	1.033
UINTAH 13.8	0.935	1.025	1.061	0.941	1.026	1.063	0.909	1.020	1.051

[4] A definition of TOT2A is provided in Appendix A of this study report

Table 3 represents the expected voltages that could occur at transmission busses that serve Grand Valley Power loads under normal (system normal or system intact) and prior outage conditions. For example, the Adobe 230kV bus that is listed in Table 3 experiences a 0.996 p.u. voltage in the "12HS_GVP69" study case under "Normal" conditions. The "Normal" condition means the system is operating with the Fruita-BookcliffGV 69kV line open and no outages are present on the system. The 0.996 p.u. voltage is within the acceptable voltage range (0.95 p.u. to 1.05 p.u.) that PSCo designs its systems to under system normal (no outages) conditions. The "Low" column represents the lowest bus voltage condition the Adobe 230kV bus experienced (0.922 p.u.) with the Fruita-BookcliffGV 69kV line open and a subsequent transmission line or transformer outage occurring on the system. The 0.922 p.u. voltage level is above the 0.90 p.u. acceptable low voltage criteria level under outage conditions; therefore, this bus voltage is acceptable. The "High" column represents the highest bus voltage condition the Adobe 230kV bus experienced (1.022 p.u.) with the Fruita-BookcliffGV 69kV line open and a subsequent transmission line or transformer outage occurring on the system. The 1.022 p.u. voltage level is less than the 1.10 p.u. acceptable high voltage criteria level for PSCo; therefore, this bus voltage is acceptable.

Table 3 lists the normal and outage condition bus voltages that could occur under the two prior outage conditions that concern Grand Valley Power. The first prior outage requires that the Uintah-LomaTap 69kV line be opened and the FruitaGV-BookcliffGV 69kV line closed. This prior outage results in the LomaGV, FruitaGV, BookcliffGV, and HighlineGV loads being served on a radial line from the Ute Grand Junction Substation. The second prior outage requires that the Ute Grand Junction-HighlineGV 69kV line be opened and the FruitaGV-BookcliffGV 69kV line be closed. This prior outage results in the LomaGV, FruitaGV, BookcliffGV, and HighlineGV loads served on a radial line from the Uintah Substation.

Table 3 indicates that with the second prior outage, (Ute Grand Junction-HighlineGV 69kV line open and the FruitaGV-BookcliffGV 69kV line closed that results in the LomaGV, FruitaGV, BookcliffGV and HighlineGV loads served on a radial line from the Uintah Substation), two transmission busses could experience voltages less than the 0.90 p.u. criteria if a subsequent outage on the bulk transmission system were to occur when Grand Valley Power was operating its 69kV system this way. These include the BookcliffGV 69kV bus (0.892 p.u.) and the HighlineGV 69kV bus (0.887 p.u.). This is an unlikely event. It represents two outages[5] existing at the same time. In addition, it requires a significant north-to-south TOT2A flow. Historical data gathered indicates that the TOT2A flow is at 185 MW or above only 18.5% percent of the time. Because this represents a very unlikely condition (two outages with a significant TOT2A north-to-south flow), no transmission upgrades are recommended.

[5] The outages represent an initial outage condition (the second outage that involves the Ute Grand Junction-HighlineGV 69kV line open with the FruitaGV-BookcliffGV 69kV line closed) followed by a system adjustment and a subsequent outage of the Clifton-Grand Junction 230kV branch after sectionalizing. The Uintah 230-69kV transformer on-load tap changer response is not allowed under outage conditions; however, if it were allowed, it would not correct the voltage violations because of the extremely low voltage at the Uintah 230kV bus (0.903 p.u.) under outage conditions.

The flows on lines that serve Grand Valley Power loads were monitored under system intact and outage conditions and for the two prior outage conditions that concern Grand Valley Power. The line flows are provided in Table 4.

Table 4 Maximum Flows for Lines Serving Grand Valley Power Load Busses (TOT2A=185 MW)

12HS_GVP			System Normal Fruita-Bookclf Open		Uintah-LomaTp Open Fruita-Bookclf Closed		GndJct-Highln Open Fruita-Bookclf Closed	
Monitored Element		Rate	Flow	%OL	Flow	%OL	Flow	%OL
ADOBE 230.00-UINTAH 230.0	1	494.4	157.8	31.9	159.4	32.2	155.3	31.4
BOOKCFGV 69.000-FRUITAGV 69.0	1	44.0	0.0	0.0	4.3	9.9	14.3	32.6
BOOKCFGV 69.000-HIGHLNGV 69.0	1	44.0	6.7	15.3	11.1	25.2	7.3	16.6
CAMEO 69.000-DEBEQUE 69.0	1	55.9	19.6	35.0	19.6	35.0	19.6	35.0
COLBRAN 138.00-RIFLE CU 138.0	1	162.0	40.5	25.0	41.1	25.3	38.6	23.8
FRUITA 69.000-UINTAH 69.0	1	32.3	10.4	32.1	10.4	32.1	10.4	32.1
GRANDJCT 138.00-COLBRAN 138.0	1	162.0	43.7	27.0	44.3	27.3	41.8	25.8
GRANDJCT 69.000-HIGHLNGV 69.0	1	44.0	14.2	32.3	18.8	42.7	0.0	0.0
GRANDJCT 69.000-ORCHMEGV 69.0	1	44.0	9.5	21.6	9.5	21.6	9.5	21.6
LOMATPGV 69.000-FRUITAGV 69.0	1	44.0	2.2	5.0	2.2	5.0	16.7	38.0
LOMATPGV 69.000-LOMA GV 69.0	1	44.0	2.2	5.0	2.2	5.0	2.2	5.0
HORIZON 230.00-ADOBE 230.0	1	494.4	144.3	29.2	145.8	29.5	140.8	28.5
UINTAH 69.000-LOMATPGV 69.0	1	44.0	4.3	9.9	0.0	0.0	19.0	43.1
UNA ORCH 69.000-DEBEQUE 69.0	1	55.9	16.1	28.9	16.1	28.9	16.1	28.9

Table 4 demonstrates that no line serving Grand Valley Power loads is anticipated to experience a potential overload for any of the three scenarios studied (system intact and prior outage condition) and for any subsequent transmission or transformer facility outage. Therefore, no transmission upgrades are recommended.

The transmission lines and busses in the study area were monitored under system intact and outage conditions with the Grand Valley Power system operating with the FruitaGV-BookcliffGV 69kV line open. The results are shown in Table 5. Table 5 lists four criteria violations in the study area. The Hopkins-Basalt 69kV criteria violation is mitigated by a known operating practice that involves opening the line under certain outage conditions. The Hopkins 230-115kV and Rifle 138-69kV criteria violations are being resolved through the PSCo Capital Budget Process. The Rockwood 115kV bus criteria violation is a Tri-State G&T issue.

Table 5 Study Area Criteria Violations for "System Normal" Condition (TOT2A = 185 MW)

Case: 12HS_GVP69.sav						
Monitored Element	Ckt	Limiting Contingency	Rating	LnFlow	%O/L	V-Cont
HOPKINS 115.00-BASALT 115.00	1	BASALT 115.0-BASALT 230.0-T2	66.9	105.1	157.0	
HOPKINS 115.00-HOPKINS 230.00	T3	BASALT 115.0-BASALT 230.0-T2	100.0	119.8	119.8	
RIFLE CU 69.000-RIFLE CU 138.00	T2	RIFLE_PS 230.0-RIFLE_WA 230.0-1	25.0	31.5	126.1	
ROCKWOOD 115.00		HESPERUS 115.0-ROCKWOOD 115.0-1				0.897

The "12HS_GVP69" case was modified by closing the FruitaGV-Bookcliff 69kV line and opening the Uintah-LomaTapGV 69kV line in order to simulate one of the two prior outage conditions that concern Grand Valley Power. Contingencies were simulated and the results placed in Table 6 below.

Table 6 Study Area Criteria Violations for Prior Outage No. 1 Condition (TOT2A=185 MW)

Case: 12HS_GVP69-OUTAGE-1						
Monitored Element	Ckt	Limiting Contingency	Rating	LnFlow	%O/L	V-Cont
HOPKINS 115.00-BASALT 115.00	1	BASALT_____115.0-BASALT_____230.0-T2	66.9	105.1	157.1	
HOPKINS 115.00-HOPKINS 230.00	T3	BASALT_____115.0-BASALT_____230.0-T2	100.0	119.9	119.9	
RIFLE CU 69.000-RIFLE CU 138.00	T2	RIFLE_PS____230.0-RIFLE_WA____230.0-1	25.0	31.7	126.9	
ROCKWOOD 115.00		HESPERUS____115.0-ROCKWOOD____115.0-1				0.897

The results show the first prior outage condition (opening the Uintah-LomaTapGV 69kV line and closing the FruitaGV-BookcliffGV 69kV line) does not significantly affect already existing issues with the system.

The "12HS_GVP69" case was modified by closing the FruitaGV-BookcliffGV 69kV line and opening the Ute Grand Junction-HighlineGV 69kV line in order to simulate the other prior outage conditions that could concern Grand Valley Power. Contingencies were simulated and the results placed in Table 7 below.

Table 7 Study Area Criteria Violations for Prior Outage No. 2 Condition (TOT2A=185 MW)

Case: 12HS_GVP69-OUTAGE-2						
Monitored Element	Ckt	Limiting Contingency	Rating	LnFlow	%O/L	V-Cont
CLIFTON 230.0		CLIFTON____230.0-GRANDJCT____230.0-1				0.898
GRANDJPS 230.0		CLIFTON____230.0-GRANDJCT____230.0-1				0.898
GRANDJPS 230.0		CLIFTON____230.0-GRANDJPS____230.0-1				0.898
HOPKINS 115.00-BASALT 115.0	1	BASALT_____115.0-BASALT_____230.0-T2	66.9	105.0	157.0	
HOPKINS 115.00-HOPKINS 230.0	T3	BASALT_____115.0-BASALT_____230.0-T2	100.0	119.3	119.3	
HORIZON 230.0		CLIFTON____230.0-GRANDJCT____230.0-1				0.898
HORIZON 230.0		CLIFTON____230.0-GRANDJPS____230.0-1				0.898
RIFLE CU 69.000-RIFLE CU 138.0	T2	RIFLE_PS____230.0-RIFLE_WA____230.0-1	25.0	30.9	123.8	
ROCKWOOD 115.0		HESPERUS____115.0-ROCKWOOD____115.0-1				0.897

With the Ute Grand Junction-HighlineGV 69kV branch out-of-service and the FruitaGV-BookcliffGV69kV branch closed (that results in the LomaGV, FruitaGV.BookcliffGV and HighlineGV loads served on a radial line from the Uintah Substation), a contingency of the Clifton-Grand Junction 230kV line or the Grand Junction 345-230kV transformer results in low voltages (less than 0.90 p.u.) at the Clifton 230kV, Grand JunctionPS 230kV and the Horizon 230kV busses. Although this double contingency scenario is not likely to occur, it indicates that the 69kV system has limitations under certain operating scenarios. If this scenario were to occur (the Ute Grand Junction-HighlineGV 69kV branch out-of-service with the FruitaGV-BookcliffGV 69kV line closed to provide radial service to the Grand Valley Power loads), and a subsequent outage of either the Grand Junction 345-230kV transformer or Grand Junction 230-Clifton 230kV branch, Grand Valley Power would

need to shed approximately two MW of load connected to the Uintah-Ute Grand Junction 69kV line in order to bring the HighlineGV bus voltage to 0.90 p.u.

VI. Study Results – TOT2A at 300 MW North-to-south

The Grand Valley Power system was studied with TOT2A at 300 MW north-to-south and was found to be reliable based on the relative risk of various contingencies. Appendix A provides a detailed description of these studies.

APPENDIX A

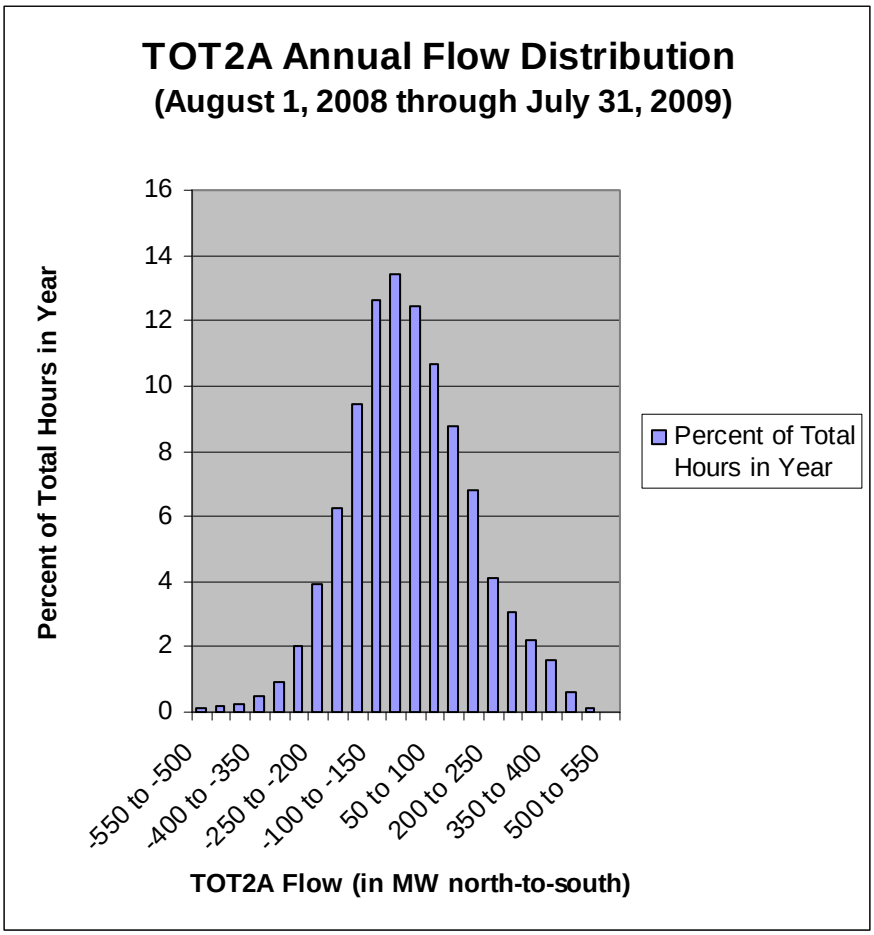
TOT2A Sensitivity Study

A sensitivity study was conducted to consider the impact of high TOT2A north-to-south flows on the Grand Valley Power system. The Western Electricity Coordinating Council (WECC) has defined several power transfer paths within the coordinating council. Three power transfer paths that are located near the study area include TOT1A on the north, TOT5 on the west, and TOT2A on the south. Of these three power transfer paths, TOT2A has the greatest impact on the Grand Valley Power loads and transmission system. TOT2A is defined below:

Line/Transformer	Metered End
-Hesperus-San Juan 345 kV	San Juan
-Durango-Glade Tap 115 kV	Glade Tap
-Lost Canyon-Shiprock 230 kV	Shiprock

Studies have determined that high north-to-south transfers across the TOT2A power transfer path can negatively impact the system between Cameo and Ute Grand Junction. To determine the frequency that TOT2A transfers occur within certain flow ranges, a year's worth of real time data for TOT2A was obtained. The year selected was from August 1, 2008 through July 31, 2009. The hourly flows for TOT2A were grouped within selected ranges and the numbers of hours within each range were recorded. A frequency distribution chart was developed. Figure 2 below represents a histogram showing the frequency distribution of power flows across TOT2A. Positive flows represent north-to-south flows across TOT2A. Negative flows represent south-to-north flows across TOT2A. The frequency distribution histogram demonstrates that flows across TOT2A tend to occur between 150 MW north-to-south and 150 MW south-to-north.

Figure 2 TOT2A Annual Flow Frequency Distribution Chart

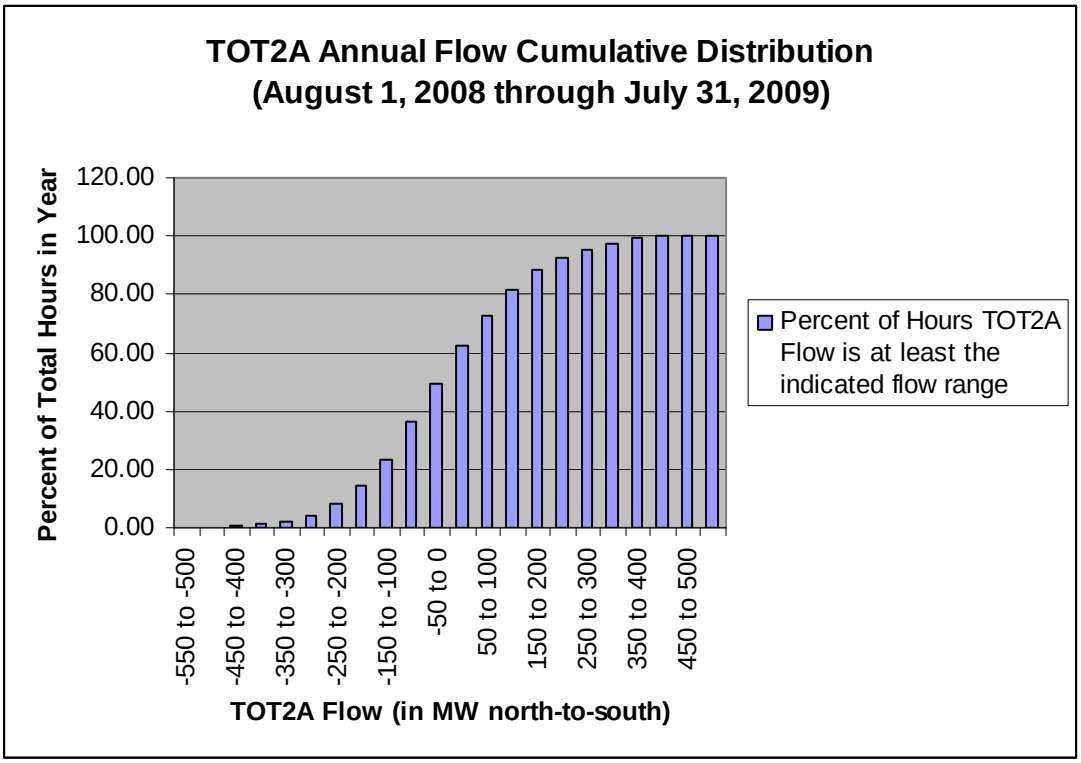


North-to-south flows across the TOT2A transfer path can significantly affect the reliability of the Grand Valley Power study area. The Grand Valley Power system lies in an area just south of the generation resources of the Craig and Hayden generating stations. Much of the power scheduled to New Mexico or to the southwest Colorado load area crosses the study area. This impacts the Grand Valley Power area by causing higher transmission line flows and lower bus voltages. On the other hand, south-to-north schedules across the TOT2A path has less of an impact on the Grand Valley System because most of the south-to-north transfer is used to serve the southwest Colorado loads; hence, a smaller portion of the transfer crosses the Grand Valley Power system. Therefore, the number of hours and magnitude of power flows across TOT2A in the north-to-south direction gives an indication of the relative risk of criteria violations to the Grand Valley Power system. To show this impact, a cumulative distribution chart was developed and is shown in Figure 3 below.

The cumulative distribution chart in Figure 3 shows the amount of hours the TOT2A flow in the north-to-south direction was less than a given flow range for the year of data obtained. From the chart in Figure 3, it can be seen that annual TOT2A north-to-south flows are at 300 MW or less 95.5% of the time. In other words, north-to-south

flows across TOT2A above 300 MW are very unlikely. The annual TOT2A flow was at 185 MW or above only 18.5% percent of the time.

Figure 3 TOT2A North-to-South Flow Cumulative Distribution



From this real time data it was concluded that studying the Grand Valley System with the north-to-south TOT2A flow at 185 MW and 300 MW is adequate to capture the relative risk of reliability to the Grand Valley Power system.

The "12HS_GVP69" case was modified by using the San Juan and Shiprock phase-shifting transformers to control the TOT2A transfer levels. The "12HS_GVP69" case had a TOT2A transfer level of 185 MW north-to-south. A case with a TOT2A transfer level of 300 MW north-to-south was created by opening the El Paso-Glade Tap 115kV line and setting the San Juan phase-shifting transformer at 70% of the 300 MW schedule or 210 MW and the Shiprock phase-shifting transformer at 30% of the 300 MW schedule or 90 MW. The Craig/Hayden generation was increased by 115 MW and the San Juan generation was decreased by 115 MW. The area interchange between WAPA-RMR[6] and New Mexico was increased by 115 MW. The new study case created is called "12HS_GVP69-T300". Contingencies (facility outages) were simulated and the results are listed in Table 8 below.

[6] WAPA-RMR is an acronym for Western Area Power Administration – Rocky Mountain Region

Table 8 Bus Voltage Range for Grand Valley Power Load Busses (TOT2A=300 MW)

Case: 12HS_GVP69-T300	System Normal Fruita-Bookclf Open			Uintah-LomaTp Open Fruita-Bookclf Closed			GndJct-Highln Open Fruita-Bookclf Closed		
Monitored Element	Low	Normal	High	Low	Normal	High	Low	Normal	High
ADOBE 230.0	0.905	0.980	1.010	0.910	0.980	1.012	**0.882**	0.976	1.001
BOOKCFGV 69.0	0.925	0.981	1.002	0.902	0.969	0.990	**0.872**	0.976	1.009
COLBRAN 138.0	0.977	0.998	1.013	0.976	0.997	1.013	0.980	1.001	1.015
DEBEQUE 69.0	0.916	0.987	1.020	0.916	0.985	1.018	0.916	0.989	1.023
FRUITA 69.0	0.940	1.017	1.055	0.947	1.020	1.058	0.906	1.006	1.038
FRUITAGV 69.0	0.944	1.021	1.058	**0.896**	0.963	0.984	**0.895**	0.997	1.029
HIGHLNGV 69.0	0.930	0.985	1.006	0.910	0.976	1.002	**0.867**	0.971	1.005
LOMA GV 69.0	0.944	1.021	1.059	**0.893**	0.960	0.982	0.906	1.006	1.039
LOMATPGV 69.0	0.945	1.023	1.060	**0.894**	0.962	0.983	0.908	1.008	1.040
ORCHMEGV 69.0	0.940	0.995	1.016	0.926	0.992	1.012	0.971	1.007	1.027
UINTAH 13.8	0.916	1.005	1.047	0.922	1.005	1.049	**0.887**	1.000	1.036

Table 8 represents the expected voltages that could occur at transmission busses that serve Grand Valley Power loads under “Normal” and outage conditions. For example, the FruitaGV 69kV bus that is listed in Table 8 experiences a 1.021 p.u. voltage in the “12HS_GVP69-T300” study case under “Normal” conditions. The “Normal” condition means the system is operating with the Fruita-BookcliffGV 69kV line open and no outages are present on the bulk transmission system. The 1.021 p.u. voltage is within the acceptable voltage range (0.95 p.u. to 1.05 p.u.) under system normal (no outage) conditions. The “Low” column represents the lowest bus voltage condition the FruitaGV 69kV bus experienced (0.944 p.u.) with the Fruita-BookcliffGV 69kV line open and a subsequent transmission line or transformer outage occurring on the system. The 0.944 p.u. voltage level is above the 0.90 p.u. acceptable low voltage criteria level for PSCo under outage conditions; therefore, this bus voltage is acceptable. The “High” column represents the highest bus voltage condition the FruitaGV 69kV bus experienced (1.058 p.u.) with the Fruita-BookcliffGV 69kV line open and a subsequent transmission line or transformer outage occurring on the system. The 1.058 p.u. voltage level is less than the 1.10 p.u. acceptable high voltage criteria level; therefore, this bus voltage is acceptable.

Table 8 lists the normal and outage condition bus voltages that could occur under the two prior outage conditions. The first prior outage condition is with the Uintah-LomaTap 69kV line open and the FruitaGV-BookcliffGV 69kV line closed and the LomaGV, FruitaGV.BookcliffGV and HighlineGV loads served on a radial line from the Ute Grand Junction Substation. Table 8 also lists the bus voltages that could occur with the second prior outage. The second prior outage is with the Ute Grand Junction-HighlineGV 69kV line open and the FruitaGV-BookcliffGV 69kV line closed and the LomaGV, FruitaGV.BookcliffGV and HighlineGV loads served from the Uintah Substation.

Table 8 indicates that with the second prior outage, the Ute Grand Junction-HighlineGV 69kV line open and the FruitaGV-BookcliffGV 69kV line closed (and the LomaGV, FruitaGV.BookcliffGV and HighlineGV loads served from the Uintah

Substation), five transmission busses could experience voltages less than the 0.90 p.u. criteria if an outage on the system were to occur when Grand Valley Power was operating its 69kV system this way. These include the Adobe 230kV bus (0.882 p.u.), BookcliffGV 69kV bus (0.872 p.u.), FruitaGV 69kV (0.895 p.u.), the HighlineGV 69kV bus (0.867 p.u.) and the Uintah 13.8kV bus (0.887 p.u.). This is an unlikely event. It represents two outages occurring at the same time. In addition, it requires a significant north-to-south TOT2A. The historical data obtained shows that the TOT2A flow is at 300 MW or above only 4.5% percent of the time. In addition, an outage on the system would need to occur while Grand Valley Power was operating in this configuration. Therefore, no transmission upgrades are recommended to address this unlikely scenario.

The flows on lines that serve Grand Valley Power loads were monitored under system intact and outage conditions and for the two prior outages that Grand Valley Power can experience. The line flows are provided in Table 9. Table 9 demonstrates that no line serving Grand Valley Power loads displayed a potential overload for all scenarios anticipated at a TOT2A north-to-south level of 300 MW. Therefore, no transmission upgrades are required.

Table 9 Maximum Flows for Lines Serving Grand Valley Power Load Busses (TOT2A=300 MW)

12HS_GV69-T300			System Normal: Fruita-Bookclf Open		Uintah-LomaTp Open Fruita-Bookclf Closed		GndJct-Highln Open Fruita-Bookclf Closed	
Monitored Element	Ckt	Rating	Line Flow	% Nominal	Line Flow	% Nominal	Line Flow	% Nominal
ADOBE 230.0-UINTAH 230.0	1	494.4	189.6	38.3	191.2	38.7	184.2	37.3
BOOKCFGV 69.0-FRUITAGV 69.0	0	44.0	0.0	0.0	4.4	9.9	14.3	32.6
BOOKCFGV 69.0-HIGHLNGV 69.0	1	44.0	6.7	15.3	11.1	25.2	7.3	16.6
CAMEO 69.0-DEBEQUE 69.0	1	55.9	19.6	35.1	19.6	35.1	19.6	35.1
FRUITA 69.0-UINTAH 69.0	1	32.3	10.4	32.1	10.4	32.1	10.4	32.1
GRANDJCT 138.0-COLBRAN 138.0	1	162.0	51.0	31.5	51.6	31.9	49.1	30.3
GRANDJCT 69.0-HIGHLNGV 69.0	1	44.0	14.2	32.3	18.8	42.8	0.0	0.0
GRANDJCT 69.0-ORCHMEGV 69.0	1	44.0	9.5	21.6	9.5	21.6	9.5	21.6
HORIZON 230.00-ADOBE 230.0	1	494.4	176.2	35.6	177.8	36.0	171.0	34.6
LOMATPGV 69.0-FRUITAGV 69.0	1	44.0	2.2	5.0	2.2	5.0	16.7	38.0
LOMATPGV 69.0-LOMA GV 69.0	1	44.0	2.2	5.0	2.2	5.0	2.2	5.0
UNA ORCH 69.0-DEBEQUE 69.0	1	55.9	16.1	28.9	16.1	28.9	16.1	28.9
UINTAH 69.0-LOMATPGV 69.0	1	44.0	4.3	9.9	0.0	0.0	19.0	43.2

The TOT2A flow level was increased to 500 MW north-to-south. Under this very high TOT2A transfer level, additional bus voltage and branch flow criteria violations in the study area were observed. Under system intact conditions, bus voltage violations were noted at Cameo 230kV (0.942 p.u.), Clifton 230kV (0.938 p.u.), GrandJct 230kV (0.939 p.u.), GrandJPS 230kV (0.937 p.u.), Horizon 230kV (0.937 p.u.), Adobe 230kV (0.938 p.u.), Bench 230kV (0.949 p.u.), and Uintah 230kV (0.940 p.u.). These issues related to the 230kV transmission system will be addressed by the PSCo in a coordinated effort with other transmission utilities including WAPA-RMR, Tri-State G&T, and Platte River Power Authority.

Single contingencies of transmission lines and transformers in the study area were simulated and the results are listed in the table below.

Table 10 Study Area Criteria Violations for Case 12HS_GVP-T500"

Case: 12HS_GVP69-T500.sav						
Monitored Element	Ckt	Limiting Contingency	Rating	LnFlow	%O/L	V-Cont
ADOBE 230.0		CLIFTON 230.0-GRANDJCT 230.0-1				**0.854**
AM EAST 115.0		HESPERUS 115.0-FLOR.RIV 115.0-1				0.868
BENCH 230.0		PARACHUT 230.0-RIFLE_PS 230.0-1				0.855
BOOKCFGV 69.0		GRANDJCT 345.0-RIFLE_CU 345.0-1				**0.896**
CAMEO 230.0		PARACHUT 230.0-RIFLE_PS 230.0-1				0.866
CASCADEL 115.0		HESPERUS 115.0-ROCKWOOD 115.0-1				0.885
CLIFTON 230.0		CLIFTON 230.0-GRANDJCT 230.0-1				0.851
CRAIG 230.00-RIFLE WA 230.0	1	CRAIG 345.0-MEEKER 345.0-1	478.0	525.5	109.9	
CURECANT 115.00-SOCANAL 115.0	1	GRANDJCT 345.0-MONTROSE 345.0-1	120.0	142.9	119.1	
DEBEQUE 69.0		CAMEO 69.00-DEBEQUE 69.00-1				**0.896**
FLOR.RIV 115.0		HESPERUS 115.0-FLOR.RIV 115.0-1				0.863
FRUITA 69.0		CLIFTON 230.0-GRANDJCT 230.0-1				**0.885**
FRUITAGV 69.0		CLIFTON 230.0-GRANDJCT 230.0-1				**0.889**
GRANDJCT 115.00-GRANDJCT 138.0	T2	GRANDJCT 345.0-RIFLE_CU 345.0-1	50.0	62.5	124.9	
GRANDJCT 230.0		GRANDJCT 230.0-GRANDJCT 345.0-1				0.854
GRANDJPS 230.0		CLIFTON 230.0-GRANDJCT 230.0-1				0.851
HOPKINS 115.00-BASALT 115.0	1	BASALT 115.0-BASALT 230.0-T2	66.9	104.6	156.3	
HOPKINS 115.00-HOPKINS 230.0	T3	BASALT 115.0-BASALT 230.0-T2	100.0	120.4	120.4	
HORIZON 230.0		CLIFTON 230.0-GRANDJCT 230.0-1				0.852
LOMA GV 69.0		CLIFTON 230.0-GRANDJCT 230.0-1				**0.889**
LOMATPGV 69.0		CLIFTON 230.0-GRANDJCT 230.0-1				**0.891**
MONTROSE 115.00-SOCANAL 115.0	1	GRANDJCT 345.0-MONTROSE 345.0-1	120.0	121.5	101.3	
PAGOSA 115.0		HESPERUS 115.0-FLOR.RIV 115.0-1				0.877
PARACHUT 230.0		PARACHUT 230.0-RIFLE_PS 230.0-1				0.858
RIFLE CU 69.000-RIFLE CU 138.0	**T2**	GRANDJCT 345.0-RIFLE_CU 345.0-1	25.0	32.2	**128.7**	
ROCKWOOD 115.0		HESPERUS 115.0-ROCKWOOD 115.0-1				0.879
UINTAH 230.0		CLIFTON 230.0-GRANDJCT 230.0-1				0.857
UINTAH 69.0		CLIFTON 230.0-GRANDJCT 230.0-1				0.892
UNA ORCH 69.0		CAMEO 69.00-DEBEQUE 69.00-1				0.898
WEELERPS 230.		PARACHUT 230.0-RIFLE_PS 230.0-1				0.857

The results demonstrate that at a very high TOT2A flow of 500 MW north-to-south, criteria violations may occur that could impact the Grand Valley Power system. Several busses in the study area could experience low voltages under outage conditions, including some 230kV busses. This issue is being address in a long-range transmission planning study that PSCo is conducting. The contingency overload of WAPA-RMR's Craig-RifleWA 230kV transmission line at 110% will be addressed by a joint study group composed of representatives of PSCo, WAPA-RMR, Tri-State G&T and Platte River Power Authority. The contingency overload of the Grand Junction 138-115kV transformer was identified in previous studies and a recommendation to add a second 50 MVA 138-115kV transformer was proposed.

The criteria violations listed in Table 10 occur under contingency conditions for a TOT2A north-to-south flow of 500 MW. From the historical data gathered, it was determined that a TOT2A north-to-south flow at 500 MW or above occurred for only

one hour during the year. On Monday, September 1, 2008 hour ending 1600 hours, the TOT2A north-to-south flow reached 531 MW. PSCo is studying the long-term development of the area to determine the best alternative to address the violations.

APPENDIX B

Debeque 69kV Load Serving Issues

The Debeque Substation was identified as a Grand Valley Power load-serving bus that could experience criteria violations as demand increases on the RifleCu-Grand Valley-Una-Debeque-Cameo 69kV line. The Rifle 25 MW 138-69kV transformer was found to be a limiting element to load growth at Debeque Substation (a Grand Valley Power and Xcel Energy Retail load bus) and the Una Substation. The RifleCu-Cameo 69kV transmission line serves Grand Valley Power and Xcel Retail loads at Debeque Substation and serves PSCo retail loads at Una Substation. As demand at these substations grows, impacts on the system may occur.

The Debeque and Una substations are separated by approximately six miles. Voltages at the Una Substation are observed to be lower than bus voltages at the Debeque Substation by approximately 0.6%. Since the bus voltages at the Una Substation tend to be less than the bus voltages at the Debeque Substation, the Una Substation was selected as one of the variables for the study. Demand at the Una Substation and TOT2A transfer flows were varied to assess the impact on the RifleCu 25 MVA 138-69kV transformer and the low voltage at the Una Substation (and the Debeque Substation). The demand at Debeque Substation was fixed at 2.5 MW. This demand is expected to grow after 2012 as Grand Valley Power loads increase.

The study demonstrates that as demand at Una Substation increases, the flow across the RifleCu 25 MVA 138-69 kV transformer increases beyond its 25 MVA rating. In addition, the Una Substation bus voltage decreases as the demand increases. Replacing the RifleCu 35 MVA 138-69kV transformer will be required to support any load additions at Una Substation (and Debeque Substation). In addition, a capacitor bank will be required at the Una Substation to support the Una and Debeque bus voltages. Long term solutions are being investigated in order to support the entire Grand Valley Power and PSCo retail customer requirements.

A. Existing RifleCu 138-69kV Transformer Modeled in the Case

A 2011 heavy summer peak demand base case was obtained that reflects the study period. The Debeque Substation demand was represented at 2.5 MW. The Cameo generation station was not represented in the case. This reflects the Cameo station retirement that will occur at the end of 2010. Demand at the Una Substation was varied between 0 MW and 30 MW. In addition, north-to-south schedules across TOT2A were varied between 100 MW and 500 MW.

Figure 4 Impact of Una 69kV Demand on the RifleCu 138-69kV Transformer Under System Intact Conditions

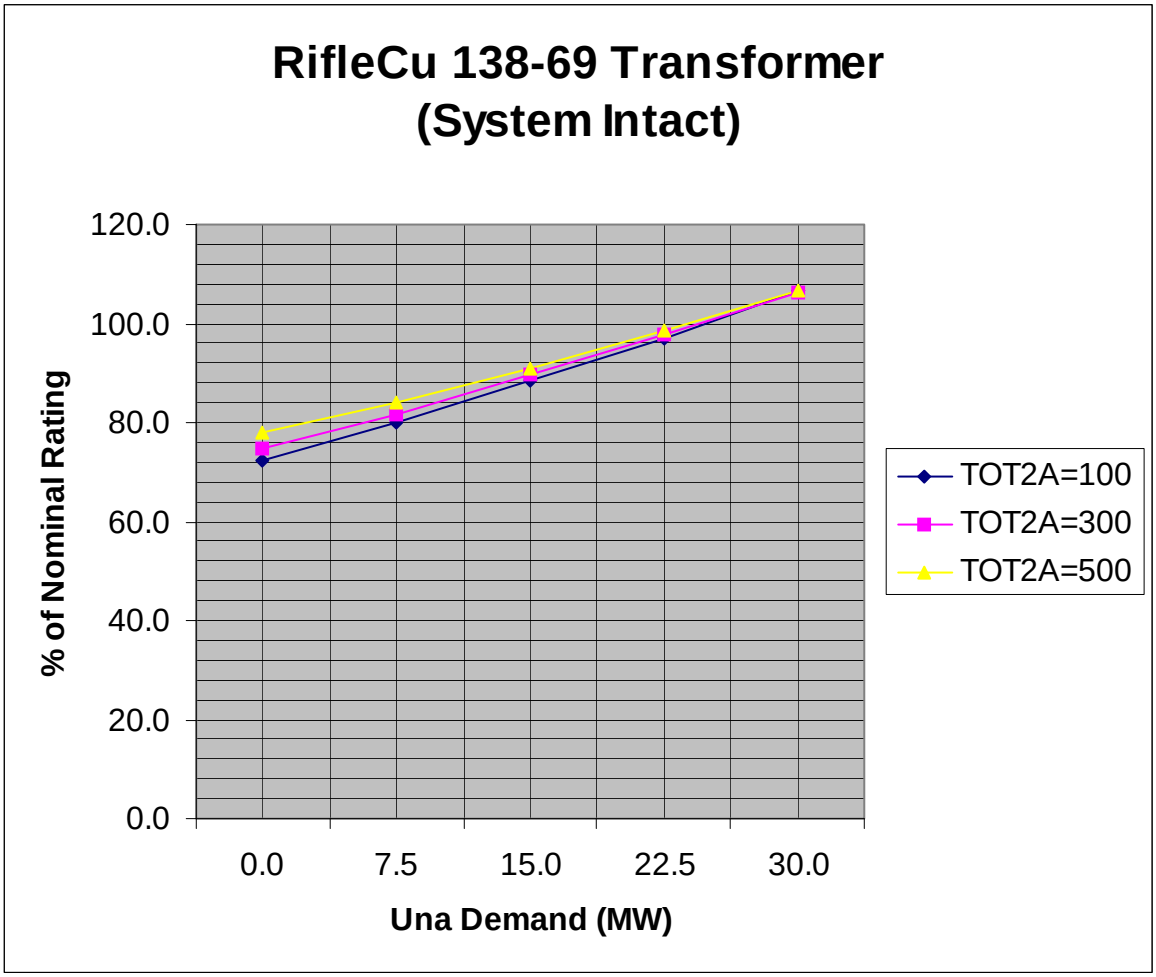


Figure 4 represents the impact on the RifleCu 138-69kV transformer as the Una 69kV demand is varied under system normal condition (no outage on the system). With the Debeque demand at 2.5 MW and the Una demand at 15 MW, the RifleCu 25 MVA 115-69kV transformer flow is at approximately 90% of rating. As Una demand is increased to 22.5 MW, the RifleCu transformer flow is just under the transformer rating. When the Una demand increased to 30 MW, the RifleCu transformer flow is well above its nominal rating.

Figure 5 Impact of Una 69kV Demand on the Una 69kV Bus Voltage Under System Intact Conditions

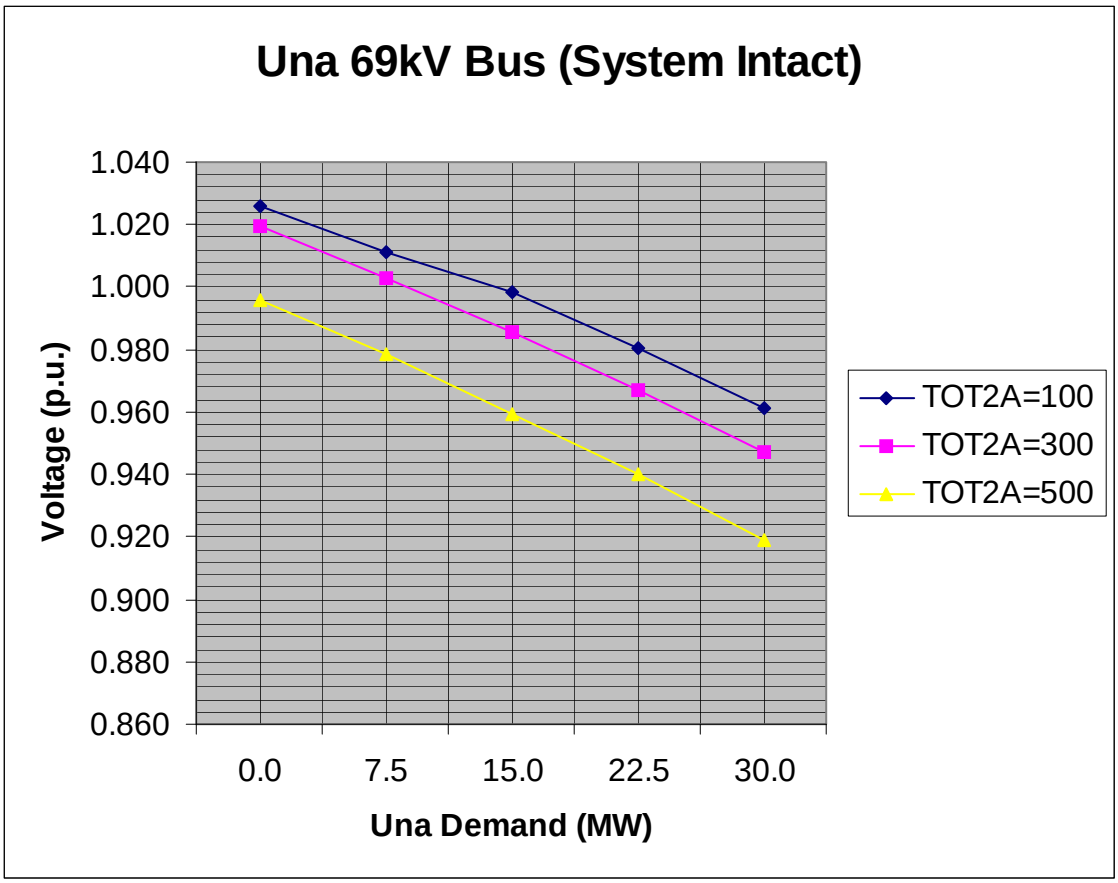


Figure 5 demonstrates the impact of demand increases at Una Substation on the voltages at Una Substation under system intact conditions. As TOT2 transfer levels increase, the voltages at Una Substation decrease below the 0.95 p.u. criteria. With 2.5 MW at the Debeque Substation and the demand at Una Substation increased to 22.5 MW, the system intact bus voltage at Una Substation is less than the 0.95 p.u. system intact criteria limit at a TOT2A flow of 500 MW north-to-south.

Figure 6 Impact of Una 69kV Demand on the RifleCu 138-69kV Transformer Under Outage Conditions

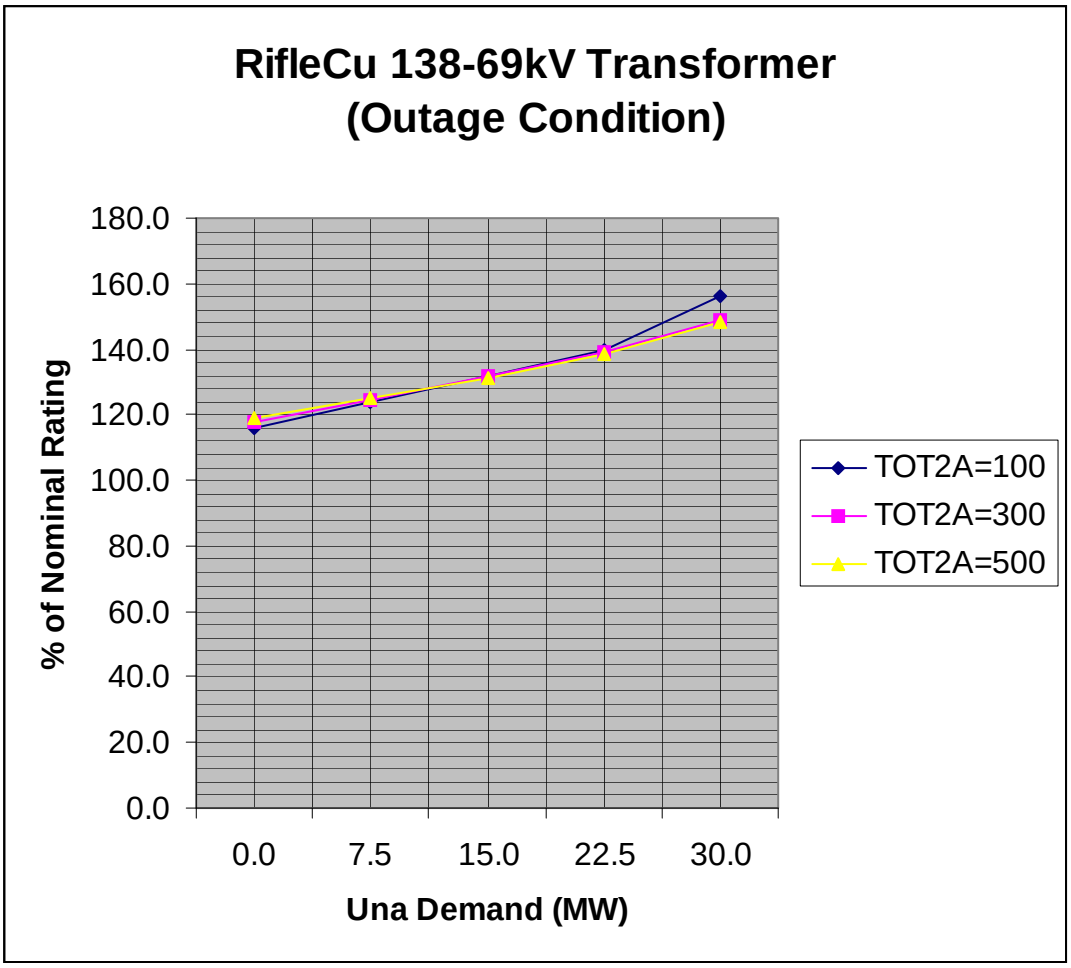


Figure 6 demonstrates the impact of outage conditions on the RifleCu 138-69kV transformer. With Debeque demand at 2.5 MW and Una demand at 0.0 MW, an outage on the transmission system could cause the contingency flow across the RifleCu 138-69kV transformer to exceed its 115% emergency limit. Clearly, mitigation is needed to address outage conditions that affect flows across the RifleCu 138-69kV transformer.

Figure 7 Impact of Una 69kV Demand on the Una 69kV Bus Voltage Under Outage Conditions

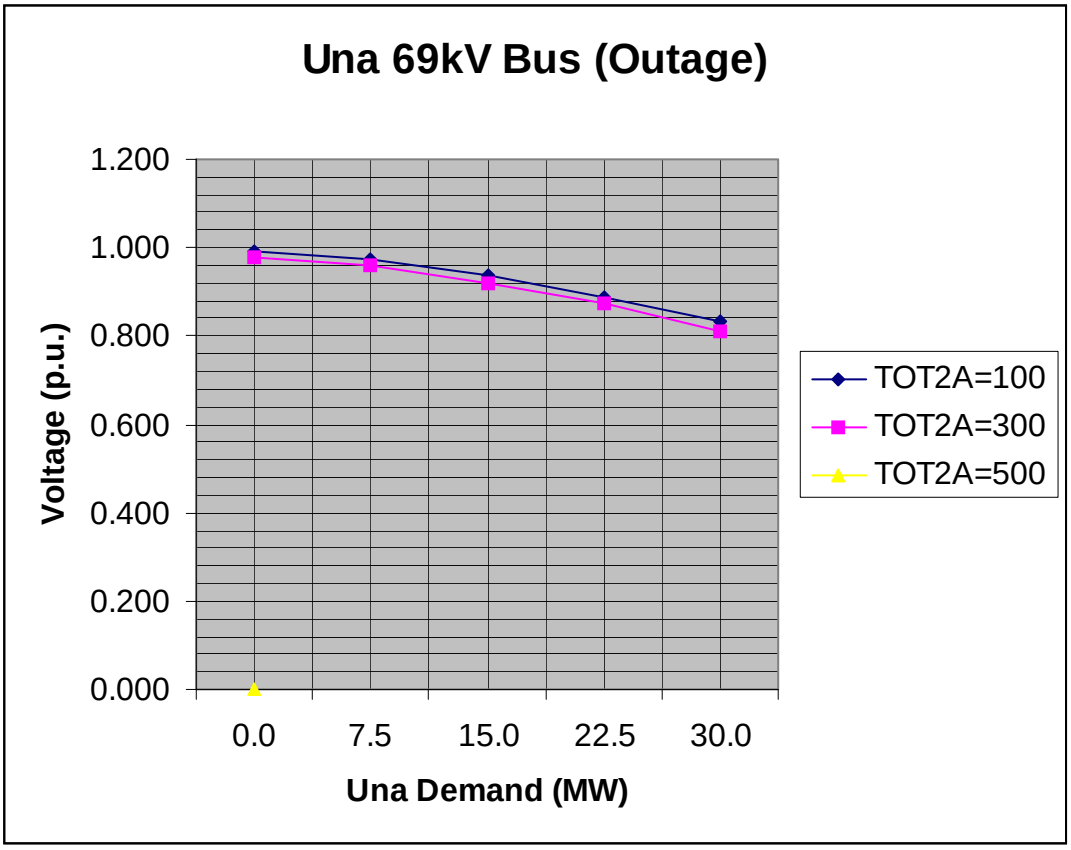
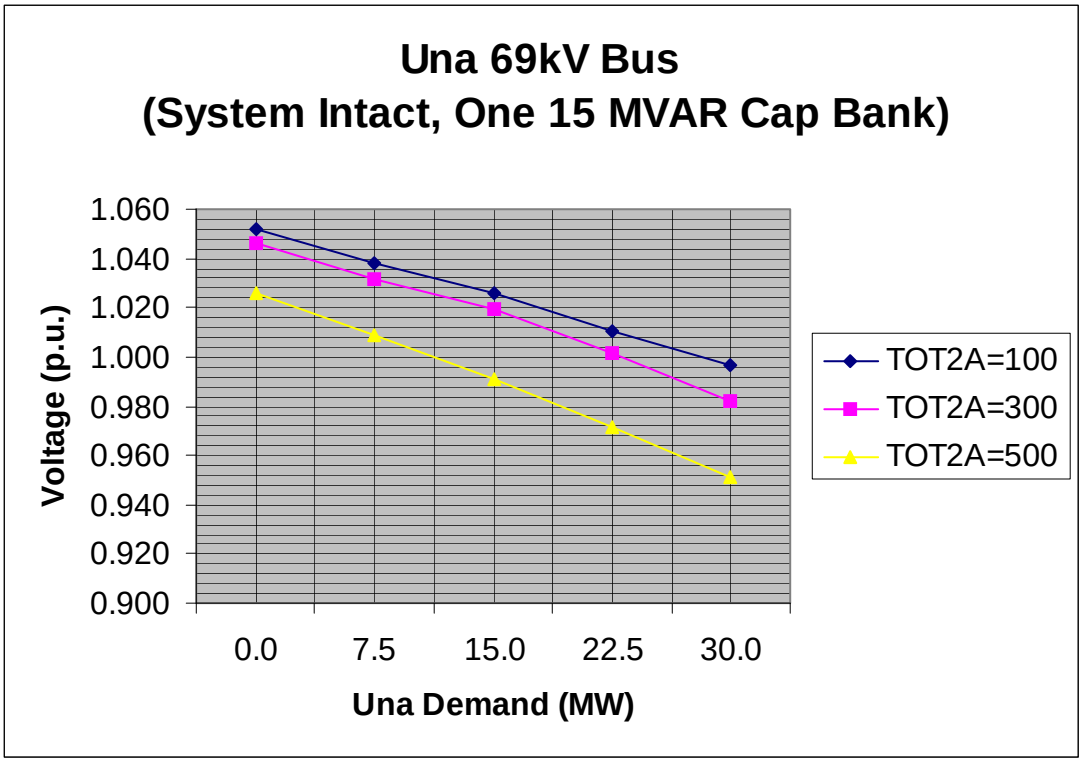


Figure 7 shows the impact of increased Una demand (with Debeque demand at 2.5 MW) on the Una bus voltage under outage conditions. With Una demand at 22.5 MW, an outage on the transmission system could cause the Una 69kV bus voltage to be less than the 0.9 p.u. criteria limit for outage conditions. This demonstrates that mitigation is needed in order to serve increased demand on the RifleCu-Cameo 69kV transmission line under outage conditions.

B. RifleCu 75 MVA 138-69kV Transformer Modeled in the Case

A heavy summer peak demand base case was modified to reflect the replacement of the existing 25 MVA 138-69kV RifleCu transformer with a 75 MVA transformer. Demand at the Debeque Substation was increased to 5 MW to represent potential growth at Debeque Substation. Demand at Una was varied between 0 MW and 30 MW. In addition, north-to-south schedules across TOT2A were varied between 100 MW and 500 MW. A 15 MVAR capacitor bank was added at Una Substation to provide voltage support. The bus voltage at the Una 69kV Substation was monitored

Figure 8 Impact of Una 69kV Demand on the Una 69kV Bus Voltage (System Intact) With a 15 MVAR Capacitor Bank at Una Substation



Power flow studies show that a new RifleCu 75 MVA 138-69 kV transformer would have sufficient capacity to serve the increased demands from Grand Valley Power and Xcel Retail. Figure 8 demonstrates that the Una bus voltage would require reactive support to remain above the 0.95 p.u. criteria limit under system intact conditions. Adding a single 15 MVAR capacitor bank at the Una Substation provides sufficient support under system intact conditions for projected demand increases at the Debeque Substation (5 MW), the Una Substation, and under varying TOT2A flow levels.

Figure 9 Impact of Una 69kV Demand on the Una 69kV Bus Voltage (Outage Condition) with one 15 MVAR Capacitor Bank at Una Substation

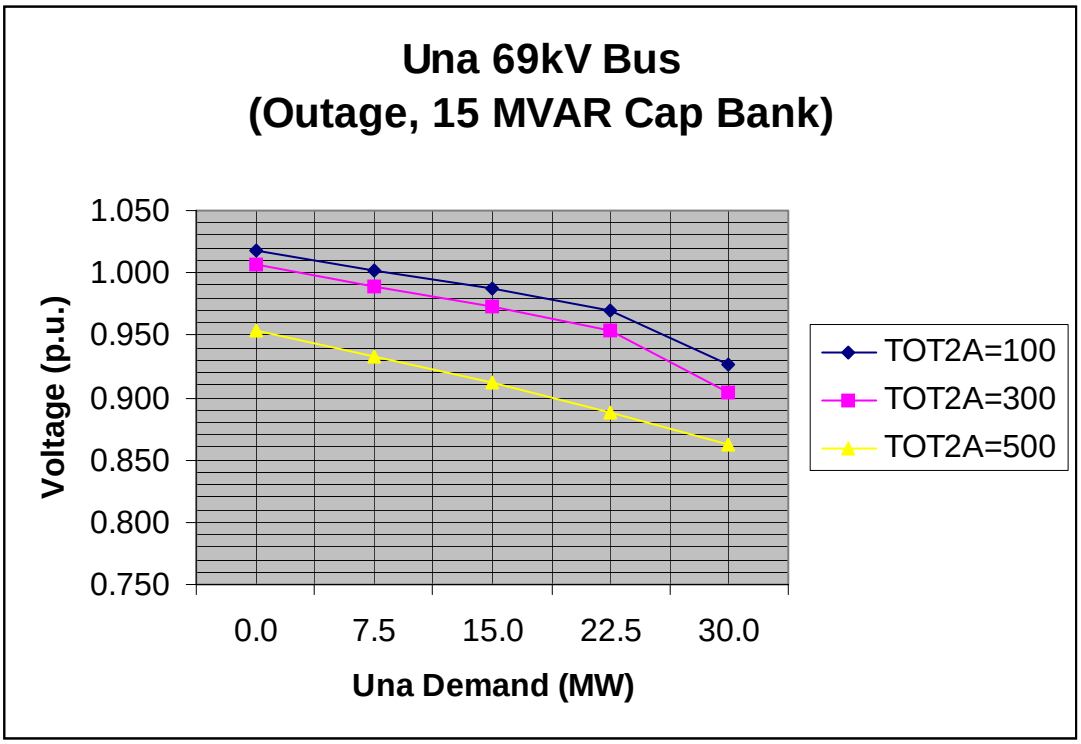


Figure 9 shows the impact of the addition of one 15 MVAR capacitor bank at the Una Substation under outage conditions with Debeque demand at 5 MW, Una demand varied between 0 MW and 30 MW, and TOT2A flows varied between 100 MW north-to-south and 500 MW north-to-south. The studies show that a second 15 MVAR capacitor bank would be required if the TOT2A north-to-south flow was increased to 500 MW and an outage condition occurred on the system affecting the RifleCu-Cameo 69kV line. A single 15 MVAR capacitor bank at Una Substation mitigates the Una 69kV bus voltage for all demand and TOT2A conditions except for the highest TOT2A flow. This result assumes 5 MW of demand at the Debeque Substation.

Alternatives are being considered to mitigate the RifleCu 25 MVA 138-69kV transformer. One alternative includes the replacement of the existing 138kV/69kV, 25MVA transformer with a 75MVA transformer at the Rifle Substation. A circuit breaker would be installed in the existing 138kV transformer bay so that the new transformer would connect to the main bus. A new 138kV switch between the new circuit breaker and existing transformer tap would be installed to allow for breaker maintenance. The 1.5" tube tap between the 138kV bay and the transformer bus would be replaced with a 2" tube. The high side of the transformer would be connected to the existing transformer bus. The low side of the transformer would be connected to the existing 69kV switch. A new relay panel would be installed for the new circuit breaker and transformer protection. A second alternative would consist of the replacement of the 25 MVA 138-69kV transformer with a 75 MVA 230kV/69kV transformer at the Rifle Substation and substation improvements to complete the installation of the 230-69kV transformer.

APPENDIX C

Power Flow Diagrams

Diagram 1. “Normal” condition (FruitaGV-BookcliffGV 69kV line open)
Grand Valley Power Study Area
Case “12HS_GVP69”
2012 summer coincident peak demands for Grand Valley Power
TOT2A at 185 MW North-to-South
Cameo Generation retired
Fruita Generation out-of-service

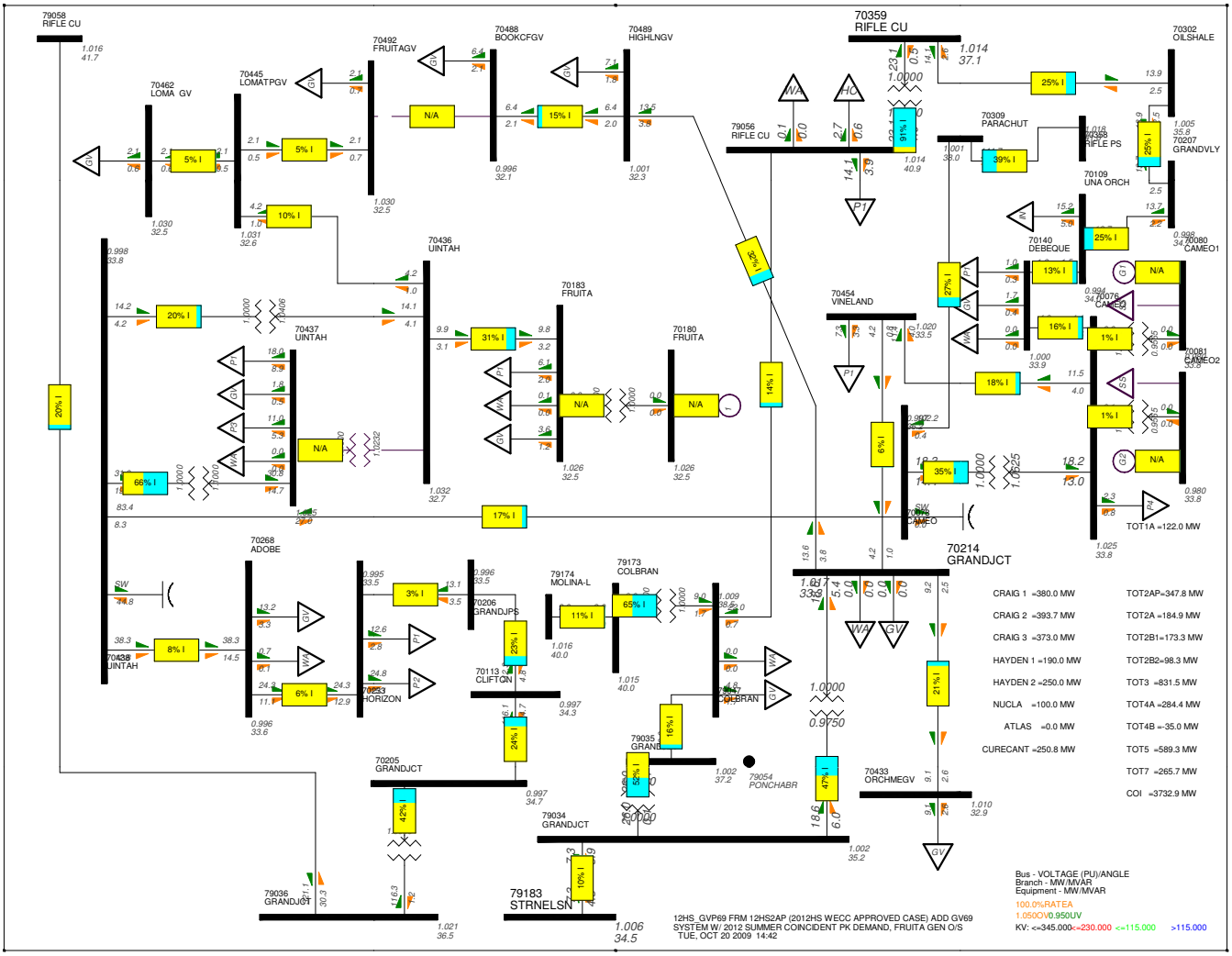

79058 RIFLE CU
70359 RIFLE CU
70462 LOMA GV
70445 LOMATPGV
70492 FRUITAGV
70488 BOOKCFGV
70489 HIGHLNGV
70302 OILSHALE
70309 PARACHUT
70207 GRANDVLY
70109 UNA ORCH
70140 DEBEQUE
70080 CAMEO1
70076 CAMEO
70081 CAMEO2
70454 VINELAND
70436 UINTAH
70183 FRUITA
70180 FRUITA
70437 UINTAH
70268 ADOBE
70206 GRANDJPS
79174 MOLINA-L
79173 COLBRAN
70113 CLIFTON
70205 GRANDJCT
79035 GRANDJCT
79054 PONCHABR
70433 ORCHMEGV
79034 GRANDJCT
79036 GRANDJCT
79183 STRNELSN
70214 GRANDJCT
CRAIG 1 =380.0 MW
CRAIG 2 =393.7 MW
CRAIG 3 =373.0 MW
HAYDEN 1 =190.0 MW
HAYDEN 2 =250.0 MW
NUCLA =100.0 MW
ATLAS =0.0 MW
CURECANT =250.8 MW
TOT2AP=347.8 MW
TOT2A =184.9 MW
TOT2B1=173.3 MW
TOT2B2=98.3 MW
TOT3 =831.5 MW
TOT4A =284.4 MW
TOT4B =-35.0 MW
TOT5 =589.3 MW
TOT7 =265.7 MW
COI =3732.9 MW
Bus - VOLTAGE (PU)/ANGLE
Branch - MW/MVAR
Equipment - MW/MVAR
100.0%RATEA
1.050OV0.950UV
KV: <=345.000 <=230.000 <=115.000 >115.000
12HS_GVP69 FRM 12HS2AP (2012HS WECC APPROVED CASE) ADD GV69
SYSTEM W/ 2012 SUMMER COINCIDENT PK DEMAND, FRUITA GEN O/S
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Diagram 2. Prior Outage #1 (Uintah-LomaTapGV 69kV line open and FruitaGV-Bookcliff 69kV line closed)
Grand Valley Power Study Area
Case “12HS_GVP69-OUTAGE-1”
2012 summer coincident peak demands for Grand Valley Power
TOT2A = 185 MW North-to-South
Grand Valley Power Study Area
Cameo Generation retired
Fruita Generation out-of-service

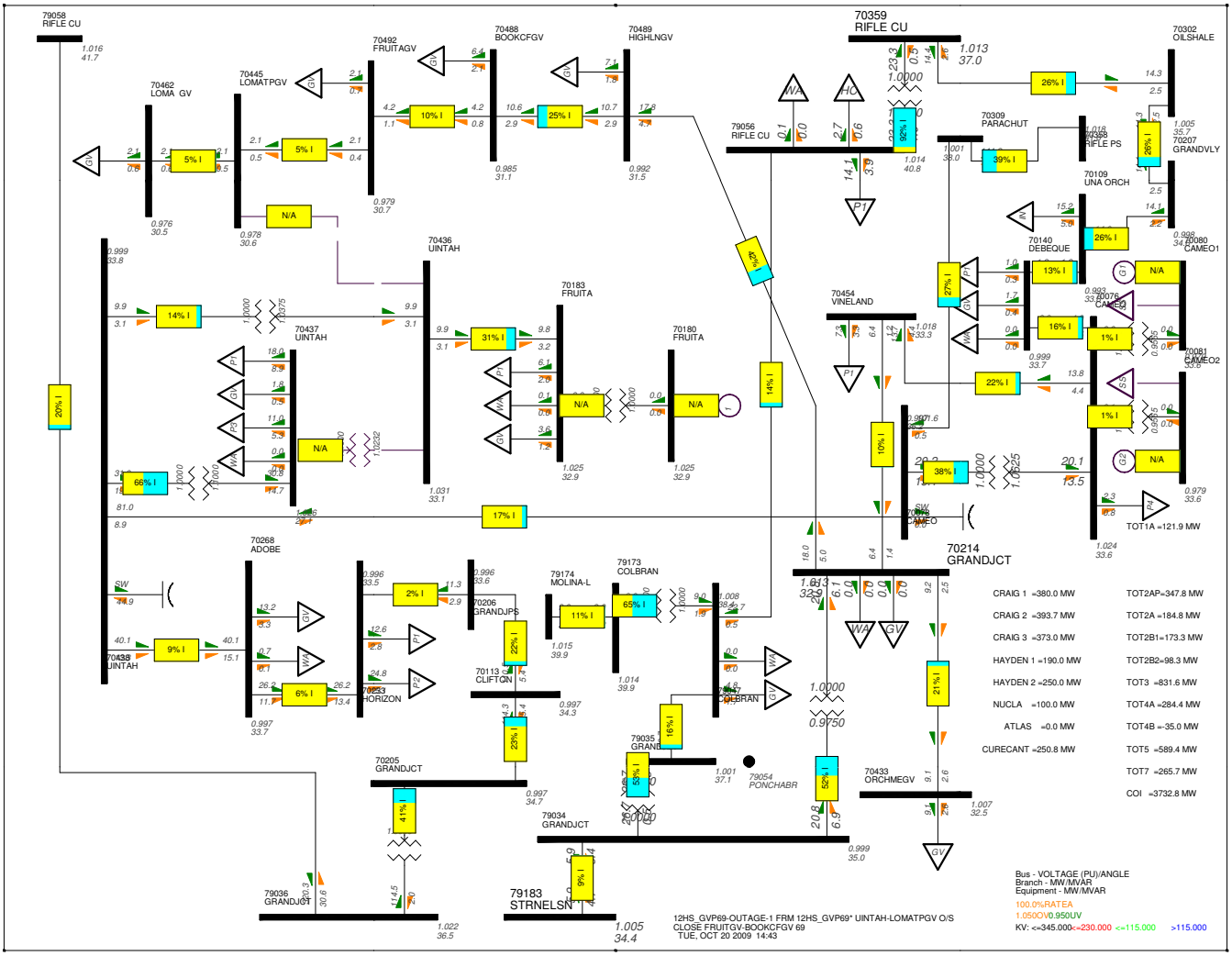
79058 RIFLE CU
70359 RIFLE CU
70302 OILSHALE
70462 LOMA GV
70445 LOMATPGV
70492 FRUITAGV
70488 BOOKCFGV
70489 HIGHLNGV
79056 RIFLE CU
70309 PARACHUT
70207 GRANDVLY
70109 UNA ORCH
70140 DEBEQUE
70454 VINELAND
70436 UINTAH
70183 FRUITA
70437 UINTAH
70180 FRUITA
70214 GRANDJCT
70268 ADOBE
79174 MOLINA-L
79173 COLBRAN
70206 GRANDJPS
70113 CLIFTON
70205 GRANDJCT
79034 GRANDJCT
70433 ORCHMEGV
79183 STRNELSN
79036 GRANDJCT
CRAIG 1 =380.0 MW
CRAIG 2 =393.7 MW
CRAIG 3 =373.0 MW
HAYDEN 1 =190.0 MW
HAYDEN 2 =250.0 MW
NUCLA =100.0 MW
ATLAS =0.0 MW
CURECANT =250.8 MW
TOT2AP=347.8 MW
TOT2A =184.8 MW
TOT2B1=173.3 MW
TOT2B2=98.3 MW
TOT3 =831.6 MW
TOT4A =284.4 MW
TOT4B =-35.0 MW
TOT5 =589.4 MW
TOT7 =265.7 MW
COI =3732.8 MW
Bus - VOLTAGE (PU)/ANGLE
Branch - MW/MVAR
Equipment - MW/MVAR
100.0%RATEA
1.050OV0.950UV
KV: <=345.000<=230.000 <=115.000 >115.000
12HS_GVP69-OUTAGE-1 FRM 12HS_GVP69* UINTAH-LOMATPGV O/S
CLOSE FRUITGV-BOOKCFGV 69
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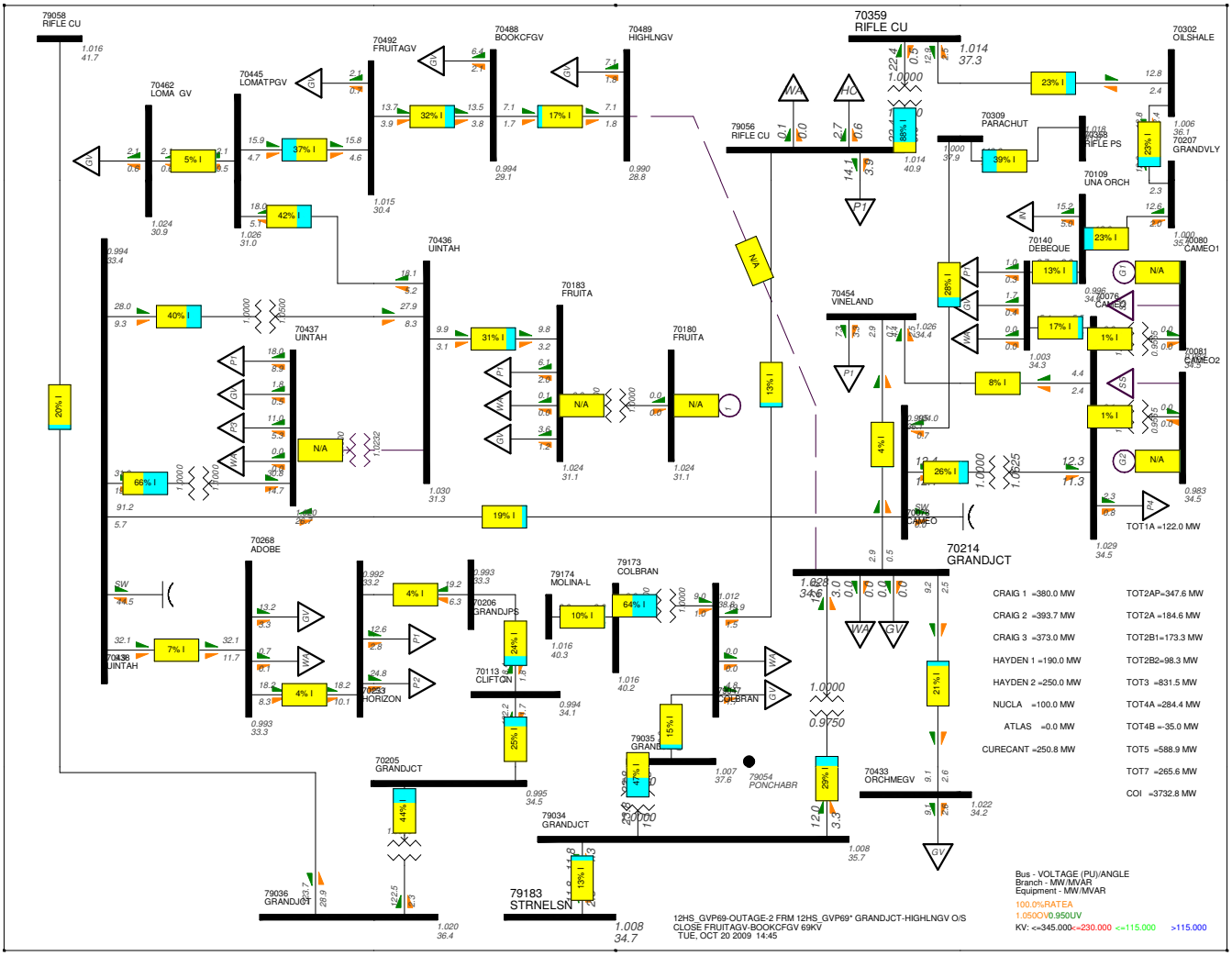
Diagram 3. Prior Outage #2 (Ute Grand Junction-HighlineGV 69kV line open and FruitaGV-Bookcliff 69kV line closed)
Grand Valley Power Study Area
Case “12HS_GVP69-OUTAGE-2”
2012 summer coincident peak demands for Grand Valley Power
TOT2A = 185 MW North-to-South
Grand Valley Power Study Area
Cameo Generation retired
Fruita Generation out-of-service


79058 RIFLE CU
70359 RIFLE CU
70462 LOMA GV
70445 LOMATPGV
70492 FRUITAGV
70488 BOOKCFGV
70489 HIGHLNGV
70302 OILSHALE
70207 GRANDVLY
70309 PARACHUT
70109 UNA ORCH
70140 DEBEQUE
70080 CAMEO1
70076 CAMEO
70081 CAMEO2
70454 VINELAND
70436 UINTAH
70437 UINTAH
70183 FRUITA
70180 FRUITA
70268 ADOBE
70206 GRANDJPS
79174 MOLINA-L
79173 COLBRAN
70113 CLIFTON
70205 GRANDJCT
79035 GRANDJCT
79034 GRANDJCT
79036 GRANDJCT
79183 STRNELSN
70214 GRANDJCT
70433 ORCHMEGV
79056 RIFLE CU
79054 PONCHABR
CRAIG 1 =380.0 MW
CRAIG 2 =393.7 MW
CRAIG 3 =373.0 MW
HAYDEN 1 =190.0 MW
HAYDEN 2 =250.0 MW
NUCLA =100.0 MW
ATLAS =0.0 MW
CURECANT =250.8 MW
TOT2AP=347.6 MW
TOT2A =184.6 MW
TOT2B1=173.3 MW
TOT2B2=98.3 MW
TOT3 =831.5 MW
TOT4A =284.4 MW
TOT4B =-35.0 MW
TOT5 =588.9 MW
TOT7 =265.6 MW
COI =3732.8 MW
TOT1A =122.0 MW
Bus - VOLTAGE (PU)/ANGLE
Branch - MW/MVAR
Equipment - MW/MVAR
100.0%RATEA
1.050OV0.950UV
KV: <=345.000<=230.000 <=115.000 >115.000
12HS_GVP69-OUTAGE-2 FRM 12HS_GVP69* GRANDJCT-HIGHLNGV O/S
CLOSE FRUITAGV-BOOKCFGV 69KV
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