

2008 WestConnect 2013 and 2018 Transmission Adequacy Study Report

A Report Detailing the
Findings of the 2013 and the 2018
Transmission Adequacy
Study

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Report Prepared by



K. R. Saline & Associates, PLC
160 N. Pasadena, Suite 101
Mesa, AZ 85201-6764
Phone: 480-610-8741
Fax: 480-610-8796
www.krsaline.com

Foreword

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KRSA is appreciative of the cooperation and support of the WestConnect planning participants throughout the inaugural WestConnect subregional planning process. Their attendance at subregional planning meetings, performance of technical studies, and contribution of data and information for this report has been exemplary. This indicates their continued commitment to improve and perfect an open, transparent and stakeholder driven subregional planning process that was in place prior to formation of the WestConnect planning process.

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EXECUTIVE SUMMARY

The purpose of the WestConnect annual Adequacy Study is test the adequacy of the most current WestConnect Transmission Plan. The study is a collaborative effort with the WestConnect members and is conducted in an open and transparent environment.

The approved WestConnect Adequacy study plan included two separate study years: 2013 and 2018 which were the 5th and 10th year of the WestConnect 2007 Ten Year Plan. These years were selected for evaluation to represent a near-term planning horizon and a long-term planning horizon.

The study was a joint effort which included all three of the WestConnect subregional planning groups: Colorado Coordinated Planning Group (CCPG), Southwestern Transmission Planning Group (SWAT) and the newly formed Sierra Subregional Planning Group (SSPG).

Included in the study work was the development of the two WestConnect Planning base cases, 2013 and 2018. Both these cases were developed to represent a heavy summer peak load and were built to model the 5th and 10th year of the WestConnect Transmission Plan. The cases were coordinated through WestConnect and included input from all the participating parties.

The study is a high level power flow analysis which included the traditional N-0, N-1 and selected N-2 analysis. Performance was evaluated against the North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Council (WECC) Standards. Specifically, the following NERC standards are addressed in this study:

- TPL-001-0 – System Performance Under Normal Conditions (N-0)
- TPL-002-0 – System Performance Following Loss of a Single BES Elements (N-1)
- TPL-003-0 – System Performance Following Loss of Two or More BES Elements (N-2 or >)

Not all N-2 or more contingencies were study. The participants provided a list of N-2 Contingencies that they would normally analyze within their own planning cycles.

The 2013 and the 2018 adequacy results showed vary few actual issues that were not contributed to base case modeling errors in the base case. For all-lines-in-service (NERC Category A), for all systems, there were no actual which were contributed to modeling issues. For the N-1 analysis (NERC Category B) the analysis identified various issues which in the most part were contributed to modeling errors. Mitigation for issues not contributed to modeling errors have planned solutions or are known issues which will be resolved in subsequent transmission plans. For the N-2 analysis (NERC Category C) the analysis identified various issues, some were contributed to modeling errors, some will be solve with planned N-1 mitigation and others have existing RAS schemes to mitigate the issues.

OVERVIEW

WestConnect is composed of electric utility companies providing transmission services throughout the southwestern United States. Its members work collaboratively to assess stakeholder and market needs and to develop cost-effective enhancements to the western wholesale electricity market. WestConnect is committed to coordinating its work with other regional industry efforts to achieve as much consistency as possible in the Western Interconnection. A WestConnect Steering Committee is charged with the task of overseeing development and implementation of a variety of initiatives for the above stated purpose on behalf of the WestConnect members. Formation of a regional transmission planning function is one of the initiatives WestConnect has undertaken. On August 24, 2006, the WestConnect Steering Committee approved a “WestConnect Planning Objectives and Procedures for Regional Planning” document.

In May 2007 twelve transmission providers signed a WestConnect Project Agreement for Subregional Transmission Planning (STP Agreement). A 13th transmission provider signed the STP Agreement in November of 2007. The STP Agreement establishes a formal commitment of the signatory parties to fund and oversee the WestConnect subregional planning process. The WestConnect STP Agreement also established a Planning Management Committee (PMC) made up of one representative of each of the signatory parties. The PMC is tasked with implementation of a subregional planning process that complies with the WestConnect Planning Objectives and Procedures for Regional Planning. The transmission providers that have signed the WestConnect STP Agreement and that currently comprise the PMC membership are listed below.

Table 1 – Current WestConnect Planning Management Committee Members

Arizona Public Service	Salt River Project
El Paso Electric	Southwest Transmission Cooperative
Imperial Irrigation District	Transmission Agency of Northern California
Nevada Power Co. / Sierra Pacific Power Co.	Tri-State Generation and Transmission
Xcel Energy / Public Service Co. of Colorado	Tucson Electric Power Company
Public Service Co. of New Mexico	Western Area Power Administration
Sacramento Municipal Utility District	Basin Electric Power Cooperative
Black Hill Power	

The PMC has the authority to enter into contracts with individuals or firms for provision of project management, report writing, transmission planning and secretarial/communications services to the SWAT, CCPG

and other subregional transmission planning (STP) groups efforts that form the WestConnect planning area. On May 23, 2007 K.R. Saline and Associates was hired as an independent contractor for the purpose of managing the WestConnect planning process and providing the above stated contracted services. The purpose of these contracted services is to annually develop a ten year integrated regional transmission plan derived from SWAT, CCPG, SSPG and other STP efforts that accommodate all transmission needs across the WestConnect planning area. As part of the annual transmission plan WestConnect conducts a 5th and 10th year adequacy study to determine the adequacy of the WestConnect Ten Year Transmission Plan for a near-term planning horizon and a long-term planning horizon.

The WestConnect transmission planning area encompasses all or portions of seven Western states: Arizona, California, Colorado, New Mexico, Nevada, Texas, and Wyoming. The planning area consists of the geographic area traversed by transmission facilities owned and operated by the WestConnect STP Agreement transmission providers as listed above in **Table 1**. Many of their transmission facilities are jointly owned with other parties. The figure below graphically displays the current WestConnect planning foot print.

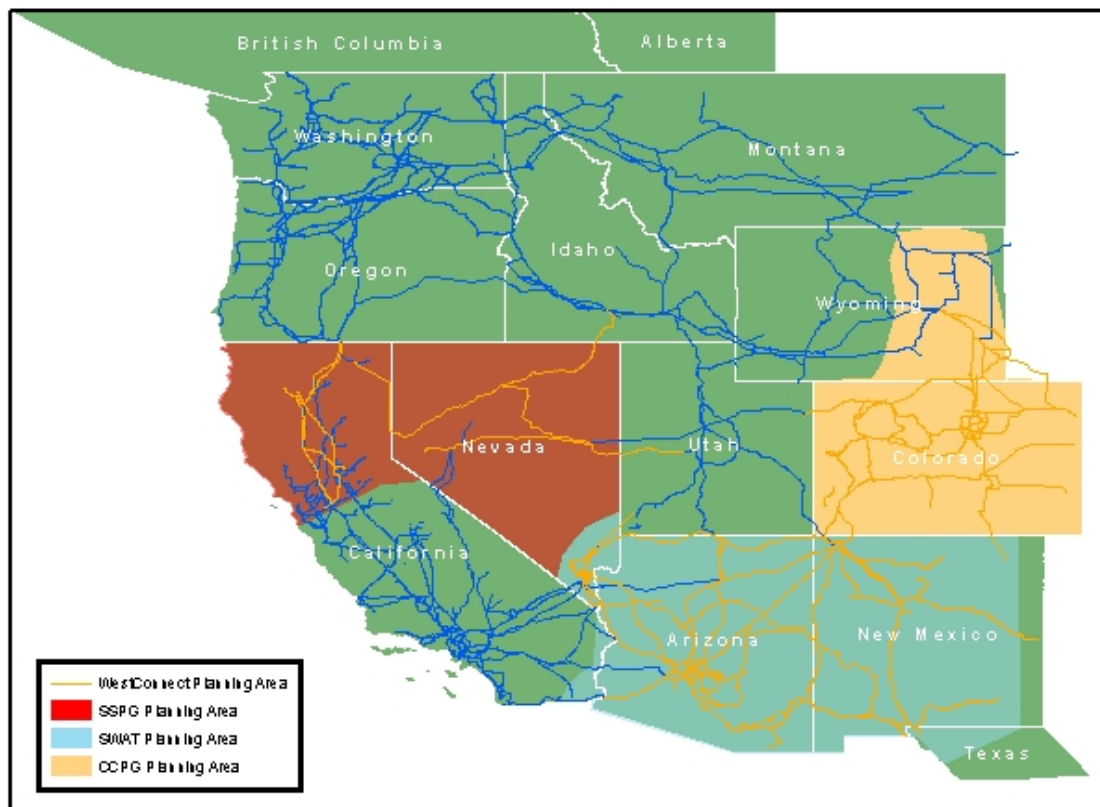


Figure 1 – WestConnect Planning Area

This report documents the findings of the 5th and 10th year adequacy study of the WestConnect subregional transmission plan for the calendar year 2007.

PURPOSE

The purpose of this study is to test the adequacy of the WestConnect 2007 subregional transmission plan. The study was conducted at the WestConnect subregional level in an open and transparent environment. The results of the study have been provided to members for review and comment in a timely manner in order for them to include the results in their annual planning cycles. This was accomplished by building WestConnect coordinated base cases which included loads, resources and transmission plans from each WestConnect member. The base case building process and the adequacy study effort was coordinated through WestConnect. Results were provided to each member for their review and comment. This report documents the study process, results and comments received from the members.

STUDY SCOPE

WestConnect has performed a study to test the adequacy of the 2007 WestConnect Transmission Plan. The adequacy of the Plan was determined by documenting system performance relative to WECC / NERC planning requirements. Traditional N-0, N-1 and selected N-2 contingency outages were performed on the 5th year and the 10th of the Plan. The Study only included basic Power Flow Analysis screening for Thermal and Voltage violations. Any deficiencies in the Plan were noted with sufficient lead time for WestConnect subregional transmission planning participants to investigate solutions for incorporation into their subsequent WestConnect Transmission Plans.

In addition, potential corridor outages involving planned facilities were modeled if provided and the resulting system performance documented. These corridor outages were intended to be performed in the 10th year of the current planning period. The purpose was to ascertain what degree of system reliability risk is associated with placing proposed projects in common corridors with other facilities. Identification of such risks in advance of siting of new facilities is needed with sufficient lead time to explore alternative routes. It is not believed that studying such corridor outages in the 10th year of the study period would offer sufficient lead time to pursue alternates routes.

STUDY PARTICIPANTS

COLORADO COORDINATED PLANNING GROUP (CCPG)

The Colorado Coordinated Planning Group (CCPG) is a joint, high voltage transmission system planning forum. It was created for the purpose of assuring a high degree of reliability in the planning, development, and operation of the high voltage transmission system in the Rocky Mountain Region in accordance with its Joint Transmission Access Principles and the Electric Transmission Service Policy Statement. The CCPG provides the technical forum required to complete reliability assessments, develop joint business opportunities, and accomplish coordinated planning, under the single-system planning concept in the Rocky Mountain Region of the Western Electricity Coordinating Council. This subregional planning group includes the participation of: Public Service Company of Colorado, Arkansas River Power Authority, Tri-State, Colorado Springs Utilities, Colorado Association of Municipal Utilities, Platte River Power Authority, Municipal Energy Agency of Nebraska, Western Area Power Administration, West Plains, Utah Associated Municipal Power Systems, Basin Electric, and North American Power Group. The CCPG Planning Area is shown in light brown in an overview map of the WestConnect planning area illustrated in the figure below.

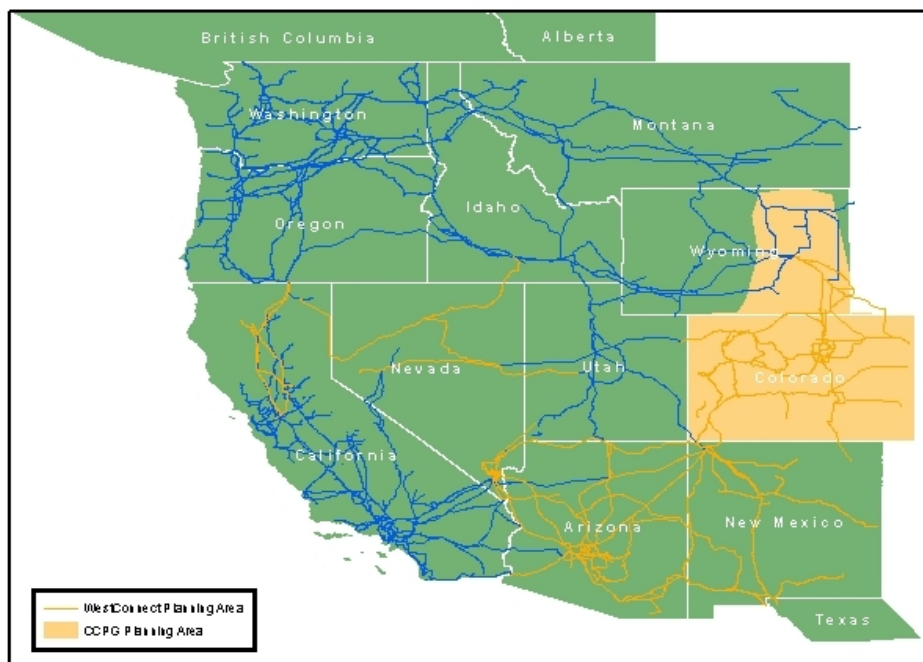


Figure 2– CCPG Planning Area

SOUTHWESTERN AREA TRANSMISSION (SWAT)

The Southwest Area Transmission (SWAT) planning group is comprised of transmission regulators / governmental entities, transmission users, transmission owners, transmission operators and environmental entities. The goal of SWAT is to provide an open, transparent, and collaborative forum for all stakeholders to submit input and projects towards a subregional planning effort in order to develop a high level transmission plan that maximizes regional benefits, while making efficient use of the existing transmission system. The SWAT subregional planning group is currently organized as six subcommittees which are overseen by a SWAT Oversight Committee. The subregional planning group members who participated in this study include: Arizona Public Service (APS), Imperial Irrigation District (IID), Public Service Company of New Mexico (PNM), El Paso Electric Company (EPE), Salt River Project (SRP), Southwestern Transmission Cooperative (SWTC), Southwestern Transmission Cooperative (SWTC) and Western Area Power Administration (WAPA-DSW). The SWAT Planning Area is shown in light blue in an overview map of the WestConnect planning area illustrated in the figure below.



Figure 3– SWAT Planning Area

SIERRA SUBREGIONAL PLANNING GROUP (SSPG)

The Sierra Subregional Planning Group (SSPG) is a joint high voltage transmission system planning forum with a primary purpose of assuring a high degree of reliability in the planning, development and operation of the high

voltage transmission system in the Sierra Pacific region. This is in accordance with the Joint Transmission Access Principles and the Electric Transmission Service Policy Statement, dated Dec. 16, 1991.

The SSPG provides the technical forum required to complete reliability assessments, develop joint business opportunities and accomplish coordinated planning, under the single-system planning concept in the Sierra Pacific region of the Western Electricity Coordinating Council. The subregional planning group members who participated in this study include: Sacramento Municipal Utility District (SMUD), Sierra Pacific Power (SPP), Transmission Agency of Northern California (TANC) and Western Area Power Authority (WAPA-SNR). The SSPG Planning Area is shown in red in an overview map of the WestConnect planning area illustrated in the figure below.

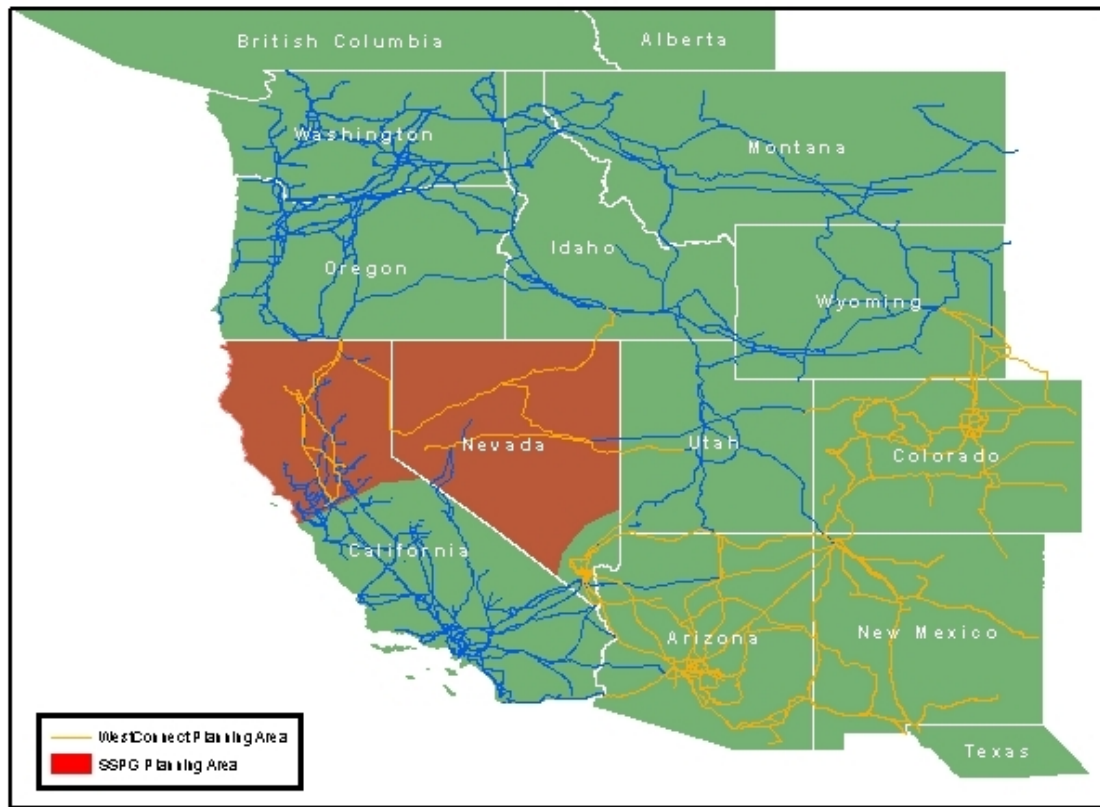


Figure 4 – SSPG Planning Area

STUDY TIME FRAME

The 5th year (summer 2013) of the ten year plan was selected to represent a near-term planning horizon. The 10th year (summer 2018) was selected to represent a longer-term planning horizon. For both study years base cases were developed to represent a heavy summer load and resource.

STUDY METHODOLOGY

The study only included basic Power Flow analysis. Traditional N-0, N-1 and selected N-2 contingency outages were performed. The adequacy was determined by documenting system performance relative to WECC and NERC criteria. WECC Category A, B and C (**Table 3**) and NERC TPL 001, 002 and 003 (**Table 4**) were used. The voltage violation criteria were limited to 5% voltage deviation for the 2013 study only. Only Thermal violations for the 2018 were monitored and reported for this study time frame.

Table 2 – WECC Category A, B and C System Adequacy Standards

WECC Category A, B and C			
Category	Contingencies	Thermal Limits	Voltage Limits
A	All Facilities in Service	A/R ¹	A/R
B	Event resulting in the loss of a single element.		
C ²	Multiple	A/R	A/R

Table 3 – NERC Standards TPL-001, 002 and 003

NERC Standards TPL-001, 002 and 003			
TPL- Standard	Contingencies	Thermal Limits	Voltage Limits
TPL-001	All Facilities in Service	A/R ³	A/R
TPL-002	Event resulting in the loss of a single or element.		
TPL-003 ⁴	Multiple	A/R	A/R

¹ Applicable rating (A/R) refers to the applicable normal and emergency facility thermal rating

² WestConnect Adequacy Study analyzed only selected N-2 contingencies provided by the members.

³ Applicable rating (A/R) refers to the applicable normal and emergency facility thermal rating

⁴ WestConnect Adequacy Study analyzed only selected N-2 contingencies provided by the members.

BASE CASE DEVELOPMENT

The 2013 base case was developed using the WECC 2012 heavy summer case (12hs2a.sav) as the seed case. This case was released by WECC as a final approved case on November 14th 2007. For the 2018 base case development the WECC 2018 heavy summer case (18hs1a.sav) was used. This case was released by WECC as a final approved case on June 13th 2008. The CCPG subregional planning group in their annual case building process for internal study work was also in the process of coordinating the development of a 2013 heavy summer and a 2018 heavy summer case. In order to avoid duplicate work for the CCPG members, it was decided early in the process that WestConnect would use the CCPG coordinated base cases for the starting point for the WestConnect coordinated base cases. WestConnect applied all the changes it received from the other members to the CCPG cases for the development of the WestConnect 2013 and 2018 heavy summer base cases. Both cases were built to represent a heavy summer load and included all planned facilities for the appropriate study year. A complete list of the planned facilities included in the base cases can be found in the Appendix section of this report (Appendix D-E). Load and resources were balanced and coordinated among the members. Coordination of resources by WestConnect was minimal and only required when it was necessary to avoid duplicate commitment of generation and balancing of Control area schedules.

BASE CASE REVIEW PROCESS

The base case review was conducted using a 5 stepped process. The WECC case was sent out to the members for initial review and was followed up with a series of 3 or more revisions prior to completion of the final version. The final version of the 2013 WestConnect base case was finalized on July 16, 2008. The final version 2018 WestConnect base case was finalized on October 30th, 2008.

CONTINGENCY LIST DEVELOPMENT

Contingency list and violation criteria were provided to WestConnect by the members. The study only analyzed N-0, N-1 and selected N-2 contingencies. Not all members provided N-2 contingencies. CCPG provided a single contingency list for their members. The following tables (**Table 5 & 6**) summarize the contingencies and screening criteria provided to WestConnect. A complete list of contingencies for each member that provided them, are located in the Appendix section of this report (**Appendix: A-C**).

Table 4 – WestConnect 2013 Adequacy Study

WestConnect 2013 Adequacy Study					
Subregional Group	WestConnect Member	Contingencies		Screening	
		N-1	N-2 or >	Voltage Level	Area
CCPG⁵		1126	113	100 kV & above	Colorado and WAPA-RM
	Black Hills Power				
	Basin Electric Power Cooperative				
	Tri-State Generation and Transmission				
	Western Area Power Administration (WAPA-RM)				
	Xcel Energy / Public Service Co. of Colorado				
SWAT					
	Arizona Public Service (APS)	522	8	100 kV & above	Arizona, New Mexico Imperial Irrigation District, Southern California
	Imperial Irrigation District (IID)	26	9	100 kV & above	Arizona, Imperial Irrigation District, Southern California Edison, San Diego, LADWP
	Public Service Company of New Mexico (PNM)	156	147	100 kV & above	Arizona, El Paso, New Mexico
	El Paso Electric Company (EPE)	114	None provided	100 kV & above	Arizona, El Paso, New Mexico
	Salt River Project (SRP)	100	11	100 kV & above	Arizona
	Southwestern Transmission Cooperative (SWTC)	96	14	100 kV & above	Arizona and New Mexico
	Tucson Electric Power (TEP)	141	Self Run	100 kV & above	Arizona, New Mexico, El Paso
	Western Area Power Administration (WAPA-DSW)	198	11	100 kV & above	Arizona, Nevada, Southern California and IID
	Nevada Power Co.	411	10	100 kV & above	Arizona, Nevada, San Diego, South California, LADWP, Sierra Pacific and PACE
SSPG					
	Sacramento Municipal Utility District (SMUD)	44	None provided	100 kV & above	PG&E
	Sierra Pacific Power Company (SPPC)	106	5	100 kV & above	Arizona, Nevada, San Diego, South California, LADWP, Sierra Pacific and PACE
	Transmission Agency of Northern California (TANC)	15	8	100 kV & above	PG&E and Northwest
⁶	Western Area Power Administration (WAPA-SNR)				

⁵ CCPG Study was conducted as a group and reported together with all of it's members

⁶ Western Area Power Administration (WAPA-SNR) Area was included in the Sierra Pacific study Results

Table 5 – WestConnect 2018 Adequacy Study

WestConnect 2018 Adequacy Study					
Subregional Group	WestConnect Member	Contingencies		Screening	
		N-1	N-2 or >	Voltage Level	Area
CCPG⁷		1126	113	100 kV & above	Colorado and WAPA-RM
	Black Hills Power				
	Basin Electric Power Cooperative				
	Tri-State Generation and Transmission				
	Western Area Power Administration (WAPA-RM)				
	Xcel Energy / Public Service Co. of Colorado				
SWAT					
	Arizona Public Service (APS)	522	7	100 kV & above	Arizona, New Mexico Imperial Irrigation District, Southern California
	Imperial Irrigation District (IID)	26	9	100 kV & above	Arizona, Imperial Irrigation District, Southern California Edison, San Diego, LADWP
	Public Service Company of New Mexico (PNM)	156	147	100 kV & above	Arizona, El Paso, New Mexico
	El Paso Electric Company (EPE)	114	None provided	100 kV & above	Arizona, El Paso, New Mexico
	Salt River Project (SRP)	100	11	100 kV & above	Arizona
	Southwestern Transmission Cooperative (SWTC)	96	14	100 kV & above	Arizona and New Mexico
	Tucson Electric Power (TEP)	159	Self Run	100 kV & above	Arizona, New Mexico, El Paso
	Western Area Power Administration (WAPA-DSW)	226	27	100 kV & above	Arizona, Nevada, Southern California and IID
	Nevada Power Co.	432	10	100 kV & above	Arizona, Nevada, San Diego, South California, LADWP, Sierra Pacific and PACE
SSPG					
	Sacramento Municipal Utility District (SMUD)	44	None provided		PG&E
	Sierra Pacific Power Company (SPPC)	106	5	100 kV & above	PG&E
	Transmission Agency of Northern California (TANC)	15	8	100 kV & above	Arizona, Nevada, San Diego, South California, LADWP, Sierra Pacific and PACE
⁸	Western Area Power Authority (WAPA-SNR)	226		100 kV & above	PG&E and Northwest

⁷ CCPG Study was conducted and reported together with all of its members

⁸ Western Area Power Administration (WAPA-SNR) Area was included in the Sierra Pacific study Results

POWER FLOW ANALYSIS

The power flow analysis was conducted with GE PSLF version 16.3 and the contingency processor was GE SSTOOLS Version 2-1, which was the most recently, released versions of PSLF and SSTOOLS by WECC at the time of this study. Each contingency list provided by the members was run separately using the members provided screening criteria. Results were compiled and sent to the members for review and comment.

REVIEW PROCESS

The power flow results were sent to each member individually for comment and review. A conference call was held to further discuss the results and to obtain additional comments. Comments were compiled and included in the results section of this report.

STUDY RESULTS

COLORADO COORDINATED PLANNING GROUP STUDY RESULTS

The power flow analysis for CCPG monitored voltage levels of 100 kV and above and monitored the following Areas for voltage and thermal violations: Colorado and WAPA-RM.

2013 Study Results

For the 2013 study, CCPG provided a list of approximately 1126 N-1 contingencies and 113 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the CCPG system. For the N-1 analysis there were 26 thermal violations and several voltage deviation issues. For the N-2 or greater there were six thermal violations and several voltage deviation issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 6 – CCPG 2013 RESULTS TABLE

CCPG 2013 RESULTS												
CATEGORY A												
OVERLOAD							OUTAGE					
	FROM	TO	C K	KV	RATE MVA	% OL		FROM	TO	C K	KV	COMMENT
NO ISSUES												
CATEGORY B												
Line	TIMNTHTP	RICHRDTP	1	115	85	159	Line	LINDEN	TIMBERLN	1	115	1
Tran	MIDWAYBR 230/115 KV				100	150	Line	MIDWAYBR	RD_NIXON	1	230	2
Line	COMANCHE	READER	2	115	180	148	Line	COMANCHE	READER	1	115	3
Line	COMANCHE	READER	1	115	180	148	Line	COMANCHE	READER	2	115	4
Line	MIDWAYBR	RD_NIXON	1	115	115	142	Line	MIDWAYBR	RD_NIXON	1	230	5
Line	HESPERUS	FLOR.RIV	1	115	128	135	Line	DURANGO	BAYFIELD	1	115	6
Tran	COMANCHE 230/115 A1				176	129	Tran	COMANCHE 230/115 A2				7
Line	COBBLKTP	TIMNTHTP	1	115	85	128	Line	PONNEQUI	OWL_CRK	1	115	9
Line	BRUSH SS	B.CK PS	1	115	178	128	Line	BRUSH SS	B.CK PS	2	115	10
Line	BRUSH SS	B.CK PS	2	115	178	128	Line	BRUSH SS	B.CK PS	1	115	11
Tran	WELD LM 230/115 kv 1				150	124	Tran	WELD PS 230/115 kv T1				12
Line	POUDRE	LAPORTAP	1	115	120	123	Line	LINDEN	TIMBERLN	1	115	13
Line	GEORGETN	HENDERPS	1	115	65	122	Line	BLUERIVR	DILLON	1	230	14
Line	WATERTON	ROXBOROU	1	115	139	122	Line	CASTLRCK	WOLFSBTP	1	115	15
Line	LOVELL	NAHNEJEN	1	115	109	122	Line	YELLOWTLP	YELLOWBR	1	230	16
Line	POUDRE	RICHRDTP	1	115	120	121	Line	LINDEN	TIMBERLN	1	115	13
Line	ARAPAHOB	SOUTH 1	1	115	125	120	Line	BANCROFT	GRAY ST	1	115	17
Line	ALCOVA	MIRACLEM	1	115	80	116	Line	ALCOVA	MIRACLEM	2	115	18
Line	ALCOVA	MIRACLEM	2	115	80	116	Line	ALCOVA	MIRACLEM	1	115	18

Table 7 – CCPG 2013 RESULTS TABLE: CONTINUED

CCPG 2013 RESULTS: CONTINUED													
CATEGORY B													
OVERLOAD							OUTAGE					COMMENT	
	FROM	TO	C K	KV	RATE MVA	% OL		FROM	TO	C K	KV		
Line	LITTLET2	WATERTON	1	115	135	116	Line	ARAPAHOB	ENGLE3TP	1	115	19	
Line	BANCROFT	KENDRICK	1	115	138	116	Line	ALLISON	SODALAKE	1	115	20	
Tran	DANIELPK 230/115 T1					150	112	LINE	PARKERPS	BAYOU	1	115	21
Line	COMANCHE	WALSENBG	1	230	159	111	Line	BOONE	STEM BCH	1	230	23	
Line	LAFAYETT	VALMONT	1	115	149	111	Tran	FTLUPTON 230/115 T3				24	
Tran	MALTA 230/115 T1					100	111	Tran	DILLON 230/115.00 T2				25
CATEGORY C													
Line	COMANCHE	READER	2	115	180	159	Line	COMANCHE	READER	1	115	26	
							Line	BOONE	DOT TAP	1	115		
Line	COMANCHE	READER	1	115	180	155	Line	COMANCHE	READER	2	115	27	
							Line	CANONCITY	W CANON	1	115		
Tran	CHMBERS 230/115 KV 1					280	132	Line	SMOKYHILL	SPRUCE	2	230	28
							Line	SMOKYHILL	POWHATON	1	230		
Line	LOVELL	NAHNEJEN	1	115	109	126	Line	YELLOWTLP	YELLOWBR	1	230	29	
							Line	GOOSE CK	YELLOWTLP	1	230		
Line	COBBLKTP	TIMNTHTP	1	115	85	121	Line	AULT	CHEYENNE	1	230	30	
							Line	CHEYENNE	PONNEQUI	1	115		
Line	BASIN	NAHNEJEN	1	115	109	110	Line	YELLOWTLP	YELLOWBR	1	230	31	
							Line	GOOSE CK	YELLOWTLP	1	230		

CCPG 2013 VOLTAGE RESULTS									
VOLTAGE DEVIATION					OUTAGE				
BUS	KV	%DV			FROM	TO	C K	KV	COMMENT
NO ISSUES									
CATEGORY B									
Multiple buses with greater than 5% voltage Deviation See Appendix Section for details									
CATEGORY C									
Multiple buses with greater than 5% voltage Deviation See Appendix Section for details									

2013 Comments.

1. Rating of TIMNATH-RICHARD TAP is 236 MVA
2. Front Range Generation off line in model. Increased generation eliminates overload.
3. Need Comment
4. Need Comment
5. Need Comment
6. Planned additions mitigates this issues
7. Need Comment
8. Need Comment
9. TIMNATH-COBB LAKE-BLACK HOLLOW-AULT to have 236 MVA rating in June 2010
10. Need Comment
11. Need Comment
12. Planned in-service date for Boyd-Weld project is 2013.
13. Ault 230/115-kV Transformer provides additional source to area which alleviates overload. Planned in-service date of December 2010.

- 14. Need Comment
- 15. Need Comment
- 16. Outage of Yellowtail PACE-WAPA tie results in reduced Yellowtail south rating requiring reduction in Yellowtail generation. Area phase shifters may also be available to reduce loading.
- 17. Need Comment
- 18. ALCOVA-MIRACLE MILE 115-kV line rating will be increased to 109 MVA by 2010. 80 MVA limit is a CT limit.
- 19. Need Comment
- 20. Need Comment
- 21. Need Comment

2013 Comments: Continued

- 22. Need Comment
- 23. Need Comment
- 24. Need Comment
- 25. Overload within emergency rating of Malta 230/115-kV transformer.
- 26. Need Comment
- 27. Need Comment
- 28. Need Comment
- 29. Need Comment
- 30. Need Comment
- 31. Need Comment

2018 STUDY RESULTS

For the 2018 study, CCPG provided a list of approximately 1126 N-1 contingencies and 113 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the CCPG system. For the N-1 analysis there were 52 thermal violations and for the N-2 or greater there were 21 thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 8 – CCPG 2018 RESULTS TABLE

CCPG 2018 RESULTS												
CATEGORY A												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
NO ISSUES												
CATEGORY B												
Line	BRUSH SS	B.CK PS	1	115	218	104	Line BRUSH SS 115.0 to B.CK PS 115.0 Circuit 1				1	
Line	ALLISON	SODALAKE	1	115	206	106	Line BANCROFT 115.0 to KENDRICK 115.0 Circuit 1				2	
Tran	ARAPAHOB	115/230	T5		280	106	Line ARAPAHOE 230.0 to DAKOTA 230.0 Circuit 1				3	
Line	BANCROFT	KENDRICK	1	115	192	116	Line ALLISON 115.0 to SODALAKE 115.0 Circuit 1				4	
Line	BROMFLD1	SEMPER	1	115	80	269	Line CHEROKEE 115.0 to FEDERHT1 115.0 Circuit 1				5	
Line	BROMFLD1	VALMONT	1	115	159	120	Line LOUISVIL 115.0 to VALMONT 115.0 Circuit 1				6	
Line	CAPHILL2	DENVTM	1	115	131	100	Line DENVTM 115.0 to GRAY ST 115.0 Circuit 1				7	
Line	CHEROKEE	TODD CRE	1	115	135	104	Tran FTLUPTON 115.00 to FTLUPTON 230.00 Circuit T3				8	
Line	CHEROKEE	FEDERHT1	1	115	186	111	Line BROMFLD1 115.0 to SEMPER 115.0 Circuit 1				9	
Tran	COMANCHE	115/230	A1		176	101	Tran COMANCHE 115 to COMANCHE 230.00 Circuit A2				10	
Line	COMANCHE	READER	2	115	218	100	Line COMANCHE 115.0 to READER 115.0 Circuit 1				11	
Tran	DANIELPK	115/230	T1		150	108	Line WATERTON 115.0 to ROXBOROU 115.0 Circuit 1				12	
Tran	FTLUPTON	115/230	T3		280	101	Line LAFAYETT 115.0 to VALMONT 115.0 Circuit 1				13	
Tran	HOPKINS	115/230	T3		100	119	Tran BASALT 115.00 to BASALT 230.00 Circuit T2				14	
Line	HOPKINS	BASALT	1	115	67	154	Tran BASALT 115.00 to BASALT 230.00 Circuit T2				15	
Line	LAFAYETT	VALMONT	1	115	135	120	Tran FTLUPTON 115.00 to FTLUPTON 230.00 Circuit T3				16	
Line	LEYDEN	PLAINVW	1	115	150	203	Line LEYDEN 115.0 to RIDGE 115.0 Circuit 1				17	
Line	MONFORT	UNC	1	115	187	109	Line GREELEY 115.0 to WELD PS 115.0 Circuit 1				18	
Line	ROSEDALE	ARROWHLK	1	115	135	129	Line GREELEY 115.0 to WELD PS 115.0 Circuit 1				19	
Line	SMOKYHIL	PEAKVIEW	1	115	187	120	Line PARKERPS 115.0 to GRNDVIEW 115.0 Circuit 1				20	
Line	WATERTON	MARTN1TP	1	115	217	107	Line ARAPAHOB 115.0 to ENGLE3TP 115.0 Circuit 1				21	
Line	WATERTON	MARTN2TP	1	115	119	119	Tran SODALAKE 115.00 to SODALAKE 230.00 Circuit T2				22	
Line	WATERTON	ROXBOROU	1	115	135	103	Line CASTLRCK 115.0 to WOLFSBTP 115.0 Circuit 1				23	
Line	WELD PS	ARROWHLK	1	115	135	144	Line GREELEY 115.0 to WELD PS 115.0 Circuit 1				24	
Line	PARKERPS	SULPHUR	1	115	180	103	Line PARKERPS 115.0 to SULPHUR 115.0 Circuit 2				25	
Line	PARKERPS	SULPHUR	2	115	180	103	Line PARKERPS 115.0 to SULPHUR 115.0 Circuit 1				26	
Line	PARKERPS	GRNDVIEW	1	115	187	121	Line SMOKYHIL 115.0 to PEAKVIEW 115.0 Circuit 1				27	
Tran	CHMBERS	115/230	1		280	104	Line SILVSADL 230.0 to REUNION 230.0 Circuit 1				28	
Line	COLO GRN	TWNBUTTE	1	230	435	105	Line LAMAR CO 230.0 to COLO GRN 230.0 Circuit 1				29	
Line	ALCOVA	MIRACLEM	1	115	80	133	Line ALCOVA 115.0 to MIRACLEM 115.0 Circuit 2				30	
Line	ALCOVA	MIRACLEM	2		80	132	Line ALCOVA 115.0 to MIRACLEM 115.0 Circuit 1				31	
Line	BASIN	NAHNEJEN	1	115	109	114	Line YELOWTLP 230.0 to YELLOWBR 230.0 Circuit 1				32	
Line	COBBLKTP	TIMNATH	1	115	109	120	Line PONNEQUI 115.0 to OWL_CRK 115.0 Circuit 1				33	
Line	DEL CTAP	DELCAMIN	1	115	130	105	Tran ERIE SW 230.00 to ERIE SW 115.00 Circuit 1				34	
Line	GERING	STEGALL	1	115	80	106	Line STEGALL 115.0 to EMIGRANT 115.0 Circuit 1				35	
Line	LOVELL	YELLOWBR	1	115	109	108	Line YELOWTLP 230.0 to YELLOWBR 230.0 Circuit 1				36	
Line	LOVELL	NAHNEJEN	1	115	109	130	Line YELOWTLP 230.0 to YELLOWBR 230.0 Circuit 1				36	

Table 9 – CCPG 2018 RESULTS TABLE: CONTINUED

CCPG 2018 RESULTS: CONTINUED												
CATEGORY B												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
Tran	MIRACLEM	115/230	1		167	103	Line MIRACLEM 115.0 to MEDBOWTP 115.0 Circuit 1					37
Line	POUDRE	RICHRDTP	1	115	120	148	Line LINDEN 115.0 to TIMBERLN 115.0 Circuit 1					38
Line	POUDRE	LAPORTAP	1	115	120	100	Line CHEYENNE 115.0 to PONNEQUI 115.0 Circuit 1					38
Tran	SIDNEY	115/230	1		167	130	Line N.YUMA 230.0 to SPRNGCAN 230.0 Circuit 1					39
Tran	STEGALL	230/115	1		100	111	Tran STEGALL 230.00 to STEGALL 115.00 Circuit 2					40
Tran	WELD LM	115.230	1		150	121	Tran WELD PS 115.00 to WELD PS 230.00 Circuit T1					41
Line	CTTNWD N	KETTLECK	1	115	106	147	Line BRIARGAT 115.0 to CTTNWD S 115.0 Circuit 1					42
Tran	KELKER N	230/115	1		293	109	Tran KELKER E 115.00 to KELKER S 230.00 Circuit 1					43
Line	FONTERO	DRAKE E	1	115	129	104	Line CTTNWD N 230.0 to FULLER 230.0 Circuit 1					44
Line	RD_NIXON	KELKER S	1	230	317	107	Line KELKER N 230.0 to RD_NIXON 230.0 Circuit 1					45
Line	CURECANT	SOCANAL	1	115	120	113	Line GRANDJCT 345.0 to MONTROSE 345.0 Circuit 1					46
Line	DURANGO	HESPERUS	1	115	85	103	Line LOSTCANY 115.0 to MANCOSTP 115.0 Circuit 1					47
Tran	GRANDJCT	115/138	T2		50	101	Line GRANDJCT 345.0 to RIFLE CU 345.0 Circuit 1					48
Line	MONTROSE	SOCANAL	1	115	120	112	Line GRANDJCT 345.0 to MONTROSE 345.0 Circuit 1					49
Line	HESPERUS	FLOR.RIV	1	115	128	168	Line DURANGO 115.0 to BAYFIELD 115.0 Circuit 1					50
CATEGORY C												
Line	BROMFLD1	SEMPER	1	115	80	105	FTLUPTON 230.0 to ST.VRAIN 230.0 Circuit 1 and 2					51
Line	COMANCHE	READER	2	115	218	107	CANONCTY to W CANON AND COMANCHE-READER 115.0					52
Line	HOPKINS	BASALT	1	115	67	121	HDN-CRG and HDN-FOID 230.0					53
Tran	CHMBERS	115/230	1		280	148	SMOKYHIL 230.0 to SPRUCE AND SMOKYHIL TO POWHATON 230.0					54
Line	ALCOVA	MIRACLEM	1	115	80	101	Line AULT 345.0 to LAR.RIVR 345.0 AND AU 345/230					55
Line	ALCOVA	MIRACLEM	2	115	80	100	Line AULT 345.0 to LAR.RIVR 345.0 AND AU 345/230					55
Line	BASIN	NAHNEJEN	1	115	109	117	Line YELOWTLP 230.0 to YELLOWBR AND G.CRK 230.0					56
Line	COBBLKTP	TIMNATH	1	115	109	113	Line AULT to CHEYENNE 230.0 AND CHEYENNE-PONN 115.0					33
Line	LOVELL	YELLOWBR	1	115	109	111	Line YELOWTLP 230.0 to YELLOWBR AND G.CRK 230.0					56
Line	LOVELL	NAHNEJEN	1	115	109	134	Line YELOWTLP 230.0 to YELLOWBR AND G.CRK 230.0					36
Line	POUDRE	LAPORTAP	1	115	120	100	Line AULT to CHEYENNE 230.0 AND CHEYENNE-PONN 115.0					38
Tran	SIDNEY	115/230	1		167	132	Line N.YUMA to SPRNGCAN 230.0 and NYU230/115					58
Tran	STEGALL	230/115	1		100	125	STEGALL 230.0 BUS					59
Line	FONTERO	RAMPART	1	115	129	107	Tran CTTNWD N 230.00 to CTTNWD N 115.00 Circuit 1and2					60
Line	FONTERO	DRAKE E	1	115	129	119	Tran CTTNWD N 230.00 to CTTNWD N 115.00 Circuit 1and2					61
Line	CAHONE	NUCLA	1	115	132	104	Line MTR to HSP 345.0 and CCI-LCN 230.0					62
Line	CRAIG	RIFLE WA	1	230	478	103	CRAIG 345.0 to CBTAP AND AULT 345.0					63
Line	CURECANT	SOCANAL	1	115	120	116	Line GRANDJCT to RIFLE CU 345.0 and GJT345/230					64
Line	DURANGO	HESPERUS	1	115	85	103	Line CURECANT to LOSTCANY to SHIPROCK 230.0					65
Tran	GRANDJCT	115/138	T2		50	102	Line GRANDJCT to RIFLE CU 345.0 and GJT345/230					66
Line	MONTROSE	SOCANAL	1	115	120	114	Line RFL to GJT to MTR 345.0					67

2018 Comments

1. 1-32 Need Comments for all violations!!
33. TIMNATH-COBB LAKE-BLACK HOLLOW-AULT to have 236 MVA rating in June 2010
34. Need Comment!
35. Need Comment!
36. Planned in-service date for Boyd-Weld project is 2013.
37. Need Comment!
38. Ault 230/115-kV Transformer provides additional source to area which alleviates overload. Planned in-service date of December 2010.
39. Need Comment!
40. Need Comment!
41. Planned in-service date for Boyd-Weld project is 2013.
42. 42-54 Need Comments!
55. ALCOVA-MIRACLE MILE 115-kV line rating will be increased to 109 MVA by 2010. 80 MVA limit is a CT limit.
56. Outage of Yellowtail PACE-WAPA tie results in reduced Yellowtail south rating requiring reduction in Yellowtail generation. Area phase shifters may also be available to reduce loading.
57. 57-67 Need Comment!

SOUTHWESTERN AREA TRANSMISSION STUDY RESULTS

APS STUDY RESULTS

The power flow analysis for APS monitored voltage levels of 100 kV and above and monitored the following Areas for voltage and thermal violations: Arizona, New Mexico Imperial Irrigation District and Southern California.

2013 Study Results

For the 2013 study, APS provided a list of approximately 520 N-1 contingencies and eight N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the APS system. For the N-1 analysis there were two thermal violations and five voltage deviation issues. For the N-2 or greater there were no thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 10 – APS 2013 RESULTS TABLE

APS 2013 RESULTS												
CATEGORY A												
OVERLOAD							OUTAGE					
	FROM	TO	CK	KV	RATE MVA	% OL		FROM	TO	CK	KV	COMMENT
NO ISSUES												
CATEGORY B												
Line	RACEWAY	WESTWING	1	230	374	121	Tran	WESTWING 500/230 KV				1
Line	RACEWYW	RACEWAY	1	230	374	115	Tran	WESTWING 500/230 KV				2
CATEGORY C												
NO ISSUES												

APS 2013 VOLTAGE RESULTS											
VOLTAGE DEVIATION						OUTAGE					
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV		FROM	TO	C K	KV	COMMENT	
CATEGORY B											
GAVILNPK	230	1.007	0.925	10.9	Line	GAVLINWA	PINPK	1	230	3	
PRESCOTT	230	1.011	0.94	8.0	Line	YAVAPAI	WILOWLKE	1	230	4	
PRESCOTT	115	1.015	0.935	7.1	Line	YAVAPAI	WILOWLKE	1	230	5	
WILOWLKE	230	1.011	0.94	7.1	Line	YAVAPAI	WILOWLKE	1	230	6	
WILOWLKW	230	1.011	0.94	7.1	Line	YAVAPAI	WILOWLKE	1	230	7	
CATEGORY C											
NO ISSUES											

2013 Comments:

1. This is a known issue that is highly sensitive to the set-up of a case and the fact that there is only a bulk rep. APS is monitoring this potential overload and can implement an automatic RAS if this overload is an actual problem as the system develops.
2. This line (RACEWAY-RACEWYWA 230kV) doesn't actually exist. There is only 1 230kV bus.
3. **Need Comment!**
4. **Need Comment!**
5. **Need Comment!**
6. **Need Comment!**
7. **Need Comment!**

2018 Study Results

For the 2018 study, APS provided a list of approximately 520 N-1 contingencies and eight N-2 or greater contingencies. With all lines in service there was one N-0 thermal violation on the APS system. For the N-1 analysis there were seven thermal violations and for the N-2 or greater there were no thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 11 – APS 2018 RESULTS TABLE

APS 2018 RESULTS												
CATEGORY A												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY B												
Tran	YAVAPAI 500/230 KV 1				336	135	Tran	YAVAPAI 500/230 KV 2				1
Tran	RACEWAY 500/230 KV 1				598	104	Tran	WESTWING 500/230 KV 1				2
Line	CACTUS	OCOTILLO	1	230	447	124	Line	CACTUS	PNPKAPS	1	230	1
Line	CACTUS	PNPKAPS	1	230	447	126	Line	CACTUS	OCOTILLO	1	230	1
Line	LONEPEAK	PNPKAPS	1	230	545	111	Line	REACH	1			
Line	RACEWAY	RACEWAY	1	230	374	134	Tran	WESTWING 500/230 KV				3
Line	RACEWAY	WESTWING	1	230	403	129	Tran	WESTWING 500/230 KV				4
CATEGORY C												
NO ISSUES												

2018 Comments:

1. This overload is increased because there is no underlying 69kV system.
2. This transformer will have at least a 700MVA emergency rating.
3. This line (RACEWAY-RACEWYWA 230kV) doesn't actually exist. There is only 1 230kV bus.
4. This is a legitimate overload. However, there are many solutions that may be implemented in the future to solve this overload. It will be monitored as the system grows.
5. All Voltage issues were contributed to no underlying 69kV system.

IID STUDY RESULTS

The power flow analysis for IID monitored voltage levels of 100 kV and above and monitored the following Areas for voltage and thermal violations: Arizona, Imperial Irrigation District, Southern California, Edison, San Diego, LADWP

2013 Study Results

For the 2013 study, IID provided a list of approximately 26 N-1 contingencies and nine N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the IID system. For the N-1 analysis there were no thermal violations and there were no voltage deviation issues. For the N-2 or greater there were no thermal violations and there were no voltage deviation issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 12 – IID 2013 RESULTS TABLE

IID 2013 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
NO ISSUES												
CATEGORY B												
NO ISSUES												
CATEGORY C												
NO ISSUES												

IID 2013 VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					COMMENT
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV	FROM	TO	C K	KV		
CATEGORY B										
NO ISSUES										
CATEGORY C										
NO ISSUES										

2018 Study Results

For the 2018 study, IID provided a list of approximately 26 N-1 contingencies and nine N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the IID system. For the N-1 analysis there were no thermal violations and for the N-2 or greater there were no thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 13 – IID 2018 RESULTS TABLE

IID 2018 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
NO ISSUES												
CATEGORY B												
NO ISSUES												
CATEGORY C												
NO ISSUES												

PNM STUDY RESULTS

The power flow analysis for PNM monitored voltage levels of 100 kV and above and monitored the following Areas for voltage and thermal violations: Arizona, El Paso and New Mexico.

2013 Study Results

For the 2013 study, PNM provided a list of approximately 156 N-1 contingencies and 147 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the PNM system. For the N-1 analysis there were four thermal violation and 20 voltage issues. For the N-2 or greater there were 12 thermal violations and 24 voltage issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 14 – PNM 2013 RESULTS TABLE

PNM 2013 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
NO ISSUES												
CATEGORY B												
Line	BELEN_PG	WILLARD	1	115	30	120	Line	ALGODONE	PACHMAN	1	115	1
Line	PERSON	PROSPER	1	115	156	114	Line	SANDIA	WESTMESA	1	345	2
Line	PROSPER	KAFB	1	115	156	111	Line	SANDIA	WESTMESA	1	345	3
Line	ALGODONE	BUFORD_T	1	115	66	113	Line	BELEN	WILLARD	1	115	4
CATEGORY C												
Line	BLCKRA_T	WESTMS_3	1	115	97	145	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)				5	
Line	BLCKRA_T	WESTMS_3	1	115	97	145	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)				5	
Line	RR_TAP	BLCKRA_T	1	115	97	136	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)				5	
Line	RR_TAP	PALM_T	1	115	97	136	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)				5	
Line	BELEN_PG	WILLARD	1	115	30	134	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)				5	
Line	PALM_T	PACHMANN	1	115	97	126	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)				5	
Line	ALGODONE	BUFORD_T	1	115	66	121	TOME-BELEN-WEST MESA 3 115 kV (BF 42462)				4	
TRAN	WESTMESA 230/115 1				448	120	SANDIA-WEST MESA-345/115 TRANSFORMER #2 (BF 22482)				5	
Line	PERSON	PROSPER	1	115	156	114	SANDIA 345 kV STATION (BF 31282,30182)				5	
Tran	WESTMESA 230/115 2				480	113	SANDIA-WEST MESA-345/115 TRANSFORMER #2 (BF 22482)				5	
Line	WESTMS_1	PARADIS1	1	115	215	113	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)				5	
Line	PARADIS1	IRVING	1	115	215	112	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)				1	
Line	PROSPER	KAFB	1	115	156	111	SANDIA 345 kV STATION (BF 31282,30182)				3	

PNM 2013 VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					COMMENT
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV	FROM	TO	C K	KV		
CATEGORY B										
ALAMOGCP	115	0.998	0.878	12	AMRAD 345/115 kV TRANSFORMER					6
ALAMOGPG	115	0.998	0.878	12	AMRAD 345/115 kV TRANSFORMER					7
ALLISON#	115	1.041	0.979	6.2	MCKINLEY-YAHTAHEY 345/115 kV TRANSFORMER					8
ALLISONT	115	1.042	0.98	6.2	MCKINLEY-YAHTAHEY 345/115 kV TRANSFORMER					9
BUFORD	115	0.945	0.885	6	BELEN-WILLARD 115 kV (WL)					10
DURAN	115	0.943	0.862	8.1	BELEN-WILLARD 115 kV (WL)					12
ESTANCIA	115	0.944	0.875	7	BELEN-WILLARD 115 kV (WL)					13
GALLUPPG	115	1.041	0.976	6.6	MCKINLEY-YAHTAHEY 345/115 kV TRANSFORMER					14
GAMERCO	115	1.041	0.98	6.1	MCKINLEY-YAHTAHEY 345/115 kV TRANSFORMER					15
GAVILAN	115	0.984	0.847	13.7	AMRAD 345/115 kV TRANSFORMER					16
HOLLYWO#	115	0.984	0.847	13.7	AMRAD 345/115 kV TRANSFORMER					17
MORIARTY	115	0.945	0.884	6.1	BELEN-WILLARD 115 kV (WL)					18
PITT-MID	115	1.044	0.979	6.5	MCKINLEY-YAHTAHEY 345/115 kV TRANSFORMER					19
RUIDOSO	115	0.984	0.847	13.7	AMRAD 345/115 kV TRANSFORMER					20
SOCORROP	115	1.002	0.875	12.7	BELEN-SOCORRO 115 kV (SOC)					21
TORRANCE	115	0.944	0.863	8.1	BELEN-WILLARD 115 kV (WL)					22
WILLARD	115	0.948	0.869	7.9	BELEN-WILLARD 115 kV (WL)					23
WNDWROCK	115	1.019	0.952	6.7	MCKINLEY-YAHTAHEY 345/115 kV TRANSFORMER					24
YAHTAHEY	115	1.044	0.979	6.5	MCKINLEY-YAHTAHEY 345/115 kV TRANSFORMER					25
CATEGORY C										
ALAMOGCP	115	0.998	0.86	13.8	AMRAD 345 kV STATION (BF 6348B,2968B,0388B)					26
ALAMOGPG	115	0.998	0.86	13.8	AMRAD 345 kV STATION (BF 6348B,2968B,0388B)					27
BECKNER	115	1.036	0.932	10.4	ALGODONE-NORTON-ZIA 115 kV (DOUBLE CIRCUIT)					28
BELEN_PG	115	1.011	0.879	13.2	TOME-BELEN-WEST MESA 3 115 kV (BF 42462)					29
BERNARDO	115	1.006	0.879	12.7	TOME-BELEN-WEST MESA 3 115 kV (BF 42462)					30
BUFORD_T	115	0.946	0.882	6.5	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)					31
COLINAS	115	1.033	0.928	10.5	ALGODONE-NORTON-ZIA 115 kV (DOUBLE CIRCUIT)					32
DURAN	115	0.943	0.862	8	WILLARD-BELEN-SOCORRO 115 kV (BF 44662)					33
ELDORAD#	115	1.034	0.928	10.6	ALGODONE-NORTON-ZIA 115 kV (DOUBLE CIRCUIT)					34
ELDRADOT	115	1.035	0.928	10.7	ALGODONE-NORTON-ZIA 115 kV (DOUBLE CIRCUIT)					35
ESTANCIA	115	0.944	0.875	6.9	WILLARD-BELEN-SOCORRO 115 kV (BF 44662)					36
GAVILAN	115	0.984	0.827	15.7	AMRAD 345 kV STATION (BF 6348B,2968B,0388B)					37
HOLLYWO#	115	0.984	0.827	15.7	AMRAD 345 kV STATION (BF 6348B,2968B,0388B)					38
MORIARTY	115	0.945	0.88	6.5	WEST MESA-RIO PUERCO-SAN JUAN 345 kV (BF 35182)					39
RODEO_T	115	1.037	0.929	10.8	ALGODONE-NORTON-ZIA 115 kV (DOUBLE CIRCUIT)					40
RUIDOSO	115	0.984	0.827	15.7	AMRAD 345 kV STATION (BF 6348B,2968B,0388B)					41
SOCORROP	115	1.002	0.874	12.8	WILLARD-BELEN-SOCORRO 115 kV (BF 44662)					42
SPACHECO	115	1.033	0.923	10.9	ALGODONE-NORTON-ZIA 115 kV (DOUBLE CIRCUIT)					43
STATEPEN	115	1.036	0.935	10	ALGODONE-NORTON-ZIA 115 kV (DOUBLE CIRCUIT)					44
TAOS	115	1.038	0.927	11.1	OJO 345 kV STATION (BF 06982,05882,04782)					45
TORRANCE	115	0.944	0.864	8	WILLARD-BELEN-SOCORRO 115 kV (BF 44662)					46
WILLARD	115	0.948	0.87	7.8	WILLARD-BELEN-SOCORRO 115 kV (BF 44662)					47
YORKCANY	115	0.973	0.898	7.5	OJO 345 kV STATION (BF 06982,05882,04782)					48
ZIA_1	115	1.037	0.928	10.8	ALGODONE-NORTON-ZIA 115 kV (DOUBLE CIRCUIT)					49
ZIA_2	115	1.037	0.928	10.8	ALGODONE-NORTON-ZIA 115 kV (DOUBLE CIRCUIT)					50

2013 Comments

1. Upgrade line to 72 MVA in 2009.
2. **Need Comment!**
3. Upgrade line to 240 MVA by 2012
4. It appears that load was doubled at Buford during base case modifications. The overload does not occur if the load is corrected.
5. N-2 overloads are addressed through load shedding schemes, operating procedures or re-dispatch depending on magnitude. Additional information is available from PNM's 10-year plan studies.
6. **6-50 Need Comments!**

2018 Study Results

For the 2013 study, PNM provided a list of approximately 156 N-1 contingencies and 147 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the PNM system. For the N-1 analysis there were five thermal violation and for the N-2 or greater there were 12 thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 15 – PNM 2018 RESULTS TABLE

PNM 2018 RESULTS												
N-0												
OVERLOAD							OUTAGE					
	FROM	TO	C K	KV	RATE MVA	% OL		FROM	TO	C K	KV	COMMENT
NO ISSUES												
N-1												
Line	EAST_TAP	EMBUDO	1	115	159	104	Line	SANDIA	WESTMES	1	345	1
Line	KAFB	PROSPER	1	115	156	117	Line	SANDIA	BUS-TIE	1	115	2
Line	PROSPER	PERSON	1	115	156	121	Line	SANDIA	BUS-TIE	1	115	3
Tran	OJO 345/115 KV		1		180	101	Line	OJO	TAOS	1	345	4
Line	BELEN	WILLARD	1	115	30	113	Line	ALGODON	PACHMAN	1	115	5
N-2												
Line	B-A	NO_BERN	1	115	155	105	SANDIA-WEST MESA-345/115 TRANSFORMER #2 (BF 22482)					6
Line	EAST_TAP	EMBUDO	1	115	159	109	SANDIA-WEST MESA-345/115 TRANSFORMER #2 (BF 22482)					1
Line	IRVING	WAYNE 2	1	115	156	110	SANDIA-WEST MESA-345/115 TRANSFORMER #2 (BF 22482)					6
Line	KAFB	PROSPER	1	115	156	117	SANDIA BUS TIE-SANDIA 2-SP83 115 kV (BF 25862)					2
Line	PROSPER	PERSON	1	115	156	121	SANDIA BUS TIE-SANDIA 2-SP83 115 kV (BF 25862)					6
Line	LOSANGEL	REEVES_1	1	115	156	102	SANDIA-WEST MESA-345/115 TRANSFORMER #2 (BF 22482)					6
Line	LOSANGEL	WAYNE 2	1	115	156	109	SANDIA-WEST MESA-345/115 TRANSFORMER #2 (BF 22482)					6
Line	LUNA	MIMBRES	1	115	200	115	ARROYO-NEWMAN-AFTON 345 kV (BF 0538B)					6

Table 16 – PNM 2018 RESULTS TABLE: CONTINUED

PNM 2018 RESULTS CONTINUED													
N-0													
OVERLOAD							OUTAGE						
	FROM	TO	C K	KV	RATE MVA	% OL		FROM	TO	C K	KV	COMMENT	
Line	MARIPOSA	WESTMS_2	1	115	156	100						PRAGER-WEST MESA 2-230/115 TRANSFORMER (BF 50362)	6
Line	MIMBRES	AIRPOR_T	1	115	120	104						ARROYO-NEWMAN-AFTON 345 kV (BF 0538B)	6
Line	MONTANO	MONTANOT	1	115	156	110						MISSION-NORTH-REEVES 1 115 kV (BF 24862)	6
Line	MONTANOT	PRAGER	1	115	156	115						IRVING-WEST MESA 1 & REEVES 2-WEST MESA 2 115 kV (DOUBLE CIRCUIT)	6
Tran	WESTMESA 345/115 KV		1		448	128						SANDIA-WEST MESA-345/115 TRANSFORMER #2 (BF 22482)	6
Tran	WESTMESA 345/115 KV		2		480	121						SANDIA-WEST MESA-345/115 TRANSFORMER #2 (BF 22482)	6
Line	PACHMANN	ALGODONE	1	115	97	110						GAUDALUPE-BA-NORTON 345 kV (BF 08482)	6
Line	AUSTIN_N	MESA__#	1	115	196	109						ARROYO-NEWMAN-AFTON 345 kV (BF 0538B)	6
Tran	DIABLO 345/115 KV		1		224	109						ARROYO-NEWMAN-AFTON 345 kV (BF 0538B)	6
Tran	DIABLO 345/115 KV		2		224	109						ARROYO-NEWMAN-AFTON 345 kV (BF 0538B)	6
Tran	DIABLO 345/115 KV		3		224	109						ARROYO-NEWMAN-AFTON 345 kV (BF 0538B)	6
Tran	LUNA	LUNA	1	115	224	102						ARROYO-NEWMAN-AFTON 345 kV (BF 0538B)	6
Line	MESA__#	RIO_GRAN	1	115	196	131						ARROYO-NEWMAN-AFTON 345 kV (BF 0538B)	6
Line	RIO_GRAN	SUNSET_N	1	115	159	112						ARROYO-NEWMAN-AFTON 345 kV (BF 0538B)	6
Line	ALGODONE	BUFORD_T	1	115	66	111						TOME-BELEN-WEST MESA 3 115 kV (BF 42462)	7
Line	BELEN_PG	WILLARD	1	115	30	113						ALGODONE-PACHMANN-BA 115 kV (BF 45362)	6
Line	CLAPHAM	ROSEBUD	1	115	60	101						OJO-SAN JUAN-SHIPROCK 345 kV (BF 05482)	6
Line	SPRINGER	GLADSTON	1	115	120	113						OJO-SAN JUAN-SHIPROCK 345 kV (BF 05482)	8
Tran	GLADSTON 230/115 KV		1		200	106						OJO-SAN JUAN-SHIPROCK 345 kV (BF 05482)	8

2018 Comments

1. New line Montano-North 115 kV Line – 2009.
2. Upgrade line to 240 MVA by 2012.
3. **Need Comment.**
4. Switch in Norton-Hernandez series reactor.
5. Upgrade line to 72 MVA in 2009
6. N-2 overloads are addressed through load shedding schemes, operating procedures or re-dispatch depending on magnitude. Additional information is available from PNM's 10-year plan studies.
7. It appears that load was doubled at Buford during base case modifications. The overload does not occur if the load is corrected.
8. PNM and Tri-state are in preliminary discussions on joint study needs for the Northeast area of New Mexico to address potential import restrictions for Ojo source, Norton source and Walsenburg-Gladstone 230 kV line outages that may develop by 2018.

EPE STUDY RESULTS

The power flow analysis for EPE monitored voltage levels of 100 kV and above and monitored the following Areas for voltage and thermal violations: Arizona, El Paso and New Mexico.

2013 Study Results

For the 2013 study, EPE provided a list of approximately 114 N-1 contingencies. EPE did not provide any N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the EPE system. For the N-1 analysis there were three thermal violations and 20 voltage deviation issues. The following table shows the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 17– EPE 2013 RESULTS TABLE

EPE 2013 RESULTS												
CATEGORY A												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
NO ISSUES												
CATEGORY B												
Line	GR	VISTA_#	1	115	159	128	Line	PICANTE	CALIENTE	1	345	1
Line	LUNA	MIMBRES	1	115	200	101	Line	NEWMAN	AFTON	1	345	2
Tran	LUNA 345/115 KV		1		224	107	Line	NEWMAN	AFTON	1	345	2

EPE 2013 VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					COMMENT
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV	FROM	TO	C K	KV		
CATEGORY B										
AIRPOR	115			5.81	NEWMAN-AFTON 345					3
ARTESIA	345			5.29	CAL-NEWMAN 345					4
ARTESIAR	345			5.29	CAL-NEWMAN 345					5
BIGGS	115			5.15	CAL-NEWMAN 345					6
CALIENTE	115			6.6	CAL-NEWMAN 345					7
CALIENTE	345			5.92	CAL-NEWMAN 345					8
COYOTE	115			6.73	CAL-NEWMAN 345					9
DIABLO	345			5.02	NEWMAN-AFTON 345					10
GR	115			6.07	CAL-NEWMAN 345					11
HORIZON	115			7.09	CAL-NEWMAN 345					12
LANE_#	115			7.04	CAL-NEWMAN 345					13
MONTWOOD	115			6.7	CAL-NEWMAN 345					14
NS2	115			6.88	CAL-NEWMAN 345					15
RGC_DC	115			6.73	CAL-NEWMAN 345					16
SCOTSDAL	115			6.08	CAL-NEWMAN 345					17
SE1	115			7.29	CAL-NEWMAN 345					18
SOL	115			6.81	CAL-NEWMAN 345					19

Table 18– EPE 2013 RESULTS TABLE: CONTINUED

EPE 2013 VOLTAGE RESULTS : CONTINUED										
VOLTAGE DEVIATION					OUTAGE					
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV		FROM	TO	C K	KV	COMMENT
CATEGORY B										
SPARKS	115			7.2		CAL-NEWMAN 345				20
VISTA_#	115			6.55		CAL-NEWMAN 345				21
WRANGLER	115			7.07		CAL-NEWMAN 345				22

2013 Comments

1. Lines are planned to be upgraded in 2009.
2. Located in the PNM system and are being looked at for mitigation.
3. 3-22 Need Comments!

2018 Study Results

For the 2018 study, EPE provided approximately 114 N-1 contingencies. EPE did not provide any N-2 or greater than N-2 contingencies. With all lines in service there were no N-0 thermal violations on the EPE system. For the N-1 analysis there were 14 thermal violations. The following table shows the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 19 – EPE 2018 RESULTS TABLE

EPE 2018 RESULTS												
N-0												
OVERLOAD							OUTAGE					
	FROM	TO	C K	KV	RATE MVA	% OL		FROM	TO	C K	KV	COMMENT
NO ISSUES												
N-1												
Line	LUNA	MIMBRES	1	115	200	117	Line	NEWMAN	AFTON	1	345	1
Line	MIMBRES	AIRPOR_T	1	115	120	106	Line	NEWMAN	AFTON	1	345	1
Line	ASCARATE	COPPER	1	115	159	109	Line	CAL	NEWMAN	1	345	2
Line	AUSTIN_N	MARLOW	2	115	219	106	Line	CAL	NEWMAN	1	345	3
Line	COPPER	SE1	1	115	159	109	Line	NEWMAN	AFTON	1	345	4
Tran	DIABLO 345/115 KV		1		224	104	Line	NEWMAN	AFTON	1	345	5
Tran	DIABLO 345/115 KV		2		224	104	Line	NEWMAN	AFTON	1	345	5
Tran	DIABLO 345/115 KV		3		224	104	Line	NEWMAN	AFTON	1	345	5
Tran	LUNA 345/115 KV		1		224	116	Line	NEWMAN	AFTON	1	345	1
Line	MESA_#	RIO_GRAN	1	115	196	119	Line	NEWMAN	AFTON	1	345	6
Line	NEWMAN	BIGGS	1	115	159	124	Line	CAL	NEWMAN	1	345	7
Line	RIO_GRAN	SUNSET_N	1	115	159	103	Line	NEWMAN	AFTON	1	345	8
Line	EL_BUTTE	PICACHO	1	115	40	100	Line	NEWMAN	AFTON	1	345	9
Tran	GLADSTON 230/115 KV		1		200	101	Line	NEWMAN	AFTON	1	345	10

2018 Comments

1. Located in the PNM system and are being looked at for mitigation.
2. Need Comment.
3. Need Comment.
4. Need Comment.
5. Need Comment.
6. Need Comment.
7. Need Comment.
8. Need Comment.
9. Need Comment.
10. Need Comment.

SRP STUDY RESULTS

The power flow analysis for SRP monitored voltage levels of 100 kV and above and monitored all of Arizona system for voltage and thermal violations.

2013 Study Results

For the 2013 study, SRP provided a list of approximately 530 N-1 contingencies and 12 N-2 or greater contingencies. With all lines in service there were no N-0 thermal on the SRP system. For the N-1 analysis there was one thermal violation and 4 voltage deviation violations. For the N-2 or greater there were two thermal violations and no voltage violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 20 – SRP 2013 RESULTS TABLE

SRP 2013 THERMAL RESULTS												
CATEGORY A												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
NO ISSUES												
CATEGORY B												
Line	461E5.1N	MRMNFLAT	1	115	159	103	Line	GOLDFELD	HORMESA	1	115	1
CATEGORY C												
Line	AGUAFRIA	ALEXANDR	1	230	869	127	DEERVLY-PINNACLE PEAK AND DEERVALLEY - WESTWING 230 KV				2	
Line	ANDERSON	KYR-NEW	1	230	869	119	RUDD - ORME #1 & #2 230 KV				2	

SRP 2013 VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV	FROM	TO	C K	KV	COMMENT	
NO ISSUES										
CATEGORY B										
RAY	115	1.008	0.901	10.7	Line	RAY	SUPERIOR	1	115	3
KNOLL	115	1.005	0.902	10.3	Line	RAY	SUPERIOR	1	115	4
MORRISAZ	115	1.006	0.905	10.1	Line	RAY	SUPERIOR	1	115	5
KEARNY	115	1.018	0.937	8.1	Line	RAY	SUPERIOR	1	115	6
CATEGORY C										
NO ISSUES										

2013 Comments:

1. Modeling error, incorrect rating in the base case
2. The planned solution for N-2 outages that create overloads is for SRP to drop load to reduce the overload.
3. Need Comment.
4. Need Comment.
5. Need Comment.
6. Need Comment.

2018 Study Results

For the 2018 study, SRP provided a list of approximately 530 N-1 contingencies and 12 N-2 or greater contingencies. With all lines in service there was one N-0 thermal violation on the SRP system. For the N-1 analysis there was three thermal violation and for the N-2 or greater there were six thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 21 – SRP 2018 RESULTS TABLE

SRP 2018 THERMAL RESULTS													
CATEGORY A													
OVERLOAD							OUTAGE					COMMENT	
	FROM	TO	C K	KV	RATE MVA	% OL		FROM	TO	C K	KV		
Line	WHITETNK	RUDD	1	230	833	104		BASE CASE (N-0) OVERLOAD					1
CATEGORY B													
Line	CORBELL	SANTAN	1	230	695	100	Line	CORBELL	KYRENE	1	230	2	
Line	WHITETNK	RUDD	1	230	920	107	Line	AGUAFRIA	WESTWNG	1	230	1	
Line	461E5.1N	MRMNFLAT	1	115	159	111	Line	GOLDFELD	HORMESA	1	115	3	
CATEGORY C													
Tran	GILARIVR	GILARIVR	1	230	560	101		JOJOBA - GILA RIVER #1 AND #2 500 KV					4
Line	JOJOBA	GILARIVR	1	230	545	126		JOJOBA - GILA RIVER #1 AND #2 500 KV					4
Line	JOJOBA	TS4	1	230	545	126		JOJOBA - GILA RIVER #1 AND #2 500 KV					4
Line	AGUAFRIA	ALEXANDR	1	230	797	154		DEERVLY-PINNACLE PEAK AND DEERVALLEY - WESTWING 230 KV					4
Line	ANDERSON	KYR-NEW	1	230	869	151		RUDD - ORME #1 & #2 230 KV					4
Line	WHITETNK	RUDD	1	230	920	117		DEERVALLEY - WESTWING E AND AGUA FRIA - WESTWING 230 KV					4

2018 Comments

1. Modeling error in the case.
2. The limiting element for this overload is planned for an upgrade.
3. Modeling error incorrect rating in the base case.
4. The planned solution for N-2 outages that create overloads is for SRP to drop load to reduce the overload.

SWTC STUDY RESULTS

The power flow analysis for SWTC monitored voltage levels of 100 kV and above and monitored all of Arizona and New Mexico systems for voltage and thermal violations.

2013 Study Results

For the 2013 study, SWTC provided a list of approximately 96 N-1 contingencies and 6 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the SWTC system. For the N-1 analysis there was one thermal violation and three voltage deviation issues. For the N-2 or greater there was one thermal violations and 16 voltage deviation issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 22 – SWTC 2013 RESULTS TABLE

SWTC 2013 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL		FROM	TO	C K	KV		
CATEGORY A												
NO ISSUES												
CATEGORY B												
Tran	COPPERVR	345/230 KV	1		224	120	Line	MORENCI	GREEN-SW	1	230	1
CATEGORY C												
Line	ADAMSTAP	PANTANO	1	115	140	103		APACHE to BUTERFLD 230KV & APACHE to WINCHSTR 230KV				2

SWTC 2013 VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV	FROM	TO	C K	KV	COMMENT	
CATEGORY B										
HACKBERY	230	1.000	0.933	6.7	LINE HACKBERY TO MORENCI 230 KV CIRCUIT 1				3	
RED TAIL	230	1.017	0.951	6.5	LINE APACHE TO RED TAIL 230 KV CIRCUIT 1				4	
DOSCONDO	230	1.001	0.939	6.2	LINE HACKBERY TO MORENCI 230 KV CIRCUIT 1				5	
CATEGORY C										
BICKNELL	345	1.029	0.941	8.8	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				6	
BUTERFLD	230	1.022	0.925	9.7	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				7	
DOSCONDO	230	1.001	0.943	5.8	Line APACHE 230.0 to WINCHSTR 230.0 Circuit 1 and Apache to Red Tail 230				8	
HACKBERY	230	1.000	0.947	5.4	Line APACHE 230.0 to WINCHSTR 230.0 Circuit 1 and Apache to Red Tail 230				9	
KARTCHNR	115	0.985	0.915	6.9	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				10	
NEWTUCSN	230	1.021	0.939	8.2	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				11	
PANTANO	230	1.021	0.939	8.3	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				12	
RED TAIL	230	1.017	0.942	7.5	Line APACHE 230.0 to WINCHSTR 230.0 Circuit 1 and Apache to Red Tail 230				13	
SAHUARIT	230	1.021	0.939	8.2	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				14	
SAN RAF	230	1.007	0.907	10	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				15	
SLOAN	230	1.022	0.931	9.1	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				16	
BICKNELL	345	1.029	0.941	8.8	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				17	
BUTERFLD	230	1.022	0.925	9.7	Line APACHE 230.0 to BUTERFLD 230.0 Circuit 1 and Bicknell to Vail 345				18	
DOSCONDO	230	1.001	0.943	5.8	Line APACHE 230.0 to WINCHSTR 230.0 Circuit 1 and Apache to Red Tail 230				19	
NO ISSUES										

2013 Comments

1. 1-19 Need Comments.

2018 Study Results

For the 2018 study, SWTC provided a list of approximately 96 N-1 contingencies and 14 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the SWTC system. For the N-1 analysis there were six thermal violations and for the N-2 or greater there were five thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 23 – SWTC 2018 RESULTS TABLE

SWTC 2018 RESULTS												
CATEGORY A												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
NO ISSUES												
CATEGORY B												
Line	SAG.EAST	MARANATP	1	115	120	111	Line	SAG.EAST	NAVISKA	1	115	1
Line	MARANATP	RATTLSENK	1	115	120	103	Line	AVRA	MARANA	1	115	2
Line	SNDARIO	SANDARIO	1	115	132	125	Line	AVRA	MARANA	1	115	3
Line	PICTROCK	SANDARIO	1	115	132	126	Line	AVRA	MARANA	1	115	4
Line	ADAMS TP	APACHE	1	115	110	108	Line	APACHE	BUTERFLD	1	230	5
Line	RATTLSENK	TWINPEAK	1	115	132	138	Line	AVRA	MARANA	1	115	6
CATEGORY C												
Line	MARANATP	RATTLSENK	1	115	120	114		APACHE to BUTERFLD 230KV & AVRA to MARANA 115KV AVRA to MARANA 115KV				7
Line	SNDARIO	SANDARIO	1	115	132	136		APACHE to BUTERFLD 230KV & AVRA to MARANA 115KV AVRA to MARANA 115KV				8
Line	PICTROCK	SANDARIO	1	115	132	137		APACHE to BUTERFLD 230KV & AVRA to MARANA 115KV AVRA to MARANA 115KV				9
Line	ADAMS TP	APACHE	1	115	110	168		APACHE to BUTERFLD 230KV & APACHE to WINCHSTR 230KV				10
Line	RATTLSENK	TWINPEAK	1	115	132	149		APACHE to BUTERFLD 230KV & AVRA to MARANA 115KV AVRA to MARANA 115KV				11

2018 Comments

1. Need Comment.
2. Need Comment.
3. Need Comment.
4. Need Comment.
5. Need Comment.
6. Need Comment.
7. Need Comment.
8. Need Comment.
9. Need Comment.
10. Need Comment.
11. Need Comment.

TEP STUDY RESULTS

The power flow analysis for TEP monitored voltage levels of 100 kV and above and monitored all of Arizona, New Mexico and El Paso systems for voltage and thermal violations.

2013 Study Results

For the 2013 study, TEP provided a list of approximately 141 N-1 contingencies. With all lines in service there were no N-0 thermal violations on the TEP system. For the N-1 analysis there was one thermal violation and 3 voltage deviation issues. TEP conducted their own N-2 analysis and provided their results for input into this report. TEP has proprietary software it uses to conduct this analysis which encompasses complicated load shed schemes which TEP deems to be confidential. There were six N-2 issues and 10 voltage deviation issues in the TEP system. The following table shows the six overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 24 – TEP 2013 RESULTS TABLE

TEP 2013 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
NO ISSUES												
CATEGORY B												
Tran	COPPERVR 230/345 KV	1		224	121		GREEN-SW	GREENLEE	1	345	1	
CATEGORY C												
Tran	COPPERVR 345/230 KV	1		224	107		SPRINGR TO VAIL2 WINCHSTR TO WILLOW				1	
Line	E. LOOP	PANTANO	1	138	311	152	IRV BUS				2	
Line	PANTANO	LOSREALS	1	138	311	124	IRV BUS				2	
Line	TECHPARK	VAIL 138	1	138	311	120	PINALWES TO SOUTH & VAIL TO SOUTH				2	
Line	IRVNGTN	TECHPARK	1	138	311	113	PINALWES TO SOUTH & VAIL TO SOUTH				2	
Line	LOSREALS	VAIL 138	1	138	419	107	IRV BUS				2	

TEP 2013 VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					COMMENT
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV	FROM	TO	C K	KV		
CATEGORY B										
GATEWAY	138	1.0141	0.956	5.51	TRAN GATEWAY 138.00 TO GATEWAY 345.00	CIRCUIT 1				3
VALNCIA	138	1.0148	0.959	5.45	TRAN GATEWAY 138.00 TO GATEWAY 345.00	CIRCUIT 1				4
SONOITA	138	1.0146	0.993	5.03	TRAN GATEWAY 138.00 TO GATEWAY 345.00	CIRCUIT 1				5
CATEGORY C										
CATALINA	138	1.0140	0.961	5.25	SPRINGERVILLE TO GREENLEE AND SPRINGERVILLE TO VAIL					6
RANVISTO	138	1.0148	0.961	5.22	SPRINGERVILLE TO GREENLEE AND SPRINGERVILLE TO VAIL					7
LACANADA	138	1.0182	0.965	5.21	SPRINGERVILLE TO GREENLEE AND SPRINGERVILLE TO VAIL					8
VALNCIA	138	1.0148	0.994	5.13	PINAL W TO SOUTH AND VAIL TO SOUTH					9
NARANJA	138	1.0158	0.964	5.09	SPRINGERVILLE TO GREENLEE AND SPRINGERVILLE TO VAIL					10
GATEWAY	138	1.0141	0.962	5.08	PINAL W TO SOUTH AND VAIL TO SOUTH					11
RILLITO	138	1.0141	0.964	5.04	SPRINGERVILLE TO GREENLEE AND SPRINGERVILLE TO VAIL					12
KANTOR	138	1.0178	0.962	5.55	PINAL W TO SOUTH AND VAIL TO SOUTH					13
CANEZ	138	1.0153	0.96	5.45	PINAL W TO SOUTH AND VAIL TO SOUTH					14
SONOITA	138	1.0146	0.96	5.37	PINAL W TO SOUTH AND VAIL TO SOUTH					15

2013 Comments

1. Referring to SATS Group.
2. For WECC Category B outages, Load shedding is allowed.
3. 3-15 Need Comments!

2018 Study Results

For the 2018 study, TEP provided a list of approximately 159 N-1 contingencies. With all lines in service there were two N-0 thermal violations on the TEP system. For the N-1 analysis there was one thermal violation. TEP conducted their own N-2 analysis and provided their results for input into this report. TEP has proprietary software it uses to conduct this analysis which encompasses complicated load shed schemes which TEP deems to be confidential. There were 8 N-2 issues in the TEP system. The following table shows the six overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 25 – TEP 2018 RESULTS TABLE

TEP 2018 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
Tran	GREEN-SW 345/230 KV	1		168	101	Base Case Overload All Lines In Service					1	
Line	SAG.EAST	ORACLE	1	115	798	100	Base Case Overload All Lines In Service					1
CATEGORY B												
Tran	GREEN-SW 345/230 KV	1		193	171	Line	GREENLEE	COPPERVR	1	345	1	
Tran	COPPERVR 345/230 KV	1		224	148	Line	GREEN-SW	GREENLEE	1	345	1	
CATEGORY C												
Tran	GREEN-SW 345/230 KV	1		193	177		WINCHSTR TO VAIL 345 KV & WINCHSTR TO WILLOW 345 KV					1
Tran	COPPERVR 345/230 KV	1		224	160		SPRINGR TO VAIL2 345 KV & WINCHSTR TO WILLOW 345 KV					1
Line	SAG.EAST	MARANA	1	115	798	138	SPRINGR TO VAIL2 345 KV & WINCHSTR TO WILLOW 345 KV					1
Line	SAG.EAST	ORACLE	1	115	442	125	SAGUARO TO TORTOLIT 500 KV CKT 1 & 2					1
Line	PANTANO	LOSREALS	1	138	1301	122	IRV BUS					2
Line	E. LOOP	PANTANO	1	138	1301	110	IRV BUS					2
Line	LOSREALS	VAIL	1	138	1753	107	IRV BUS					2
Line	NE.LOOP	RILLITO	1	138	1302	103	SPRINGR TO VAIL2 345 KV & WINCHSTR TO WILLOW 345 KV					2

2018 Comments

1. Referring to SATS Group.
2. For WECC Category B outages, Load shedding is allowed.

WAPA - DSW STUDY RESULTS

The power flow analysis for WAPA-DSW monitored voltage levels of 100 kV and above and monitored all of the following Areas: Arizona, Nevada, Southern California and IID systems for voltage and thermal violations.

2013 Study Results

For the 2013 study, WAPA-DSW provided a list of approximately 198 N-1 contingencies and 11 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the WAPA-DSW system. For the N-1 analysis there were five thermal violations and two voltage deviation issues. For the N-2 or greater there were eight violations and seven voltage deviation issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 26 – WAPA-DSW 2013 RESULTS TABLE

WAPA-DSW 2013 RESULTS												
OVERLOAD							OUTAGE					
	FROM	TO	C K	KV	RATE MVA	% OL		FROM	TO	C K	KV	COMMENT
CATEGORY A												
NO ISSUES												
CATEGORY B												
Line	ROGERS	ROGSWAPA	2	230	399	124	Line	ROGERS	ROGSWAPA	1	230	1
Line	ROGERS	ROGSWAPA	1	230	399	124	Line	ROGERS	ROGSWAPA	2	230	1
Line	FLAGSTAF	PINPKBRB	1	345	1219	112	Line	FLAGSTAF	PINPKBRB	2	345	2
Line	FLAGSTAF	PINPKBRB	2	345	1219	112	Line	FLAGSTAF	PINPKBRB	1	345	2
Line	WILOWLKW	PRESCOTT	1	230	268	111	Line	GAVLINWA	PINPK	1	230	3
CATEGORY C												
Line	GLEN PS	NAVAJO	1	230	340	258	FLAGSTAF to GLENCANY 345 1 and FLAGSTAF to GLENCANY 345 2				2	
Tran	GLEN PS	GLENCANY	1	230	350	238	FLAGSTAF to PINPKBRB 345 1 and FLAGSTAF to PINPKBRB 345 2				2	
Tran	SHIPROCK	SHIPROCK	1	230	330	209	FLAGSTAF to GLENCANY 345 1 and FLAGSTAF to GLENCANY 345 2				2	
Line	NAVAJO	LNGHOUSE	1	230	481	182	FLAGSTAF to GLENCANY 345 1 and FLAGSTAF to GLENCANY 345 2				2	
Line	KAYENTA	LNGHOUSE	1	230	482	179	FLAGSTAF to GLENCANY 345 1 and FLAGSTAF to GLENCANY 345 2				2	
Line	KAYENTA	SHIPROCK	1	230	482	174	FLAGSTAF to GLENCANY 345 1 and FLAGSTAF to GLENCANY 345 2				2	
Tran	GLENCANY	GLENCANY	1	230	300	142	FLAGSTAF to PINPKBRB 345 1 and FLAGSTAF to PINPKBRB 345 2				2	
Tran	GLENCANY	GLENCANY	2	230	300	142	FLAGSTAF to PINPKBRB 345 1 and FLAGSTAF to PINPKBRB 345 2				2	

WAPA-DSW VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV		FROM	TO	C K	KV	COMMENT
CATEGORY B										
GAVLINWA	230	1.02	0.908	10.1		LINE GALVLINWA TO PINPK 230 KV				3
BLYTHESC	161	1.005	0.896	10.2		LINE BLYTHE TO BLYTHESC 161 KV				4
CATEGORY C										
KAYENTA	230	1.031	0.835	10.1		Line FLAGSTAF 345.0 to GLENCANY 345.0 Circuit 1				2
SHIPROCK	230	1.028	0.891	10.2		Line FLAGSTAF 345.0 to GLENCANY 345.0 Circuit 1				2
SHIPROCK	115	1.027	0.906	10.1		Line FLAGSTAF 345.0 to GLENCANY 345.0 Circuit 1				2
FRUITAP	115	1.026	0.911	10.2		Line FLAGSTAF 345.0 to GLENCANY 345.0 Circuit 1				2
FRUITLND	115	1.026	0.911	10.1		Line FLAGSTAF 345.0 to GLENCANY 345.0 Circuit 1				2
MESA FM	115	1.024	0.917	10.1		Line FLAGSTAF 345.0 to GLENCANY 345.0 Circuit 1				2
ANIMAS	115	1.023	0.922	10.2		Line FLAGSTAF 345.0 to GLENCANY 345.0 Circuit 1				2

2013 Comments

1. Modeling error incorrect rating in the base case.
2. Glenn Canyon Generation trip scheme mitigates violations.
3. APS Line: APS and WAPA need to discuss.
4. Blythe Generation tripping scheme mitigates violations.

2018 Study Results

For the 2018 study, WAPA-DSW provided a list of approximately 226 N-1 contingencies and 27 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the WAPA-DSW system. For the N-1 analysis there were ten thermal violations and for the N-2 or greater there were eleven thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 27 – WAPA-DSW 2018 RESULTS TABLE

WAPA-DSW 2018 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
NO ISSUES												
CATEGORY B												
Line	ROGERS	ROGSWAPA	2	230	399	145	Line	ROGERS	ROGSWAPA	1	230	1
Line	ROGERS	ROGSWAPA	1	230	399	145	Line	ROGERS	ROGSWAPA	2	230	1
Line	FLAGSTAF	PINPKBRB	1	345	1219	114	Line	FLAGSTAF	PINPKBRB	2	345	2
Line	FLAGSTAF	PINPKBRB	2	345	1219	114	Line	FLAGSTAF	PINPKBRB	1	345	2
Line	FLAGSTAF	GLENCANY	1	345	1089	107	Line	FLAGSTAF	GLENCANY	2	345	2
Line	FLAGSTAF	GLENCANY	2	345	1089	107	Line	FLAGSTAF	GLENCANY	1	345	2
Tran	GLENCANY 345/230 KV		1		300	124	Tran	GLENCANY 345/230 KV		2		2
Tran	GLENCANY 345/230 KV		2		300	124	Tran	GLENCANY 345/230 KV		1		2
Line	WILOWLKW	PRESCOTT	1	230	268	128	Line	GAVLINWA	PINPK	1	230	3
Line	WILOWLKE	WILOWLKW	1	230	323	106	Line	GAVLINWA	PINPK	1	230	3
CATEGORY C												
Line	BLYTHE	NILAND	1	161	165	103	BLYTHE-PARKER 115 Circuits 1 & 2					4
Line	FLAGSTAF	GLENCANY	2	345	1089	100	GLENCANY-FLAGSTAF 345 & FLAGSTAF-PINNACLE PEAK 3451					2
Line	FLAGSTAF	PINPKBRB	2	345	1219	106	GLENCANY-FLAGSTAF 345 & FLAGSTAF-PINNACLE PEAK 3451					2
Line	GLEN PS	NAVAJO	1	230	340	184	FLAGSTAF to PINPKBRB 345 1 & 2					2
Tran	GLEN PS	GLENCANY	1	230	350	244	FLAGSTAF to PINPKBRB 345 1 & 2					2
Tran	SHIPROCK	SHIPROCK	1	230	330	224	FLAGSTAF to PINPKBRB 345 1 & 2					2
Line	NAVAJO	LNGHOUSE	1	230	481	184	FLAGSTAF to PINPKBRB 345 1 & 2					2
Line	KAYENTA	LNGHOUSE	1	230	482	166	FLAGSTAF to PINPKBRB 345 1 & 2					2
Line	KAYENTA	SHIPROCK	1	230	482	178	FLAGSTAF to PINPKBRB 345 1 & 2					2
Tran	GLENCANY	GLENCANY	1	230	300	147	FLAGSTAF to PINPKBRB 345 1 & 2					2
Tran	GLENCANY	GLENCANY	2	230	300	147	FLAGSTAF to PINPKBRB 345 1 & 2					2

2018 Comments

1. Modeling error incorrect rating in the base case.
2. Glenn Canyon Generation trip scheme mitigates violations.
3. APS Line: APS and WAPA need to discuss.
4. Blythe Generation tripping scheme mitigates violations.

NPC STUDY RESULTS

The power flow analysis for NPC monitored voltage levels of 100 kV and above and monitored all of the following Areas: Arizona, Nevada, San Diego, South California, LADWP, Sierra Pacific and PACE systems for voltage and thermal violations.

2013 Study Results

For the 2013 study, NPC provided a list of approximately 411 N-1 contingencies and 10 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the NPC system. For the N-1 analysis there were two thermal violations and eight voltage deviation issues. For the N-2 or greater there were no thermal violations and no voltage deviation issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 28 – NPC 2013 RESULTS TABLE

NPC 2013 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL		FROM	TO	C K	KV		
CATEGORY A												
NO ISSUES												
CATEGORY B												
Line	LVCOGEN	HIGHLAND	1	138	246	108	Line	LVCOGEN-CRAIG-PECOS 138 KV				1
Line	CRAIG	LVCOGEN	1	138	246	107	Line	HIGHLAND-LVCOGEN 138 KV LINE				1
CATEGORY C												
NO ISSUES												

NPC VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					COMMENT
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV		FROM	TO	C K	KV	
CATEGORY B										
EQUEST N	500	1.072	1.0	7.2	CRYSTAL-MCCULLOUGH + SRISE-MD 500 KV LINES					2
MIRANT	500	1.067	1.0	6.7	MIRANT-H ALLEN 500 KV LINE OUTAGE, GEN TRIP					3
SLHWK	500	1.067	1.0	6.7	SLHWK-H ALLEN 500 KV LINE OUTAGE, GEN TRIP					4
LENZ CB1	500	1.066	1.0	6.6	LENZ CB1-LENZIE 500 KV LINE OUTAGE, GEN TRIP					5
LENZ CB2	500	1.066	1.0	6.6	LENZ CB2-LENZIE 500 KV LINE OUTAGE, GEN TRIP					6
HACC	500	1.066	1.0	6.6	RELIANT-H ALLEN 500 KV LINE OUTAGE, GEN TRIP					7
NWEST	500	1.063	1.0	6.3	LENZIE-NORTHWEST #1 500 KV LINE AND XFMR					8
LEAVITT	138	1.014	0.962	5.2	BROOKS-LEAVITT 138 KV LINE					9
CATEGORY C										
NO ISSUES										

2013 Comments

- Overloads are known issues and are being mitigated in the current planning process.
- Need Comment

2018 Study Results

For the 2018 study, NPC provided a list of approximately 432 N-1 contingencies and 10 N-2 or greater contingencies. With all lines in service there were four N-0 thermal violations on the NPC system. For the N-1 analysis there were seven thermal violations and for the N-2 or greater there were three thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 29 – NPC 2018 RESULTS TABLE

NPC 2018 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
Line	VICTOR	SAVAGE	1	115	121	120	BASE CASE (N-0) OVERLOAD				1	
Line	VICTOR	TAP608	1	115	83	141	BASE CASE (N-0) OVERLOAD				2	
Line	VICTOR	TAP607	1	115	83	105	BASE CASE (N-0) OVERLOAD				3	
Line	MIRAGE	J.HINDS	1	230	239	147	BASE CASE (N-0) OVERLOAD				4	
CATEGORY B												
Tran	AMARGOSA 230/138 KV		1		66	116	Line	DIAMOND	SANDY	1	230	5
Line	ARTESIAN	WINTERWD	1	138	246	130	LENZIE-NORTHWEST #1 500 KV LINE AND XFMR				6	
Line	DECATUR	DURANGO	1	138	246	113	LENZIE-NORTHWEST #1 500 KV LINE AND XFMR				7	
Line	MCDONLD	QUAIL	1	138	246	120	Line	ARDEN	CAMERO	1	138	8
Line	NWEST	SNOWMT	1	138	56	122	Line	DIAMOND	SANDY	1	230	9
Line	QUAIL	AVERA	1	138	246	140	Line	ARDEN	CAMERO	1	138	10
Tran	STIR 230/138 KV		1		95	123	PST	ROBINSON-GONDER PST 345/345 KV # 1				
CATEGORY C												
Line	ARTESIAN	WINTERWD	1	138	246	168	LENZIE-H ALLEN #2 + LENZIE-NW 500 KV LINES				11	
Line	DECATUR	DURANGO	1	138	246	113	LENZIE-H ALLEN #2 + LENZIE-NW 500 KV LINES				12	
Line	FAULKNER	WILSON	1	138	246	110	LENZIE-H ALLEN #2 + LENZIE-NW 500 KV LINES				13	

2018 Comments

- 1-13 Needs Comment.

SIERRA SUBREGIONAL PLANNING GROUP STUDY RESULTS

SMUD STUDY RESULTS

The power flow analysis for SMUD monitored voltage levels of 100 kV and above and monitored the PG&E Area for voltage and thermal violations.

2013 Study Results

For the 2013 study, SMUD provided a list of approximately 44 N-1 contingencies and 0 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the SMUD system. For the N-1 analysis there were no thermal violations and no voltage deviation issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 30 – SMUD 2013 RESULTS TABLE

SMUD 2013 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	LINE/ TRAN	FROM	TO	C K	KV		
CATEGORY A												
NO ISSUES												
CATEGORY B												
NO ISSUES												
CATEGORY C												
NONE WERE ANALYZED												

SMUD VOLTAGE RESULTS											
VOLTAGE DEVIATION					OUTAGE					COMMENT	
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV	FROM	TO	C K	KV			
CATEGORY B											
NO ISSUES											
CATEGORY C											
NONE WERE ANALYZED											

2018 Study Results

For the 2018 study, SMUD provided a list of approximately 44 N-1 contingencies and 0 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the SMUD system. For the N-1 analysis there were no thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 31 – SMUD 2018 RESULTS TABLE

SMUD 2018 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	LINE/ TRAN	FROM	TO	C K	KV		
CATEGORY A												
NO ISSUES												
CATEGORY B												
NO ISSUES												
CATEGORY C												
NONE WERE ANALYZED												

SPPC STUDY RESULTS

The power flow analysis for SPPC monitored voltage levels of 100 kV and above and monitored the PG&E Area for voltage and thermal violations.

2013 Study Results

For the 2013 study, SPPC provided a list of approximately 105 N-1 contingencies and 5 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the SPPC system. For the N-1 analysis there were no thermal violations and 21 voltage deviation issues. For the N-2 or greater there were three thermal violations and no voltage deviation issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 32 – SPPC 2013 RESULTS TABLE

SPPC 2013 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
NO ISSUES												
CATEGORY B												
NO ISSUES												
CATEGORY C												
Line	NGPP	ONIONPLT	1	120	71	114	Lines	TRACY - VALMY 345 KV #1 + #2			1	
Line	DESRT TP	EAGLE	1	120	71	142	Lines	TRACY - VALMY 345 KV #1 + #2			1	
Line	DESRT TP	ONIONPLT	1	120	71	114	Lines	TRACY - VALMY 345 KV #1 + #2			1	

SPPC 2013 VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					COMMENT
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV	FROM	TO	C K	KV		
CATEGORY B										
HIL TOP	345	1.036	0.951	8.5	TRACY - VALMY 345 KV #1 + #2				2	
FTSAGEPS	345	1.024	0.948	7.6	TRACY - VALMY 345 KV #1 + #2				3	
ROBINSON	345	0.962	0.899	6.3	OFF ROBINSON-FALCON 345KV				4	
RBFLCPS	345	1.025	0.962	1.04	OFF RS-FLC PST #1 345 KV				5	
RBGONPS	345	1.025	0.962	6.3	OFF RS-GON PST #1 345 KV				6	
GONDER	345	0.973	0.914	5.9	OFF ROBINSON-FALCON 345KV				7	
BARCK TP	120	1.051	0.992	5.9	TROLLEY-BARCK TP-BLDR BSN,OXY TP 120KV				8	
OXY TP	120	1.051	0.992	5.9	TROLLEY-BARCK TP-BLDR BSN,OXY TP 120KV				9	
OXYGN PL	120	1.051	0.992	5.9	TROLLEY-BARCK TP-BLDR BSN,OXY TP 120KV				10	
BARCK ML	120	1.051	0.992	5.9	TROLLEY-BARCK TP-BLDR BSN,OXY TP 120KV				11	
BETZE	120	1.051	0.992	5.9	BELL-BAZZA-BETZE-TROLLEY 120KV				12	
BAZZA	120	1.051	0.993	5.8	BELL-BAZZA-BETZE-TROLLEY 120KV				13	
ROBINSON	500	0.991	0.934	5.7	OFF ROBINSON-FALCON 345KV				14	
SANDIA	120	1	0.947	5.3	TRACY - VALMY 345 KV #1 + #2				15	
MILLERS	120	1.006	0.954	5.2	TRACY - VALMY 345 KV #1 + #2				16	
ROUNDMTN	230	1.007	0.955	5.2	TRACY - VALMY 345 KV #1 + #2				17	
ANACONDA	120	1.008	0.956	5.2	TRACY - VALMY 345 KV #1 + #2				18	
ANACONDA	230	1.011	0.959	5.2	TRACY - VALMY 345 KV #1 + #2				19	
AUSTIN1	230	0.994	0.943	5.1	TRACY - VALMY 345 KV #1 + #2				20	
AUSTIN	230	0.994	0.943	5.1	TRACY - VALMY 345 KV #1 + #2				21	
FRONTIER	230	0.997	0.946	5.1	TRACY - VALMY 345 KV #1 + #2				22	
CAL S PS	120	1.028	0.978	5.1	TRACY - VALMY 345 KV #1 + #2				23	
CATEGORY C										
NO ISSUES										

2013 Comments

1. These are known problems and are being addressed in the approved budget. Upgrade of Desert – Eagle 120-kV line will mitigate these overloads
2. 2 – 23 Need Comments!

2018 Study Results

For the 2018 study, SPPC provided a list of approximately 105 N-1 contingencies and 5 N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the SPPC system. For the N-1 analysis there were five thermal violations and for the N-2 or greater there were five thermal violations. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 33 – SPPC 2018 RESULTS TABLE

SPPC 2018 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
NO ISSUES												
CATEGORY B												
Line	BELL	WATER TP	1	120	187	102		OFF VALMY-FALCON 345KV, Trip FALCON XFMR 345/120			1	
Line	FALCON	WATER TP	1	120	187	102		OFF VALMY-FALCON 345KV, Trip FALCON XFMR 345/120			1	
Tran	FALCON 345/120 KV		1		150	108		OFF VALMY-FALCON 345KV, Trip FALCON XFMR 345/120			1	
Line	OVERLAND	OVRLNDTP	1	120	120	110		EMERSON-CARSON T-BRUNSWICK-CARSON T-MT ROSE 120 kV			1	
Line	TRACY	TRACY E	1	120	251	102		DOVE - GREGSTR 120 KV			1	
CATEGORY C												
Tran	HIL TOP 345/230 KV		1		300	114	Lines	TRACY - VALMY 345 KV #1 + #2			1	
Line	NGPP	LONE MT	1	120	71	110	Lines	TRACY - VALMY 345 KV #1 + #2			1	
Line	NGPP	ONIONPLT	1	120	71	136	Lines	TRACY - VALMY 345 KV #1 + #2			1	
Line	DESRT TP	EAGLE	1	120	71	203	Lines	TRACY - VALMY 345 KV #1 + #2			1	
Line	DESRT TP	ONIONPLT	1	120	71	136	Lines	TRACY - VALMY 345 KV #1 + #2			1	
Tran	FTSAGEPS	FT SAGE	1	345	300	130	Lines	TRACY - VALMY 345 KV #1 + #2			1	

2018 Comments

1. These are known problems and are being addressed in the approved budget. Upgrade of Desert – Eagle 120-kV line will mitigate these overloads.

TANC STUDY RESULTS

The power flow analysis for TANC monitored voltage levels of 100 kV and above and monitored the following Areas for voltage and thermal violations: PG&E and the Northwest.

2013 Study Results

For the 2013 study, TANC provided a list of approximately 15 N-1 contingencies and eight N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the TANC system. For the N-1 analysis there were no thermal violations and no voltage deviation issues. For the N-2 or greater there were no thermal violations and no voltage deviation issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 34 – TANC 2013 RESULTS TABLE

TANC 2013 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	LINE/ TRAN	FROM	TO	C K	KV		
CATEGORY A												
NO ISSUES												
CATEGORY B												
NO ISSUES												
CATEGORY C												
NO ISSUES												

TANC 2013 VOLTAGE RESULTS										
VOLTAGE DEVIATION					OUTAGE					COMMENT
BUS	KV	V_BASE (PU)	V_CONT (PU)	%DV	FROM	TO	C K	KV		
CATEGORY B										
NO ISSUES										
CATEGORY C										
NONE WERE ANALYZED										

2018 Study Results

For the 2018 study, TANC provided a list of approximately 15 N-1 contingencies and eight N-2 or greater contingencies. With all lines in service there were no N-0 thermal violations on the TANC system. For the N-1 analysis there were no thermal violations and no voltage deviation issues. For the N-2 or greater there were three thermal violations and no voltage deviation issues. The following tables show the overloaded elements and the contingency which caused them. Only the worst case overload is listed for each element.

Table 35 – TANC 2018 RESULTS TABLE

TANC 2018 RESULTS												
OVERLOAD							OUTAGE					COMMENT
FROM	TO	C K	KV	RATE MVA	% OL	FROM	TO	C K	KV			
CATEGORY A												
NO ISSUES												
CATEGORY B												
NO ISSUES												
CATEGORY C												
Line	OLINDA	MAXWELL	1	500	3724	101		TABLE MOUNTAIN 500 TO TESLA 500 CIRCUIT #1 AND TABLE MOUNTAIN 500 TO VACA D			1	
Line	MAXWELL	TRACY	1	500	3728	101		TABLE MOUNTAIN 500 TO TESLA 500 CIRCUIT #1 AND TABLE MOUNTAIN 500 TO VACA D			2	
Line	ZETA 1	OLINDA	1	500	3550	115		TABLE MOUNTAIN 500 TO TESLA 500 CIRCUIT #1 AND TABLE MOUNTAIN 500 TO VACA D			3	

2018 Comments

1. Need Comment.
2. Need Comment.
3. Need Comment.

OBSERVATIONS

The 2013 and the 2018 adequacy results showed vary few actual issues that were not contributed to base case modeling errors in the base case. For all-lines-in-service (NERC Category A), for all systems, there were no issues. For the N-1 analysis (NERC Category B) the analysis identified various issues which in the most part were contributed to modeling errors. Mitigation for issues not contributed to modeling errors have planned solutions or are known issues which will be resolved in subsequent transmission plans. For the N-2 analysis (NERC Category C) the analysis identified various issues, some were contributed to modeling errors, some will be solve with planned N-1 mitigation and others have existing RAS schemes to mitigate the issues. The following Tables (36-37) summarize the study results for the 2013 and the 2018 adequacy study.

Table 36 – WestConnect 2013 Results Summary

WestConnect 2013 Results Summary						
Subregional Group	WestConnect Member	Thermal Violations			Voltage Violations	
		N-0	N-1	N-2 or >	N-1	N-2 or >
CCPG⁹		0	26	6		
	Black Hills Power					
	Basin Electric Power Cooperative					
	Tri-State Generation and Transmission					
	Western Area Power Administration (WAPA-RM)					
	Xcel Energy / Public Service Co. of Colorado					
SWAT						
	Arizona Public Service (APS)	0	2	0	5	0
	Imperial Irrigation District (IID)	0	0	0	0	0
	Public Service Company of New Mexico (PNM)	0	4	12	20	24
	El Paso Electric Company (EPE)	0	3	¹⁰	20	
	Salt River Project (SRP)	0	1	2	4	0
	Southwestern Transmission Cooperative (SWTC)	0	1	1	3	16
	Tucson Electric Power (TEP)	0	1	6	3	10
	Western Area Power Administration (WAPA-DSW)					
	Nevada Power Co.	0	5	8	2	7
SSPG						
	Sacramento Municipal Utility District (SMUD)	0	0	¹¹	0	
	Sierra Pacific Power Company (SPPC)	0	0	3	21	0
	Transmission Agency of Northern California (TANC)	0	0	0	0	0
¹²	Western Area Power Administration (WAPA-SNR)					

⁹ CCPG Study was conducted as a group and reported together with all of its members

¹⁰ EPE did not provide any N-2 contingencies.

¹¹ SMUD did not provide any N-2 contingencies.

¹² Western Area Power Administration (WAPA-SNR) Area was included in the Sierra Pacific study Results

Table 37 – WestConnect 2018 Results Summary

WestConnect 2018 Results Summary						
Subregional Group	WestConnect Member	Thermal Violations				
		N-0	N-1	N-2 or >		
CCPG¹³		0	52	21		
	Black Hills Power					
	Basin Electric Power Cooperative					
	Tri-State Generation and Transmission					
	Western Area Power Administration (WAPA-RM)					
	Xcel Energy / Public Service Co. of Colorado					
SWAT						
	Arizona Public Service (APS)	0	7	0		
	Imperial Irrigation District (IID)	0	0	0		
	Public Service Company of New Mexico (PNM)	0	5	12		
	El Paso Electric Company (EPE)	0	3	¹⁴		
	Salt River Project (SRP)	1	3	6		
	Southwestern Transmission Cooperative (SWTC)	0	6	5		
	Tucson Electric Power (TEP)	2	1	8		
	Western Area Power Administration (WAPA-DSW)	0	10	11		
	Nevada Power Co.	4	7	3		
SSPG						
	Sacramento Municipal Utility District (SMUD)	0	0	¹⁵		
	Sierra Pacific Power Company (SPPC)	0	5	5		
	Transmission Agency of Northern California (TANC)	0	0	3		
¹⁶	Western Area Power Administration (WAPA-SNR)					

¹³ CCPG Study was conducted as a group and reported together with all of its members

¹⁴ EPE did not provide any N-2 contingencies.

¹⁵ SMUD did not provide any N-2 contingencies.

¹⁶ Western Area Power Administration (WAPA-SNR) Area was included in the Sierra Pacific study Results