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2011 Ten Year Snapshot Study

*A report to address Arizona Corporation Commission Biennial
Transmission Assessment (BTA) requirements*

Rev #3

Salt River Project



*Central Arizona Transmission System (CATS)
Subcommittee*

Chairman: Jason Spitzkoff

Executive Summary

The Ten Year Snapshot Study is an assessment of the ten year high voltage and extra high voltage transmission plans developed by transmission owners in Arizona. The developed plans used a coordinated base case, which models the expected transmission system in 2021. The 2021 Western Electricity Coordinating Council (WECC) HS1A base case was used as the seed base case. Forecasted loads, resources, underlying transmission system, as well as planned facilities for transmission owners in the 2021 timeframe were added to the seed case to develop the 2021 Central Arizona Transmission System (CATS) case used in this study.

This study includes reviewing impacts statewide. A state-wide view assists in coordinating this and other study efforts (and results) among the various planning groups in Arizona.

The assessment of the ten year plan consisted of conducting N-0 and N-1 power flow analyses on the coordinated 2021 detail CATS base case to verify that there were no thermal overloads or voltage problems for the 2021 time frame with participants' 2021 planned facilities. Project Outage (N-1-1) power flow analyses were conducted to show the impact on the surrounding transmission system by removing an individual participant's Project from the ten year plan.

The base case showed prior to any outages (N-0 conditions) there are no busses outside of voltage criteria and no overloaded elements. Single contingency (N-1) analysis showed overloads on transmission elements and voltage deviations that will need further investigation. These thermal violations and voltage deviation issues have been seen by the utilities in internal studies and have solutions either identified or being investigated.

The Project Outage (N-1-1) portion of the study, taking out facilities associated with a Ten Year Planned Project and running contingencies, showed that with the exception of SRPO3 and TEPO1, a delay of a single Project would generally not cause significant impact to the remaining transmission system. Thirteen Project Outages were studied, seven APS Projects, four SRP Projects, one SWP Project, and one TEP Project. Delay of the following projects beyond the ten year window had the greatest impact (5% or greater loading as compared to the base case for the same contingency) to the transmission system:

Case # - Description

SRPO3 Pinal West – Duke – Pinal Central 500kV line (South East Valley)
TEPO1 Pinal Central – Tortolita 500 kV line

The results of the Ten Year Snapshot study indicates the planned 2021 Arizona transmission system is robust as shown by limited voltage and thermal violations in the base case. Additionally, the Project Outage scenarios indicate that a delay of either of the two planned projects above will have a significant impact on the remaining transmission system. A significant impact does not imply a violation of criteria; rather it merely reflects that in a comparison of the base case (N-0 conditions) to the Project Outage cases (N-1-1) a difference exists between the results that exceeds the monitoring criteria as specified in this study.

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Introduction

The Ten Year Snapshot Study was performed to coincide with the biennial filings with the Arizona Corporate Commission (ACC). The Ten Year Snapshot Study is a collaborative effort to assess the ten-year transmission plans for Arizona.

The objective of the study is to analyze how the participants' ten year plans perform as whole in a regional environment and the effect of omitting an individual planned transmission project from the plan.

The transmission system performance is assessed by studying N-0, N-1 and Project Outage (N-1-1) conditions on a transmission system topography, load level, and generation dispatch forecasted in a tenth year. The study consisted of a screening of voltage and thermal violations for N-0, N-1, and the Project Outage scenarios. The system performance is assessed by reviewing thermal and voltage violations under all lines in service and outage conditions. The violations are identified if thermal or voltage excursions exceed criteria determined by the North American Electric Reliability Council (NERC) transmission planning (TPL) standards.

This report is one of a series of reports required to be filed with the ACC on a biennial basis as result of Orders issued by the Arizona Corporation Commission from previous Biennial Transmission Assessments. Other reports, including the Corridor Outage Studies and Extreme Contingencies Studies, are not included with this report but will be submitted separately under separate cover.

Study Methodology

Case building

The study began with development of a power flow case that reflected a 2021 timeframe and included participant’s Ten Year Plan (TYP) projects. Annually, entities planning to build transmission or generation above 100kV or 100MW must file a TYP with the Arizona Corporation Commission (ACC).

This year’s planning case, reflective of a 2021 transmission and generation topology, was a 2021 case modified by Arizona Public Service (APS), Salt River Project (SRP), Electrical District #3 (ED3), Tucson Electric Power (TEP), Southwest Transmission Cooperative (SWTC), and Western Area Power Administration (WAPA).

After a round-robin approach to updating the case, the study work began with reviewing the system under “all lines in service” or “ALIS” conditions. Overloads or voltage violations were corrected to alleviate any ALIS issues. This analysis is also known as “N-O” analysis which indicates the number of lines out of service is “o”, zero.

Case Highlights for Arizona

Generation

The generation capacity modeled for Arizona was 38,502MW with 30,346MW online.

Planned Generation

The following announced generation was modeled in the case:

Fuel Type	Project Name	Modeled	MW Dispatched
Natural Gas	Bowie	Yes	500
Natural Gas	Abel	Yes	450
Solar	Agua Caliente	Yes	290
Solar	Solana-Gila Bend area	Yes	280
Wind	Perrin Ranch	No ¹	0
Wind	SunZia	Yes	1500

Table 1 - Announced Generation

Load

The state of Arizona was modeled with 22,825 MW of load in this 2021 study. In the 2009 Ten Year Snapshot Study, the state of Arizona was modeled with 25,340 MW of load in the 2019 study. The modest load in this 2021 study is in part due to estimates of load reductions expected in the ten year time frame in response to the ongoing recession.

State Status

The 2021 case shows Arizona generating 6,600MW more than required to serve Arizona loads. Arizona continues to export generation, primarily to California.

¹ Because generation information was not well known at the time of the study, the generation at Perrin Ranch was not included as part of this study. The addition of Perrin Ranch should not have an effect on any of the results presented in this report.

N-1 and Project Outage (N-1-1) Contingency Analysis

Once a base case was finalized contingency analysis was performed. Contingency analysis (also known as N-1 analysis) simulates taking an element out of service (maintenance, fire, storm damage, etc.) and assessing the impact to the remainder of the system due to the loss of that facility. The utilities reviewed the resultant violations and provided mitigation.

The last step of the study was the Project Outage analysis (also known as N-1-1) which resulted in thirteen additional cases. Each Project Outage case removed a Project (transmission facility/ies) and single contingencies were applied. The following Project Outages (separated into two tables) were considered for this analysis:

APS Project Outage cases included:

Case Code	Planned Project modeled as initially out of service for N-1-1 analysis	In service Date
	<ul style="list-style-type: none"> Bullet items are facilities identified for removal for the project 	
APSo1	Palo Verde-Sun Valley-Morgan 500 and 230 kV system <ul style="list-style-type: none"> Palo Verde - Delaney 500kV line Delaney-Sun Valley 500 kV line Sun Valley-Morgan 500kV line Sun Valley 500/230kV transformer (T1) Sun Valley-Trilby Wash 230kV line Trilby Wash 230/69 kV transformer 	2014-2016
APSo2	Palm Valley-TS2-Trilby Wash 230kV line <ul style="list-style-type: none"> Palm Valley-TS2 230kV line TS2-Trilby Wash 230kV line 	2015
APSo3	APSo1 plus APSo2 <ul style="list-style-type: none"> Palo Verde-Sun Valley-Morgan 500 and 230kV system Palm Valley-TS2-Trilby Wash 230kV line 	2015
APSo4	Sun Valley –Morgan 500kV line <ul style="list-style-type: none"> Sun Valley – Morgan 500kV line 	2016
APSo5	Hassayampa-North Gila-TS8 500 and 230 kV systems <ul style="list-style-type: none"> Hassayampa-North Gila #2 500kV line North Gila-TS8 230kV line 	2014
APSo6	Pinal Central-Sundance 230kV line <ul style="list-style-type: none"> Pinal Central-Sundance 230kV line 	2014
APSo7	Desert Basin-Pinal Central-Sundance 230kV line <ul style="list-style-type: none"> All of APSo6 plus Pinal Central-Desert Basin 230kV line 	2014

Table 2 - APS Project Outage Cases

Project Outage cases for SRP, TEP and Southwestern Power Group (SWP) are shown below:

Case Code	Planned Project modeled as initially out of service for N-1-1 analysis <ul style="list-style-type: none"> Bullet items are facilities identified for removal for the project 	In service Date
SRP01	Desert Basin-Pinal Central 230kV line <ul style="list-style-type: none"> Pinal Central-Desert Basin 230kV line 	2014
SRP02	Abel <ul style="list-style-type: none"> All Abel Gen 	2017
SRP03	Pinal West-Duke-Pinal Central 500kV line (South East Valley) <ul style="list-style-type: none"> Pinal West – Pinal Central 500kV line Pinal Central-Browning 500kV line Pinal Central-Tortolita 500kV line Desert Basin-Pinal Central-Sun Dance 230kV line Pinal Central-Randolph 230kV line (*put Randolph-Browning 230kV line back in service) Pinal Central 500/230kV transformer (T1) Pinal Central 500/230kV transformer (T2) Duke 500/230kV transformers (T1 and T2) 	2014
SRP04	RS24 All 230 kV lines and 230/69kV transformers at RS24 <ul style="list-style-type: none"> RS24-Abel RS24 230/69kV transformer (T1) RS24-Santan Abel-Schrader 230kV line 	2019
SWP01	SunZia <ul style="list-style-type: none"> SunZia South – Luna 500/345kV transformers (T1 and T2) SunZia South – Willow 500kV lines (1 and 2) SunZia South – SunZia East 500kV lines (1 and 2) All SunZia Gen 	2015
SWP02	SunZia Sensitivity Study ² <ul style="list-style-type: none"> All of SWP01 plus All of SRP03 	2014-2015
TEP01	Pinal Central-Tortolita 500kV line <ul style="list-style-type: none"> Pinal Central-Tortolita 500kV line 	2014

Table 3 – SRP, TEP, and SWP Project Outage Cases

² A sensitivity study, SWP02, was requested by one of the study participants after reviewing the results of the SRP03 outage and the impact of the SWP01 projects' resources on the remainder of the system. The results of SWP02 are not incorporated in the tables of this report, but are included in Appendix B: Contingency Results.

Monitoring Criteria

This analysis monitors thermal loading of transmission facilities and voltage deviation at substations caused by system disturbances (contingencies). The criteria in Table 4 - Monitoring criteria highlights the criteria used to identify violations for this study. Exceeding the criteria below can cause damage to the electric system. Elements that exceed the criteria indicate where problems in the system may exist and that need further review to appropriately address the thermal or voltage deviation issue. The voltage and thermal criteria used in this analysis were:

Outage Type	Thermal Criteria	Voltage Criteria
N-0 No Outage, All lines in service	No element exceeding 100% of its normal rating	Less than .95 or Greater than 1.05 ³
N-1 Single Element Outage	No element exceeding 100% of its emergency rating	No voltage deviation greater than 5%
Project Outage (N-1-1) Project Outage (with system adjustments) followed by another contingency	Reducing loadings to 100% (or less) of normal rating following the removal of a project and 100% or less of the emergency rating for the subsequent outage	No voltage deviation greater than 5%

Table 4 - Monitoring criteria

All thermal overloading results were screened to show only elements above 115kV. Voltage results were also screened for bus voltages 115kV and higher. Voltage deviation calculated as the difference in voltage between post and pre outage voltage on buses. If the voltage deviation exceeds 5%, the bus is listed as exceeding criteria.

The Project Outage (N-1-1) thermal overload results were benchmarked against the N-1 results to distinguish loadings that were only associated with the N-1-1 and were not pre-existing in the N-1 base case. Highlighting was applied to the results where flow increased 5% or more in the Project Outage scenario on the same element for the same contingency as compared to the base case.

The N-1-1 voltage deviation results were also benchmarked against N-1 results. Highlighting was applied on the same busses where voltage deviations were greater than three percent more as compared to the base case for the same bus and contingency.

Monitored Elements

All transmission facilities in Arizona with voltage greater than 115kV were monitored for thermal and voltage criteria.

System Disturbances (Contingencies)

The contingencies studied included all Arizona transmission facilities (lines, transformers, and capacitors) with voltages equal to or greater than 115kV.

³ Arizona utilities typically screen for voltage below 0.95 per unit and above 1.05 per unit on all systems less than 500kV. The 500kV system is typically operated at 525kV which results in a per unit voltage acceptable at 1.10 per unit.

Base case results

The base case results include voltage and thermal results with all lines in service (no contingencies) as well as voltage and thermal results under simulated contingency conditions.

The Base case showed no thermal violations (flow on elements exceeding an element’s normal rating). Also, there were no voltage violations in the Base case. All 115kV and above busses were within the WECC criteria and showed acceptable system voltages.

Under contingency conditions, the following busses showed voltage deviations in excess of 5% (.05) for the simulated outages. The voltage deviations shown in Table 5 – Base Case Voltage Violations indicate solutions for these violations.

Delta Voltage Violations (voltage drop, per unit)						
Name	kV	CONTINGENCY DESCRIPTION			Voltage Deviation	SOLUTIONS
EASTINA	138	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.17	This issue will be mitigated with a new line between the La Canada and the proposed Naranja substations. In addition, the Tortolita – Proposed Naranja – Rancho Vistoso line will be reconfigured as a North Loop – Proposed Naranja – Rancho Vistoso line.
ORNGROVE	138	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.17	This issue will be mitigated with a new line between the La Canada and the proposed Naranja substations. In addition, the Tortolita – Proposed Naranja – Rancho Vistoso line will be reconfigured as a North Loop – Proposed Naranja – Rancho Vistoso line.
LACANADA	138	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.16	This issue will be mitigated with a new line between the La Canada and the proposed Naranja substations. In addition, the Tortolita – Proposed Naranja – Rancho Vistoso line will be reconfigured as a North Loop – Proposed Naranja – Rancho Vistoso line.
RANVISTO	138	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.14	This issue will be mitigated with a new line between the La Canada and the proposed Naranja substations. In addition, the Tortolita – Proposed Naranja – Rancho Vistoso line will be reconfigured as a North Loop – Proposed Naranja – Rancho Vistoso line.
NARANJA	138	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.12	This issue will be mitigated with a new line between the La Canada and the proposed Naranja substations. In addition, the Tortolita – Proposed Naranja – Rancho Vistoso line will be reconfigured as a North Loop – Proposed Naranja – Rancho Vistoso line.

Table 5 – Base Case Voltage Violations

Thermal overloads due to contingencies are shown in Table 6 - Base Case Thermal Violations along with the solution to the overload.

<i>Thermal Violations (overloads, per unit)</i>											
Fname	FkV	Tname	TkV	ckt	CONTINGENCY DESCRIPTION			RTG #	MVA RTG	Overload	Solutions
TECHPARK	138	VAIL	138	1	Line VAIL	345.0 to SOUTH	345.0 Ckt 1	2	418	1.05 ⁴	TEP's 10-year plans that will be filed subsequent to the interconnection study of SunZia will include any project(s) necessary to mitigate this issue ⁴ .
IRVNGTN	138	TECHPARK	138	1	Line VAIL	345.0 to SOUTH	345.0 Ckt 1	2	418	1.00 ⁴	TEP's 10-year plans that will be filed subsequent to the interconnection study of SunZia will include any project(s) necessary to mitigate this issue ⁴ .

Table 6 - Base Case Thermal Violations

⁴ This line appears as overloaded in this study due to the addition of the SunZia project to the base case. The SunZia project has not requested interconnection with TEP. Once a valid transmission interconnection request is submitted to TEP, an interconnection study can be performed to identify all impacts and any required mitigation. Any mitigation that is required will be included in TEP's Ten-Year Plans filed subsequent to the interconnection study.

Project Outage (N-1-1) Contingency Results

The tables below highlight the impact due to the delay of a project beyond 2021 on the remaining transmission system. The Project Outage analysis is a screening tool to assist in identifying criticality of projects to the interconnected system if not in service at the end of the ten year timeframe.

For the APS Project Outage cases (APSO1-APSO7), all of the voltage violations and thermal violations were similar to the Base case. These results are included in Appendix B: Contingency Results.

For the SRP, TEP, and SWP Project Outage cases, there were a few significant differences found. The first difference being that several “No Solves” occurred during the SRPO3 and TEP01 Project Outage cases. A “No Solve” occurs when the case cannot accommodate the change in power flows as a result of the outage and no thermal or voltage results can be determined. Highlighting on the following table (Table 7) shows where a “No Solve” occurred in each case and the contingency that resulted in the “No Solve”. SRPO3 results in the SunZia Transmission project terminating at the Pinal Central 500kV bus with no alternative path for that generation to flow.

No Solves (contingencies that resulted in no solves)-SRP, TEP, and SWP Cases											
Outage	CONTINGENCY DESCRIPTION		BASE	SRP01	SRP02	SRP03			SRP04	SWP01	TEP01
line_1	Line CHOLLA	500.0 to SAGUARO	solved	solved	solved	Pmis 16725 TUBAC	138.00 = 8546.0		solved	solved	solved
	500.0 Ckt 1					Qmis 16725 TUBAC	138.00 1195				
line_410	Line SPRINGR	345.0 to CORONADO	solved	solved	solved	Pmis 16333 IRVMID3	138.00 = 13502.1		solved	solved	solved
	345.0 Ckt 1					Qmis 16509 SUNDTGE3	13.80 6742				
line_413	Line SPRINGR	345.0 to VAIL2	solved	solved	solved	Pmis 16722 SONOITA	138.00 = 126583.3		solved	solved	solved
	345.0 Ckt 1					Qmis 16722 SONOITA	138.00 100				
line_419	Line WINCHSTR	345.0 to VAIL	solved	solved	solved	Pmis 16114 PINALWES	345.00 = 461.0		solved	solved	Pmis 16400 DMP 47.20 =
	345.0 Ckt 1					Qmis 16111 BOWIE	345.00 308				63808.4 Qmis 16400 DMP
line_420	Line WINCHSTR	345.0 to WILLOW	solved	solved	solved	Pmis 16410 N. LOOP2	47.20 = 50323.4		solved	solved	solved
	345.0 Ckt 1					Qmis 16410 N. LOOP2	47.20 1344				
line_462	Line ORNGROVE	138.0 to RILLITO	solved	solved	solved	Pmis 16216 SOUTH	138.00 = 62356.7		solved	solved	solved
	138.0 Ckt 1					Qmis 16216 SOUTH	138.00 1064				
tran_680	Tran VAIL2	345.00 to VAIL	solved	solved	solved	Pmis 17501 B.VISTA	69.00 = 1290195.8		solved	solved	solved
	138.00 Ckt 1					Qmis 17501 B.VISTA	69.00 16				

Table 7 – No Solves for SRP, TEP, and SWP Cases

Similar to the Base case results, Table 8 below shows the voltage deviations for the SRP, TEP, and SWP Project Outage cases. The shaded cells indicate where voltage deviations were 3% greater than the Base case results. For comparison purposes, the table below shows the voltage deviation in the base case for each contingency taken (Column BASE) and then shows the voltage deviation for the same contingency in each Project Outage case (Column SRP01, SRP02, etc). Most deviations were insignificant (less than 3%), with the exception of the shaded cells below.

The Project showing the greatest impact to voltage violations was

- SRP03 Pinal West – Duke – Pinal Central 500kV line (South East Valley)

Delta Voltage Violations (voltage drop, per unit)-SRP, TEP, and SWP Cases													
Bus #	Name	kV	Outage	CONTINGENCY DESCRIPTION			BASE	SRP01	SRP02	SRP03	SRP04	SWP01	TEP01
17020	SAN RAF	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.04	-0.04	-0.04	-0.11	-0.04	-0.03	-0.05
17007	BUTERFLD	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.04	-0.04	-0.04	-0.10	-0.04	-0.03	-0.04
17016	PANTANO	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.02	-0.02	-0.02	-0.07	-0.02	-0.01	-0.02
17676	NEWTUCSN	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.02	-0.02	-0.02	-0.06	-0.02	-0.01	-0.02
17015	PANTANO	115	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.01	-0.01	-0.01	-0.06	-0.01	0.00	-0.01
17018	RED TAIL	230	line_525	Line APACHE	230.0 to RED TAIL	230.0 Ckt 1	-0.04	-0.04	-0.04	-0.07	-0.04	-0.03	-0.03
17089	SNDARIO	115	line_534	Line AVRA	115.0 to SNDARIO	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.06	-0.01	0.00	-0.01
17039	KARTCHNR	115	line_535	Line BUTERFLD	230.0 to PANTANO	230.0 Ckt 1	-0.03	-0.03	-0.03	-0.07	-0.03	-0.02	-0.03
17015	PANTANO	115	line_535	Line BUTERFLD	230.0 to PANTANO	230.0 Ckt 1	-0.02	-0.02	-0.02	-0.06	-0.02	-0.02	-0.03
16722	SONOITA	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	-0.01	-0.01
16723	VALNCIA	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.06	-0.01	-0.01	-0.01
16721	CANEZ	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	-0.01	-0.01
16725	TUBAC	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	-0.01	-0.01
16720	KANTOR	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	-0.01	-0.01
16247	HARRISON	138	line_435	Line E. LOOP	138.0 to HARRISON	138.0 Ckt 1	-0.05	-0.05	-0.05	-0.08	-0.05	-0.04	-0.05

Delta Voltage Violations (voltage drop, per unit)-SRP, TEP, and SWP Cases													
Bus #	Name	kV	Outage	CONTINGENCY DESCRIPTION			BASE	SRP01	SRP02	SRP03	SRP04	SWP01	TEP01
16211	ROBERTS	138	line_435	Line E. LOOP	138.0 to HARRISON	138.0 Ckt 1	-0.04	-0.04	-0.04	-0.07	-0.04	-0.04	-0.04
17023	VALEN-SW	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	0.00	-0.01
17022	THREEPNT	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	0.00	-0.01
17089	SNDARIO	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	0.00	0.00	0.00	-0.07	0.00	0.01	-0.01
17003	AVRA	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	0.00	0.00	0.00	-0.07	0.00	0.01	0.00
17023	VALEN-SW	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.08	-0.01	0.00	-0.01
17022	THREEPNT	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.07	-0.01	0.00	-0.01
17012	MARANA	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	0.00	0.00	0.00	-0.11	0.00	0.01	-0.01
17089	SNDARIO	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	0.00	0.00	0.00	-0.09	0.00	0.02	0.00
17003	AVRA	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	0.01	0.01	0.01	-0.09	0.01	0.02	0.00
17039	KARTCHNR	115	line_530	Line PANTANO	115.0 to KARTCHNR	115.0 Ckt 1	0.01	0.01	0.01	0.05	0.01	0.00	0.01
17039	KARTCHNR	115	tran_702	Tran PANTANO	230.00 to PANTANO	115.00 Ckt 1	0.01	0.01	0.01	0.05	0.01	0.00	0.01

Table 8 – Voltage Violations – SRP, TEP, and SWP Project Outage cases

Table 8 shows that if SRP03 is delayed beyond the 2021 year timeframe, voltage deviations are increased by >3% when compared to the Base case results.

The following table (Table 9) shows thermal overloads due to the SRP, TEP, and SWP Project outage analyses. Highlighting on this table indicates where overloads exceed base case loading by 5%. For comparison purposes, Table 9 below shows the thermal overloads in the base case for each contingency taken (Column BASE) and then shows the thermal overloads for the same contingency in each Project Outage case (Column SRP01, SRP02, etc). Most overloads did not exceed base case loading and were insignificant (less than 5%), with the exception of the shaded cells below. These thermal overload results indicate a delay in the following Projects could increase loading on the remaining system under contingency conditions:

- SRP03 Pinal West – Duke – Pinal Central 500kV line (South East Valley)
- TEP01 Pinal Central – Tortolita 500 kV line

Thermal Violations (overloads, per unit)-SRP, TEP, and SWP Cases																		
FName	FkV	TName	TkV	Ckt	Outage	CONTINGENCY DESCRIPTION			RTG	MVA RTG	BASE	SRP01	SRP02	SRP03	SRP04	SWP01	TEP01	
TECHPARK	138	VAIL	138	1	line_415	Line VAIL	345.0 to SOUTH	345.0 Ckt 1	2	418	1.05	1.05	1.05	1.59	A	1.051	0.93	1.13
TECHPARK	138	VAIL	138	1	line_449	Line LOSREALS	138.0 to VAIL	138.0 Ckt 1	2	418	0.93	0.93	0.93	1.25	A	0.93	< 0.90	1.03
TECHPARK	138	VAIL	138	1	line_463	Line PANTANO	138.0 to LOSREALS	138.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	1.20	A	< 0.90	< 0.90	0.98
TECHPARK	138	VAIL	138	1	line_1	Line CHOLLA	500.0 to SAGUARO	500.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	NoSolve		< 0.90	< 0.90	1.05
IRVNGTN	138	TECHPARK	138	1	line_415	Line VAIL	345.0 to SOUTH	345.0 Ckt 1	2	418	1.00	1.00	1.00	1.54	A	1.00	< 0.90	1.08
IRVNGTN	138	TECHPARK	138	1	line_449	Line LOSREALS	138.0 to VAIL	138.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	1.20	A	< 0.90	< 0.90	0.98
IRVNGTN	138	TECHPARK	138	1	line_463	Line PANTANO	138.0 to LOSREALS	138.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	1.16	A	< 0.90	< 0.90	0.94
IRVNGTN	138	TECHPARK	138	1	line_1	Line CHOLLA	500.0 to SAGUARO	500.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	NoSolve		< 0.90	< 0.90	1.01
WINCHSTR	345	WILLOW	345	1	base	Base system (n-0)			1	925	0.81	0.81	0.80	1.42		0.81	0.63	0.87
WINCHSTR	345	WILLOW	345	1	line_115	Line CORONADO	500.0 to SILVERKRG	500.0 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	1.29	A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	WILLOW	345	1	line_3	Line FOURCORN	500.0 to MOENKOPI	500.0 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	1.25	A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	WILLOW	345	1	line_545	Line HACKBERY	230.0 to MORENCI	230.0 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	1.29	A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	WILLOW	345	1	line_413	Line SPRINGR	345.0 to VAIL2	345.0 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	NoSolve		< 0.90	< 0.90	0.95
WINCHSTR	345	WILLOW	345	1	tran_680	Tran VAIL2	345.00 to VAIL	138.00 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	NoSolve		< 0.90	< 0.90	0.95
WINCHSTR	345	VAIL	345	1	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	2	1195	< 0.90	< 0.90	< 0.90	1.37	A	< 0.90	< 0.90	0.95
WINCHSTR	345	VAIL	345	1	line_115	Line CORONADO	500.0 to SILVERKRG	500.0 Ckt 1	2	1195	< 0.90	< 0.90	< 0.90	1.31	A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	VAIL	345	1	line_535	Line BUTERFLD	230.0 to PANTANO	230.0 Ckt 1	2	1195	< 0.90	< 0.90	< 0.90	1.30	A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	VAIL	345	1	base	Base system (n-0)			1	1195	0.76	0.76	0.75	1.21		0.76	0.62	0.81
WINCHSTR	345	VAIL	345	1	line_413	Line SPRINGR	345.0 to VAIL2	345.0 Ckt 1	2	1195	0.98	0.98	0.98	NoSolve		0.98	< 0.90	1.05
WINCHSTR	345	VAIL	345	1	tran_680	Tran VAIL2	345.00 to VAIL	138.00 Ckt 1	2	1195	0.98	0.98	0.98	NoSolve		0.98	< 0.90	1.05
WINCHSTR	345	VAIL	345	1	line_1	Line CHOLLA	500.0 to SAGUARO	500.0 Ckt 1	2	1195	< 0.90	< 0.90	< 0.90	NoSolve		< 0.90	< 0.90	0.95
LOSREALS	138	VAIL	138	1	line_415	Line VAIL	345.0 to SOUTH	345.0 Ckt 1	2	406	< 0.90	< 0.90	< 0.90	1.08		< 0.90	< 0.90	< 0.90
LOSREALS	138	VAIL	138	1	line_488	Line TECHPARK	138.0 to VAIL	138.0 Ckt 1	2	406	< 0.90	< 0.90	< 0.90	1.06		< 0.90	< 0.90	< 0.90
LOSREALS	138	VAIL	138	1	line_444	Line IRVNGTN	138.0 to TECHPARK	138.0 Ckt 1	2	406	< 0.90	< 0.90	< 0.90	1.04		< 0.90	< 0.90	< 0.90
WILLOW	500	WILLOW	345	1	tran_730	Tran WILLOW	500.00 to WILLOW	345.00 Ckt 2	2	806	< 0.90	< 0.90	< 0.90	1.06		< 0.90	< 0.90	< 0.90
WILLOW	500	WILLOW	345	2	tran_729	Tran WILLOW	500.00 to WILLOW	345.00 Ckt 1	2	806	< 0.90	< 0.90	< 0.90	1.06		< 0.90	< 0.90	< 0.90
CORONADO	500	CORONADO	345	2	tran_670	Tran CORONADO	500.00 to CORONADO	345.00 Ckt 1	2	806	< 0.90	< 0.90	< 0.90	1.02		< 0.90	< 0.90	< 0.90
COPPERVR	345	COPPERVR	230	1	line_540	Line MORENCI	230.0 to GREEN-SW	230.0 Ckt 1	2	224	< 0.90	< 0.90	< 0.90	1.01		< 0.90	< 0.90	0.91
COPPERVR	345	COPPERVR	230	2	line_540	Line MORENCI	230.0 to GREEN-SW	230.0 Ckt 1	2	224	< 0.90	< 0.90	< 0.90	1.01		< 0.90	< 0.90	0.91

Table 9 - Thermal Overloads SRP, TEP, and SWP Project Outage Cases

^A The top three most heavily loaded (worst) thermal violations shown for that specific line segment. Reporting of overloads was limited to control the volume of data in the report.

Again, SRP03 results in the SunZia Generation project terminating at the Pinal Central 500kV bus with no alternative path for that generation to flow. As a result, the power flows from SunZia South 500kV to Willow 345kV, then to Winchester 345kV through to Vail 345kV. This automatically causes two overloads on TEP's system (as seen on Table 9):

- Winchester – Willow 345kV line
- Winchester – Vail 345kV line

As can be expected, taking additional contingencies only aggravates the system in that area. An observation from the N-1 results of SRP03 (South East Valley) project outage case was the contribution from resources associated with the SWP01 (SunZia) project. A sensitivity study was performed that combined the Project Outage cases SRP03 with SWP01. The results of this sensitivity are located in Appendix B: Contingency Results. The results showed that the thermal violations and voltage deviations shown for SRP03 in Tables 8 and 9 can be attributed to the generation resources associated with SWP01. By reducing the contributions from SunZia, these overloads and voltage deviations may be lessened but not eliminated.

The delay of SRP03 and/or TEP01 will have an impact on the overall system. The magnitude of that impact depends on the planned generation resources dispatched to Southern Arizona. Since the contingencies related to these thermal violations were not causing thermal violations in the base case (without removal of the planned project), these findings show that SRP03 and TEP01 should not be delayed past the 2021 timeframe.

Study Findings

The Ten Year Snapshot study (aka the BTA study) investigating the coordinated impact of utilities and developers ten year plans on the Arizona extra high voltage (EHV) system found that:

- The 2021 system is robust
- Planned projects support the loads estimated for the 2021 timeframe

The Project Outage analysis (an N-1-1 analysis) indicated that the delay of any one project beyond the 2021 timeframe results in consistent thermal and voltage violations of the base case, with the exception of:

Case # - Description

SRP03 Pinal West – Duke – Pinal Central 500kV line (South East Valley)

TEP01 Pinal Central – Tortolita 500 kV line

Both projects listed above resulted in thermal loadings 5% or more than the base case (for contingencies). A delay of either of the two planned projects will have an impact on the overall system. The sensitivity study performed (SWP02) confirmed that the magnitude of that impact depends on the planned generation resources dispatched to Southern Arizona. Since the contingencies related to these thermal violations were not causing thermal violations in the base case (without removal of the planned project), these findings show that SRP03 and TEP01 should not be delayed past the 2021 timeframe. As a screening analysis, the Project Outage portion of the Ten Year Snapshot study indicates that the EHV system can support changes in the timing of most of the transmission and generation projects without significant adverse effects on the remaining system.

The results of this study could be interpreted that the delay of one project doesn't have a negative impact on the remaining system and therefore that particular project isn't needed. This interpretation of the data presented would be false. Utilities plan their transmission systems for reliability, redundancy, transmission scheduling capability, and economic considerations. This ten year snapshot is intended to view the combined impact of a state-wide collaboration of projects that perhaps individual utilities might not see when planning for the near term (5-6 years). Because all utilities' planned projects are modeled in this longer term view, and with the interconnected nature of the transmission system, removal of a single project results in redistribution of power on the remaining projects and system. This redistribution reduces the impact of the delay of an individual project and does not point to a conclusion supporting a lack of need for that individual project.

The results of the Ten Year Snapshot study indicates the planned 2021 Arizona transmission system is robust as shown by limited voltage and thermal violations in the base case. Additionally, the Project Outage scenarios indicate that a delay of either of the two planned projects out of the thirteen studied have a significant impact on the remaining transmission system. A significant impact does not imply a violation of criteria; rather it merely reflects that in a comparison of the base case (N-0 conditions) to the Project Outage cases (N-1-1) a difference exists between the results that exceeds the monitoring criteria as specified in this study.

Appendices

Appendix A: Contingency List

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11_BTA.otg                                10/19/2011
# Contingency Selection Criteria: From area 14 to 14; 100 kV to 999 kV
# Contingency Selection Criteria: From area 14 to 14; 100 kV to 999 kV
line 1      "Line CHOLLA      500.0 to SAGUARO      500.0 Circuit 1"
1.000
line      14000      14004      "1 " 1 0
0
line 2      "Line CHOLLA      500.0 to SILVERKG      500.0 Circuit 1"
1.000
line      14000      15041      "1 " 1 0
0
line 3      "Line FOURCORN      500.0 to MOENKOPI      500.0 Circuit 1"
1.000
line      14001      14002      "1 " 1 0
0
#line_4      "Line FOURCORN      500.0 to FCW      500.0 Circuit 1"
1.000
# line      14001      14030      "1 " 1 0
#0
line 5      "Line MOENKOPI      500.0 to YAVAPAI      500.0 Circuit 1"
1.000
line      14002      14006      "1 " 1 0
0
line 6      "Line MOENKOPI      500.0 to RME      500.0 Circuit 1"
1.000
line      14002      14032      "1 " 1 0
0
line 7      "Line MOENKOPI      500.0 to ELDORDO      500.0 Circuit 1"
1.000
line      14002      24042      "1 " 1 0
0
#line_8      "Line MOENKOPI      500.0 to MARKETPL      500.0 Circuit 1"
1.000
# line      14002      26044      "1 " 1 0
#0
line 9      "Line NAVAJO      500.0 to DUGAS      500.0 Circuit 1"
1.000
line      14003      14018      "1 " 1 0
0
line 10     "Line NAVAJO      500.0 to RME      500.0 Circuit 1"
1.000
line      14003      14032      "1 " 1 0
0
line 11     "Line NAVAJO      500.0 to CRYSTAL      500.0 Circuit 1"
1.000
line      14003      26123      "1 " 1 0
0
line 12     "Line YAVAPAI      500.0 to WESTWING      500.0 Circuit 1"
1.000
line      14006      14005      "1 " 1 0
0
line 13     "Line SNVLY      500.0 to MORGAN      500.0 Circuit 1"
1.000
line      14010      14011      "1 " 1 0
0
line 14     "Line MORGAN      500.0 to WESTWING      500.0 Circuit 1"
1.000
line      14011      14005      "1 " 1 0
0
line 15     "Line MORGAN      500.0 to PNPKAPS      500.0 Circuit r1"
1.000
line      14011      14016      "r1" 1 0
0
line 16     "Line DELANY      500.0 to SNVLY      500.0 Circuit 1"
1.000
line      14012      14010      "1 " 1 0
0
line_17     "Line SGRLF      500.0 to CHOLLA      500.0 Circuit 1"

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11_BTA.otg                                10/19/2011
1.000
line      14017      14000      "1 " 1 0
0
line 18     "Line DUGAS      500.0 to MORGAN      500.0 Circuit 1"
1.000
line      14018      14011      "1 " 1 0
0
#line_19     "Line DRPP      500.0 to FCW      500.0 Circuit 1"
1.000
# line      14031      14030      "1 " 1 0
#0
#line_20     "Line DRPP      500.0 to FCW      500.0 Circuit 2"
1.000
# line      14031      14030      "2 " 1 0
#0
line 21     "Line RME      500.0 to FCW      500.0 Circuit 1"
1.000
line      14032      14030      "1 " 1 0
0
line 22     "Line CHOLLA      345.0 to PREHCYN      345.0 Circuit 1"
1.000
line      14100      14103      "1 " 1 0
0
line 23     "Line CHOLLA      345.0 to MAZATZAL      345.0 Circuit 1"
1.000
line      14100      14107      "1 " 1 0
0
line 24     "Line FOURCORN      345.0 to SAN_JUAN      345.0 Circuit 1"
1.000
line      14101      10292      "1 " 1 0
0
line 25     "Line FOURCORN      345.0 to WESTMESA      345.0 Circuit 1"
1.000
line      14101      10369      "1 " 1 0
0
line 26     "Line FOURCORN      345.0 to RIOPUERC      345.0 Circuit 1"
1.000
line      14101      10390      "1 " 1 0
0
line 27     "Line FOURCORN      345.0 to CHOLLA      345.0 Circuit 1"
1.000
line      14101      14100      "1 " 1 0
0
line 28     "Line FOURCORN      345.0 to CHOLLA      345.0 Circuit 2"
1.000
line      14101      14100      "2 " 1 0
0
line 29     "Line PREHCYN      345.0 to PNPKAPS      345.0 Circuit 1"
1.000
line      14103      14102      "1 " 1 0
0
line 30     "Line MAZATZAL      345.0 to PNPKAPS      345.0 Circuit 1"
1.000
line      14107      14102      "1 " 1 0
0
line 31     "Line BUCKEYE      230.0 to LIBERTY      230.0 Circuit 1"
1.000
line      14201      19052      "1 " 1 0
tran      14201      84409      "1 " 0      85941
tran      14201      84409      "2 " 0      85940
0
line 31a    "Line BUCKEYE-LIBERTY & BUCKEYE2-BUCKEYE "
line      14201      19052      "1 " 1 0      /*"BUCKEYE 230.00 LIBERTY 230.00
Circuit 1 " */
line      14213      14201      "1 " 1 1      /*"BUCKEYE2 230.00 BUCKEYE 230.00
Circuit 1 " */
0

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line 32 1.000 line	14202	"Line CACTUS 14219 "1 " 1 0	230.0 to OCOTILLO 230.0 Circuit 1"
line 33 1.000 line	14202	"Line CACTUS 14278 "1 " 1 0	230.0 to PPAPS N 230.0 Circuit 1"
line 34 1.000 line	14203	"Line CASGRAPS 15235 "1 " 1 0	230.0 to DBG 230.0 Circuit 1"
line 35 1.000 line	14204	"Line CHOLLA 14215 "1 " 1 0	230.0 to LEUPP 230.0 Circuit 1"
line 36 1.000 line	14205	"Line COCONINO 14247 "1 " 1 0	230.0 to VERDE S 230.0 Circuit 1"
line 37 1.000 line	14206	"Line CTRYCLUB 14216 "1 " 1 0	230.0 to LINCSTRT 230.0 Circuit 1"
line 38 1.000 line	14206	"Line CTRYCLUB 14270 "1 " 1 0	230.0 to GRNDTRML 230.0 Circuit 1"
line 39 1.000 line	14207	"Line DEERVALY 14259 "1 " 1 0	230.0 to WESTWNGE 230.0 Circuit 1"
line 40 1.000 line	14207	"Line DEERVALY 15202 "1 " 1 0	230.0 to ALEXANDR 230.0 Circuit 1"
line 41 1.000 line	14207	"Line DEERVALY 15211 "1 " 1 0	230.0 to PINPKSRP 230.0 Circuit 1"
#line_42 1.000 # line	14213	"Line BUCKEYE2 14201 "1 " 1 0	230.0 to BUCKEYE 230.0 Circuit 1"
line 43 1.000 line	14210	"Line EL SOL 15201 "1 " 1 0	230.0 to AGUAFRIA 230.0 Circuit 1"
line 44 1.000 line	14211	"Line FOURCORN 10248 "1 " 1 0	230.0 to PILLAR 230.0 Circuit 1"
line 45 1.000 line	14212	"Line GLENDALE 14270 "1 " 1 0	230.0 to GRNDTRML 230.0 Circuit 1"
line 46 1.000 line	14215 14204	"Line LEUPP 14205 "1 " 1 0 14215 "1 " 1 0	230.0 to COCONINO 230.0 Circuit 1"
line 47 1.000 line	14216	"Line LINCSTRT 14219 "1 " 1 0	230.0 to OCOTILLO 230.0 Circuit 1"
line 48 1.000		"Line LINCSTRT 230.0 to WPHXAPSN	230.0 Circuit 1"

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line 0 line 49 1.000 line	14216 14217	14239 "1 " 1 0 "Line LONEPEAK 14227 "1 " 1 0	230.0 to SUNYSLOP 230.0 Circuit 1"
line 50 1.000 line	14217	"Line LONEPEAK 14261 "1 " 1 0	230.0 to PPAPS E 230.0 Circuit 1"
line 51 1.000 line	14218	"Line MEADOWBK 14206 "1 " 1 0	230.0 to CTRYCLUB 230.0 Circuit 1"
line 52 1.000 line	14218	"Line MEADOWBK 14227 "1 " 1 0	230.0 to SUNYSLOP 230.0 Circuit 1"
line 53 1.000 line	14220	"Line REACH 14217 "1 " 1 0	230.0 to LONEPEAK 230.0 Circuit 1"
line 54 1.000 line	14220	"Line REACH 14260 "1 " 1 0	230.0 to PPAPS C 230.0 Circuit 1"
#line_55 1.000 # line	14221	"Line PPAPS W 14260 "1 " 1 0	230.0 to PPAPS C 230.0 Circuit 1"
line 56 1.000 line	14221	"Line PPAPS W 19062 "1 " 1 0	230.0 to PINPK 230.0 Circuit 1"
line 57 1.000 line	14224	"Line JOJOBA 14238 "1 " 1 0	230.0 to GILARIVR 230.0 Circuit 1"
line 58 1.000 line	14225	"Line SAGUARO 14229 "1 " 1 0	230.0 to TATMOMLI 230.0 Circuit 1"
line 59 1.000 line	14225	"Line SAGUARO 14271 "1 " 1 0	230.0 to MILLIGAN 230.0 Circuit 1"
line 60 1.000 line	14226	"Line SNTAROSA 14229 "1 " 1 0	230.0 to TATMOMLI 230.0 Circuit 1"
line 61 1.000 line	14226	"Line SNTAROSA 15235 "1 " 1 0	230.0 to DBG 230.0 Circuit 1"
line 62 1.000 line	14226	"Line SNTAROSA 19068 "1 " 1 0	230.0 to TESTTRAK 230.0 Circuit 1"
line 63 1.000 line	14228	"Line SURPRISE 14210 "1 " 1 0	230.0 to EL SOL 230.0 Circuit 1"
line 64 1.000 line	14228	"Line SURPRISE 14231 "1 " 1 0	230.0 to WESTWNGW 230.0 Circuit 1"
line_65		"Line VERDE N 230.0 to VERDE S	230.0 Circuit 1"

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1.000
line 14230 14247 "1 " 1 0
0
#line_66 "Line WESTWNGW 230.0 to EL SOL 230.0 Circuit 1"
1.000
# line 14231 14210 "1 " 1 0
#0
#line_67 "Line WESTWNGW 230.0 to WESTWNGE 230.0 Circuit 1"
1.000
# line 14231 14259 "1 " 1 0
#0
line 68 "Line WESTWNGW 230.0 to PINPK 230.0 Circuit 1"
1.000
line 14231 19062 "1 " 1 0
0
line 69 "Line WHTNKAPS 230.0 to EL SOL 230.0 Circuit 1"
1.000
line 14232 14210 "1 " 1 0
0
line 70 "Line WHTNKAPS 230.0 to RUDD 230.0 Circuit 1"
1.000
line 14232 15230 "1 " 1 0
0
line 71 "Line SNVLY 230.0 to HASSY AZ 230.0 Circuit 1"
1.000
line 14265 15173 "1 " 1 0
0
#line_72 "Line WPHXAPSS 230.0 to WPHXAPSN 230.0 Circuit 1"
1.000
# line 14233 14239 "1 " 1 0
#0
line 73 "Line WPHXAPSS 230.0 to RUDD 230.0 Circuit 1"
1.000
line 14233 15230 "1 " 1 0
0
line 74 "Line YAVAPAI 230.0 to VERDE N 230.0 Circuit 1"
1.000
line 14234 14230 "1 " 1 0
0
line 75 "Line YAVAPAI 230.0 to WILOWLKE 230.0 Circuit 1"
1.000
line 14234 14249 "1 " 1 0
shunt "BAGCAP 115.00" "b4" 1 .1260
0
line 76 "Line KYR-NEW 230.0 to OCOTILLO 230.0 Circuit 1"
1.000
line 14236 14219 "1 " 1 0
0
line 77 "Line KYR-NEW 230.0 to KNOX 230.0 Circuit 1"
1.000
line 14236 15219 "1 " 1 0
0
line 78 "Line GILARIVR 230.0 to GILABEND 230.0 Circuit 1"
1.000
line 14238 14235 "1 " 1 0
shunt "GILABEND 69.00" "b1" 1 .1800
0
line 79 "Line WPHXAPSN 230.0 to WHTNKAPS 230.0 Circuit 1"
1.000
line 14239 14232 "1 " 1 0
0
#line_80 "Line FORTROCK 230.0 to ROUNDVLY 230.0 Circuit 1"
1.000
# line 14240 14223 "1 " 1 0
#0
#line_81 "Line FORTROCK 230.0 to JUNIPRMT 230.0 Circuit 1"
1.000

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# line 14240 14264 "1 " 1 0
#0
line 82 "Line ALEXNDR 230.0 to ALEXANDR 230.0 Circuit 1"
1.000
line 14241 15202 "1 " 1 0
0
line 83 "Line RACEWAY 230.0 to RACEWYWA 230.0 Circuit 1"
1.000
line 14246 19115 "1 " 1 0
0
line 84 "Line GLENDALW 230.0 to GLENDALE 230.0 Circuit 1"
1.000
line 14248 14212 "1 " 1 0
0
line 85 "Line GLENDALW 230.0 to AGUAFRIA 230.0 Circuit 1"
1.000
line 14248 15201 "1 " 1 0
0
line 86 "Line WILOWLKW 230.0 to PRESCOTT 230.0 Circuit 1"
1.000
line 14250 14222 "1 " 1 0
0
line 87 "Line WILOWLKW 230.0 to WILOWLKE 230.0 Circuit 1"
1.000
line 14250 14249 "1 " 1 0
0
line 88 "Line AVERY 230.0 to RACEWAY 230.0 Circuit 1"
1.000
line 14253 14246 "1 " 1 0
0
line 89 "Line AVERY 230.0 to SCTWSH 230.0 Circuit 1"
1.000
line 14253 14257 "1 " 1 0
0
line 90 "Line TRLBY 230.0 to TS2 230.0 Circuit 1"
1.000
line 14254 14255 "1 " 1 0
0
line 91 "Line TRLBY 230.0 to SNVLY 230.0 Circuit 1"
1.000
line 14254 14265 "1 " 1 0
0
line 92 "Line TS2 230.0 to PLMVLY 230.0 Circuit 1"
1.000
line 14255 14252 "1 " 1 0
0
line 93 "Line SCTWSH 230.0 to PPAPS W 230.0 Circuit 1"
1.000
line 14257 14221 "1 " 1 0
0
line 94 "Line TS4 230.0 to JOJOBA 230.0 Circuit 1"
1.000
line 14258 14224 "1 " 1 0
0
line 95 "Line TS4 230.0 to PLMVLY 230.0 Circuit 1"
1.000
line 14258 14252 "1 " 1 0
0
line 96 "Line PPAPS C 230.0 to PPAPS E 230.0 Circuit 1"
1.000
line 14260 14261 "1 " 1 0
0
#line_97 "Line JUNIPRMT 230.0 to SELIGMAN 230.0 Circuit 1"
1.000
# line 14264 14244 "1 " 1 0
#0
line_98 "Line N.GILA 230.0 to TS8 230.0 Circuit 1"

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1.000
line 14267 14214 "1 " 1 0
0
line 99 "Line MILLIGAN 230.0 to CASGRAPS 230.0 Circuit 1"
1.000
line 14271 14203 "1 " 1 0
0
line_100 "Line PPAPS N 230.0 to OCOTILLO 230.0 Circuit 1"
1.000
line 14278 14219 "1 " 1 0
0
#line_101 "Line PPAPS N 230.0 to PPAPS E 230.0 Circuit 1"
1.000
# line 14278 14261 "1 " 1 0
#0
line 102 "Line PPAPS N 230.0 to PINPKSRP 230.0 Circuit 1"
1.000
line 14278 15211 "1 " 1 0
0
line 103 "Line PPAPS N 230.0 to PINPKSRP 230.0 Circuit 2"
1.000
line 14278 15211 "2 " 1 0
0
#line_104 "Line ADAMS 115.0 to ADAMS TP 115.0 Circuit 1"
1.000
# line 14350 19060 "1 " 1 0
#0
line 105 "Line BONNYBKE 115.0 to BONNYBRK 115.0 Circuit 1"
1.000
line 14354 14352 "1 " 1 0
0
line 106 "Line SAG.EAST 115.0 to SAG.WEST 115.0 Circuit 1"
1.000
line 14356 14357 "1 " 1 0
0
line 107 "Line SAG.EAST 115.0 to ORACLE 115.0 Circuit 1"
1.000
line 14356 19057 "1 " 1 0
0
line 108 "Line SAG.WEST 115.0 to SNMANUEL 115.0 Circuit 1"
1.000
line 14357 14358 "1 " 1 0
0
line_109 "Line SAG.WEST 115.0 to ED-5 115.0 Circuit 1"
1.000
line 14357 19067 "1 " 1 0
0
line 110 "Line SAG.WEST 115.0 to ED-5B 115.0 Circuit 1"
1.000
line 14357 19069 "1 " 1 0
0
line 111 "Line VLYFARMS 115.0 to ORACLE 115.0 Circuit 1"
1.000
line 14359 19057 "1 " 1 0
0
#line_112 "Line BOOTHILL 115.0 to ADAMS 115.0 Circuit 1"
1.000
# line 14362 14350 "1 " 1 0
#0
#line_113 "Line BOOTHILL 115.0 to MURAL 115.0 Circuit 1"
1.000
# line 14362 14353 "1 " 1 0
#0
line 114 "Line CORONADO 500.0 to SGRLF 500.0 Circuit 1"
1.000
line 15001 14017 "1 " 1 0
0

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line 115 "Line CORONADO 500.0 to SILVERKG 500.0 Circuit 1"
1.000
line 15001 15041 "1 " 1 0
0
line 116 "Line PALOVRDE 500.0 to WESTWING 500.0 Circuit 1"
1.000
line 15021 14005 "1 " 1 0
0
line 117 "Line PALOVRDE 500.0 to WESTWING 500.0 Circuit 2"
1.000
line 15021 14005 "2 " 1 0
0
line 118 "Line PALOVRDE 500.0 to DELANY 500.0 Circuit 1"
1.000
line 15021 14012 "1 " 1 0
0
line 119 "Line PALOVRDE 500.0 to RUDD 500.0 Circuit 1"
1.000
line 15021 15061 "1 " 1 0
0
line 120 "Line PALOVRDE 500.0 to COLRIVER 500.0 Circuit 1"
1.000
line 15021 24900 "1 " 1 0
0
#line_121 "Line PERKINPS 500.0 to WESTWING 500.0 Circuit 1"
1.000
# line 15033 14005 "1 " 1 0
#0
line 122 "Line SILVERKG 500.0 to SAGUARO 500.0 Circuit 1"
1.000
line 15041 14004 "1 " 1 0
0
line 123 "Line ABEL 500.0 to BROWNING 500.0 Circuit 1"
1.000
line 15070 15051 "1 " 1 0
0
line_124 "Line PINAL_C 500.0 to ABEL 500.0 Circuit 1"
1.000
line 15080 15070 "1 " 1 0
0
line 125 "Line JOJOBA 500.0 to GILARIVR 500.0 Circuit 1"
1.000
line 15089 14007 "1 " 1 0
0
line 126 "Line JOJOBA 500.0 to GILARIVR 500.0 Circuit 2"
1.000
line 15089 14007 "2 " 1 0
0
line_127 "Line JOJOBA 500.0 to KYRENE 500.0 Circuit 1"
1.000
line 15089 15011 "1 " 1 0
0
line 128 "Line HASSYAMP 500.0 to PALOVRDE 500.0 Circuit 1"
1.000
line 15090 15021 "1 " 1 0
0
line 129 "Line HASSYAMP 500.0 to PALOVRDE 500.0 Circuit 2"
1.000
line 15090 15021 "2 " 1 0
0
line 130 "Line HASSYAMP 500.0 to PALOVRDE 500.0 Circuit 3"
1.000
line 15090 15021 "3 " 1 0
0
line 131 "Line HASSYAMP 500.0 to PINAL_W 500.0 Circuit 1"
1.000
line 15090 15088 "1 " 1 0
0

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0				
line 132	"Line HASSYAMP	500.0 to JOJOBA	500.0 Circuit 1"	
1.000				
line 15090	15089 "1 " 1 0			
0				
line 133	"Line HASSYAMP	500.0 to ARLINTON	500.0 Circuit 1"	
1.000				
line 15090	15092 "1 " 1 0			
0				
line 134	"Line HASSYAMP	500.0 to HARQUAHA	500.0 Circuit 1"	
1.000				
line 15090	15093 "1 " 1 0			
0				
line 135	"Line HASSYAMP	500.0 to MESQUITE	500.0 Circuit 1"	
1.000				
line 15090	15094 "1 " 1 0			
0				
line 136	"Line HASSYAMP	500.0 to N.GILA	500.0 Circuit 2"	
1.000				
line 15090	22536 "2 " 1 0			
0				
line 137	"Line BONNEYTP	115.0 to BONNYBRK	115.0 Circuit 1"	
1.000				
line 15103	14352 "1 " 1 0			
0				
line 138	"Line BONNEYTP	115.0 to COOLIDGE	115.0 Circuit 1"	
1.000				
line 15103	19044 "1 " 1 0			
0				
line 139	"Line ELLISON	115.0 to 843E2.7N	115.0 Circuit 1"	
1.000				
line 15105	15133 "1 " 1 0			
0				
line 140	"Line FRAZIER	115.0 to MOONSHIN	115.0 Circuit 1"	
1.000				
line 15106	15115 "1 " 1 0			
0				
line 141	"Line FRAZIER	115.0 to ROOSEVLT	115.0 Circuit 1"	
1.000				
line 15106	15134 "1 " 1 0			
0				
line 142	"Line GOLDFELD	115.0 to HORSMESA	115.0 Circuit 1"	
1.000				
line 15107	15109 "1 " 1 0			
0				
line 143	"Line HAYDENAZ	115.0 to KEARNYTP	115.0 Circuit 1"	
1.000				
line 15108	15112 "1 " 1 0			
shunt "HAYDENAZ	115.00" "b " 1 0			
0				
line 144	"Line HORSMESA	115.0 to MRMNPLAT	115.0 Circuit 1"	
1.000				
line 15109	15117 "1 " 1 0			
0				
line 145	"Line KEARNYTP	115.0 to MORRISAZ	115.0 Circuit 1"	
1.000				
line 15112	15116 "1 " 1 0			
shunt "HAYDENAZ	115.00" "b " 1 0			
0				
line 146	"Line KNOLL	115.0 to MORRISAZ	115.0 Circuit 1"	
1.000				
line 15113	15116 "1 " 1 0			
0				
line 147	"Line MIAMI	115.0 to PINAL	115.0 Circuit 1"	
1.000				
line 15114	15119 "1 " 1 0			
0				

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line 148	"Line MIAMI	115.0 to PINTOVLY	115.0 Circuit 1"	
1.000				
line 15114	15121 "1 " 1 0			
0				
line 149	"Line MIAMI	115.0 to 843E2.7N	115.0 Circuit 1"	
1.000				
line 15114	15133 "1 " 1 0			
0				
line 150	"Line MOONSHIN	115.0 to PINAL	115.0 Circuit 1"	
1.000				
line 15115	15119 "1 " 1 0			
0				
line 151	"Line MOONSHIN	115.0 to 842E2.7N	115.0 Circuit 1"	
1.000				
line 15115	15132 "1 " 1 0			
0				
line 152	"Line OAKFLAT	115.0 to SILVERT1	115.0 Circuit 1"	
1.000				
line 15118	15126 "1 " 1 0			
0				
line 153	"Line PINAL	115.0 to SILVERT1	115.0 Circuit 1"	
1.000				
line 15119	15126 "1 " 1 0			
0				
line 154	"Line RAY	115.0 to KNOLL	115.0 Circuit 1"	
1.000				
line 15122	15113 "1 " 1 0			
0				
line 155	"Line RAY	115.0 to SUPERIOR	115.0 Circuit 1"	
1.000				
line 15122	15129 "1 " 1 0			
0				
line 156	"Line REFINERY	115.0 to 842E2.7N	115.0 Circuit 1"	
1.000				
line 15123	15132 "1 " 1 0			
0				
line 157	"Line SILVERK1	115.0 to SILVERT1	115.0 Circuit 1"	
1.000				
line 15124	15126 "1 " 1 0			
0				
line 158	"Line SILVERK2	115.0 to SUPERIOR	115.0 Circuit 1"	
1.000				
line 15125	15129 "1 " 1 0			
0				
line 159	"Line SPURLOCK	115.0 to SUPERIOR	115.0 Circuit 1"	
1.000				
line 15127	15129 "1 " 1 0			
0				
line 160	"Line 842E2.7N	115.0 to 843E2.7N	115.0 Circuit 1"	
1.000				
line 15132	15133 "1 " 1 0			
0				
line 161	"Line SNYDHLAZ	115.0 to SNYDHILL	115.0 Circuit 1"	
1.000				
line 15181	19214 "1 " 1 0			
0				
line 162	"Line AGUAFRIA	230.0 to WESTWNGW	230.0 Circuit 1"	
1.000				
line 15201	14231 "1 " 1 0			
0				
line 163	"Line AGUAFRIA	230.0 to ALEXANDR	230.0 Circuit 1"	
1.000				
line 15201	15202 "1 " 1 0			
0				
line 164	"Line AGUAFRIA	230.0 to WHITETNK	230.0 Circuit 1"	
1.000				
line 15201	15218 "1 " 1 0			

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0				
line 165	"Line ANDERSON	230.0 to KYR-NEW	230.0 Circuit 1"	
1.000				
line 15203	14236 "1 " 1 0			
0				
line 166	"Line BRANDOW	230.0 to KYRENE	230.0 Circuit 1"	
1.000				
line 15204	15207 "1 " 1 0			
0				
line 167	"Line BRANDOW	230.0 to PAPAGOBT	230.0 Circuit 1"	
1.000				
line 15204	15209 "1 " 1 0			
0				
line 168	"Line BRANDOW	230.0 to WARD	230.0 Circuit 1"	
1.000				
line 15204	15217 "1 " 1 0			
0				
line 169	"Line BRANDOW	230.0 to WARD	230.0 Circuit 2"	
1.000				
line 15204	15217 "2 " 1 0			
0				
line 170	"Line CORBELL	230.0 to KYRENE	230.0 Circuit 1"	
1.000				
line 15205	15207 "1 " 1 0			
0				
line 171	"Line KYRENE	230.0 to KYR-NEW	230.0 Circuit 1"	
1.000				
line 15207	14236 "1 " 1 0			
0				
line 172	"Line KYRENE	230.0 to SCHRADER	230.0 Circuit 1"	
1.000				
line 15207	15214 "1 " 1 0			
0				
line 173	"Line ORME	230.0 to ANDERSON	230.0 Circuit 1"	
1.000				
line 15208	15203 "1 " 1 0			
0				
line 174	"Line ORME	230.0 to ANDERSON	230.0 Circuit 2"	
1.000				
line 15208	15203 "2 " 1 0			
0				
line 175	"Line ORME	230.0 to RUDD	230.0 Circuit 1"	
1.000				
line 15208	15230 "1 " 1 0			
0				
line 176	"Line ORME	230.0 to RUDD	230.0 Circuit 2"	
1.000				
line 15208	15230 "2 " 1 0			
0				
line 177	"Line PAPAGOBT	230.0 to KYR-NEW	230.0 Circuit 1"	
1.000				
line 15209	14236 "1 " 1 0			
0				
line 178	"Line PAPAGOBT	230.0 to PINPKSRP	230.0 Circuit 1"	
1.000				
line 15209	15211 "1 " 1 0			
0				
line 179	"Line PINPKSRP	230.0 to BRANDOW	230.0 Circuit 1"	
1.000				
line 15211	15204 "1 " 1 0			
0				
line 180	"Line PINPKSRP	230.0 to BRANDOW	230.0 Circuit 2"	
1.000				
line 15211	15204 "2 " 1 0			
0				
line 181	"Line ROGERS	230.0 to THUNDRST	230.0 Circuit 1"	
1.000				

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0				
line 15212	15216 "1 " 1 0			
0				
line 182	"Line ROGERS	230.0 to ROGSWAPA	230.0 Circuit 1"	
1.000				
line 15212	19502 "1 " 1 0			
0				
line 183	"Line ROGERS	230.0 to ROGSWAPA	230.0 Circuit 2"	
1.000				
line 15212	19502 "2 " 1 0			
0				
line 184	"Line SANTAN	230.0 to CORBELL	230.0 Circuit 1"	
1.000				
line 15213	15205 "1 " 1 0			
0				
line 185	"Line SANTAN	230.0 to THUNDRST	230.0 Circuit 1"	
1.000				
line 15213	15216 "1 " 1 0			
0				
line 186	"Line SCHRADER	230.0 to SANTAN	230.0 Circuit 1"	
1.000				
line 15214	15213 "1 " 1 0			
0				
line 187	"Line SILVERKG	230.0 to GOLDFELD	230.0 Circuit 1"	
1.000				
line 15215	15206 "1 " 1 0			
0				
line 188	"Line THUNDRST	230.0 to GOLDFELD	230.0 Circuit 1"	
1.000				
line 15216	15206 "1 " 1 0			
0				
line 189	"Line THUNDRST	230.0 to GOLDFELD	230.0 Circuit 2"	
1.000				
line 15216	15206 "2 " 1 0			
0				
line 190	"Line KNOX	230.0 to SNTAROSA	230.0 Circuit 1"	
1.000				
line 15219	14226 "1 " 1 0			
0				
line 191	"Line BROWNING	230.0 to RANDOLPH	230.0 Circuit 1"	
1.000				
line 15222	15240 "1 " 1 0			
0				
line 192	"Line ABEL	230.0 to SCHRADER	230.0 Circuit 1"	
1.000				
line 15224	15214 "1 " 1 0			
0				
line 193	"Line ABEL	230.0 to DINOSAUR	230.0 Circuit 1"	
1.000				
line 15224	15223 "1 " 1 0			
0				
line 194	"Line ABEL	230.0 to RS-24	230.0 Circuit 1"	
1.000				
line 15224	15225 "1 " 1 0			
0				
line 195	"Line RUDD	230.0 to PLMVLY	230.0 Circuit 1"	
1.000				
line 15230	14252 "1 " 1 0			
0				
line 196	"Line RUDD	230.0 to WHITETNK	230.0 Circuit 1"	
1.000				
line 15230	15218 "1 " 1 0			
0				
line 197	"Line PINAL_C	230.0 to DBG	230.0 Circuit 1"	
1.000				
line 15231	15235 "1 " 1 0			
0				
line_198	"Line PINAL_C	230.0 to RANDOLPH	230.0 Circuit 1"	

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1.000					
0	line	15231	15240	"1 " 1 0	
0	line 199		"Line COPPERVR	230.0 to FRISCO	230.0 Circuit 1"
1.000	line	16901	16902	"1 " 1 0	
0	line 200		"Line PD-MORNC	230.0 to FRISCO	230.0 Circuit 1"
1.000	line	16903	16902	"1 " 1 0	
0	line 201		"Line HENDRSON	230.0 to MEAD N	230.0 Circuit 1"
1.000	line	18006	19011	"1 " 1 0	
0	line 202		"Line BC TAP	230.0 to MEAD N	230.0 Circuit 1"
1.000	line	18055	19011	"1 " 1 0	
0	line 203		"Line H ALLEN	500.0 to MEAD	500.0 Circuit 1"
1.000	line	18450	19038	"1 " 1 0	
0	line 204		"Line EQUEST N	500.0 to MEAD	500.0 Circuit 1"
1.000	line	18455	19038	"1 " 1 0	
0	line 205		"Line MEAD N	230.0 to ARDEN	230.0 Circuit 1"
1.000	line	19011	18004	"1 " 1 0	
0	line 206		"Line MEAD N	230.0 to EASTSIDE	230.0 Circuit 1"
1.000	line	19011	18016	"1 " 1 0	
0	line 207		"Line MEAD N	230.0 to NEWPORT	230.0 Circuit 1"
1.000	line	19011	18021	"1 " 1 0	
0	line 208		"Line MEAD N	230.0 to EQUEST	230.0 Circuit 2"
1.000	line	19011	18600	"2 " 1 0	
0	line 209		"Line MEAD N	230.0 to SINATRA	230.0 Circuit 1"
1.000	line	19011	18618	"1 " 1 0	
0	line 210		"Line MEAD N	230.0 to HVRA3A4	230.0 Circuit 1"
1.000	line	19011	19043	"1 " 1 0	
0	#line_211		"Line MEAD S	230.0 to PAHRUMP	230.0 Circuit 1"
1.000	# line	19012	18023	"1 " 1 0	
0	line 212		"Line MEAD S	230.0 to EQUEST	230.0 Circuit 1"
1.000	line	19012	18600	"1 " 1 0	
0	line 213		"Line MEAD S	230.0 to GREENWAY	230.0 Circuit 1"
1.000	line	19012	18674	"1 " 1 0	
0	line 214		"Line MEAD S	230.0 to DIAMOND	230.0 Circuit 1"
1.000	line	19012	18915	"1 " 1 0	
0					

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line 215		"Line MEAD S	230.0 to DIAMOND	230.0 Circuit 2"	
1.000	line	19012	18915	"2 " 1 0	
0	line 216		"Line MEAD S	230.0 to MEAD N	230.0 Circuit 1"
1.000	line	19012	19011	"1 " 1 0	
0	line 217		"Line MEAD S	230.0 to ELDORDO	230.0 Circuit 1"
1.000	line	19012	24041	"1 " 1 0	
0	line 218		"Line MEAD S	230.0 to ELDORDO	230.0 Circuit 2"
1.000	line	19012	24041	"2 " 1 0	
0	line 219		"Line MEAD S	230.0 to MCCULLGH	230.0 Circuit 1"
1.000	line	19012	26046	"1 " 1 0	
0	line 220		"Line MEAD S	230.0 to MCCULLGH	230.0 Circuit 2"
1.000	line	19012	26046	"2 " 1 0	
0	line 221		"Line BLYTHE	161.0 to BUCKBLVD	161.0 Circuit 1"
1.000	line	19020	19101	"1 " 1 0	
0	line 222		"Line BLYTHE	161.0 to GLT TAP	161.0 Circuit 1"
1.000	line	19020	19105	"1 " 1 0	
0	line 223		"Line BLYTHE	161.0 to HEADGATE	161.0 Circuit 1"
1.000	line	19020	19206	"1 " 1 0	
0	line 224		"Line BLYTHE	161.0 to BLYTHEAZ	161.0 Circuit 1"
1.000	line	19020	19603	"1 " 1 0	
0	line 225		"Line BLYTHE	161.0 to NILAND	161.0 Circuit 1"
1.000	line	19020	21047	"1 " 1 0	
0	line 226		"Line BLYTHE	161.0 to BLYTHESC	161.0 Circuit 1"
1.000	line	19020	24017	"1 " 1 0	
0	line 227		"Line DAVIS	230.0 to MEAD N	230.0 Circuit 1"
1.000	line	19022	19011	"1 " 1 0	
0	line 228		"Line DAVIS	230.0 to LONGTIN	230.0 Circuit 1"
1.000	line	19022	19224	"1 " 1 0	
0	line 229		"Line DAVIS	230.0 to TOPOCK	230.0 Circuit 2"
1.000	line	19022	19320	"2 " 1 0	
0	line 230		"Line DAVIS	230.0 to MCCULLGH	230.0 Circuit 1"
1.000	line	19022	26046	"1 " 1 0	
0	line 231		"Line HOVRA5A6	230.0 to MEAD S	230.0 Circuit 1"
1.000	line	19029	19012	"1 " 1 0	
0					

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0
line 232 "Line HOVRA7-9 230.0 to MEAD S 230.0 Circuit 1"
1.000
line 19030 19012 "1 " 1 0
0
line 233 "Line MEAD 500.0 to WESTWING 500.0 Circuit 1"
1.000
line 19038 14005 "1 " 1 0
0
#line_234 "Line MEAD 500.0 to PERKINS 500.0 Circuit 1"
1.000
# line 19038 15034 "1 " 1 0
#0
line 235 "Line MEAD 500.0 to MARKETPL 500.0 Circuit 1"
1.000
line 19038 26044 "1 " 1 0
0
line 236 "Line PARKER 161.0 to BLYTHE 161.0 Circuit 1"
1.000
line 19041 19020 "1 " 1 0
0
line 237 "Line PARKER 161.0 to BOUSE 161.0 Circuit 1"
1.000
line 19041 19046 "1 " 1 0
0
line 238 "Line PARKER 161.0 to HEADGATE 161.0 Circuit 1"
1.000
line 19041 19206 "1 " 1 0
0
line 239 "Line PARKER 161.0 to PARKERAZ 161.0 Circuit 1"
1.000
line 19041 19602 "1 " 1 0
0
line 240 "Line PARKER 230.0 to EAGLEYE 230.0 Circuit 1"
1.000
line 19042 14209 "1 " 1 0
0
line 241 "Line PARKER 230.0 to BLK MESA 230.0 Circuit 1"
1.000
line 19042 19019 "1 " 1 0
0
line 242 "Line PARKER 230.0 to HAVASU 230.0 Circuit 1"
1.000
line 19042 19075 "1 " 1 0
0
line 243 "Line PARKER 230.0 to HARCUIVAR 230.0 Circuit 1"
1.000
line 19042 19204 "1 " 1 0
0
line 244 "Line PARKER 230.0 to GENE 230.0 Circuit 1"
1.000
line 19042 25402 "1 " 1 0
0
line 245 "Line COOLIDGE 115.0 to VLYFARMS 115.0 Circuit 1"
1.000
line 19044 14359 "1 " 1 0
shunt "VLYFARMS 69.00" "b1" 1 .1440
0
line 246 "Line COOLIDGE 115.0 to ED-2 115.0 Circuit 1"
1.000
line 19044 19065 "1 " 1 0
0
line 247 "Line COOLIDGE 115.0 to SIGNAL 115.0 Circuit 1"
1.000
line 19044 19066 "1 " 1 0
0
line_248 "Line COOLIDGE 115.0 to COOLDGAZ 115.0 Circuit 1"

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1.000
line 19044 19600 "1 " 1 0
0
line 249 "Line COOLIDGE 230.0 to SUN ARIZ 230.0 Circuit 1"
1.000
line 19045 19410 "1 " 1 0
0
line_250 "Line COOLIDGE 230.0 to SUN ARIZ 230.0 Circuit 2"
1.000
line 19045 19410 "2 " 1 0
0
line 251 "Line BOUSE 161.0 to KOFA 161.0 Circuit 1"
1.000
line 19046 19100 "1 " 1 0
0
line 252 "Line BOUSE 161.0 to BOUSE AZ 161.0 Circuit 1"
1.000
line 19046 19601 "1 " 1 0
0
line 253 "Line DEL BAC 115.0 to NOGALES 115.0 Circuit 1"
1.000
line 19047 19221 "1 " 1 0
0
line 254 "Line EMPIRE 115.0 to CASAGRND 115.0 Circuit 1"
1.000
line 19048 19222 "1 " 1 0
0
line 255 "Line GILA 161.0 to KNOB 161.0 Circuit 1"
1.000
line 19050 19051 "1 " 1 0
0
line 256 "Line GILA 161.0 to DOME TAP 161.0 Circuit 1"
1.000
line 19050 19070 "1 " 1 0
0
line 257 "Line KNOB 161.0 to PILOTKNB 161.0 Circuit 1"
1.000
line 19051 21059 "1 " 1 0
0
line 258 "Line LIBERTY 230.0 to WESTWNGW 230.0 Circuit 1"
1.000
line 19052 14231 "1 " 1 0
0
line_259 "Line LIBERTY 230.0 to TS4 230.0 Circuit 1"
1.000
line 19052 14258 "1 " 1 0
0
line 260 "Line LIBERTY 230.0 to LONE BUT 230.0 Circuit 1"
1.000
line 19052 19055 "1 " 1 0
0
line 261 "Line LIBERTY 230.0 to PHXWAPA 230.0 Circuit 1"
1.000
line 19052 19061 "1 " 1 0
0
line 262 "Line LIBERTY 345.0 to PEACOCK 345.0 Circuit 1"
1.000
line 19053 19315 "1 " 1 0
0
line 263 "Line LONE BUT 230.0 to TESTTRAK 230.0 Circuit 1"
1.000
line 19055 19068 "1 " 1 0
0
line 264 "Line LONE BUT 230.0 to SUN ARIZ 230.0 Circuit 1"
1.000
line 19055 19410 "1 " 1 0
0

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line 265	"Line MCCONICO	230.0 to DAVIS	230.0 Circuit 1"	
1.000				
line 19056	19022 "1 " 1 0			
0				
line 266	"Line MCCONICO	230.0 to GRIFFITH	230.0 Circuit 1"	
1.000				
line 19056	19310 "1 " 1 0			
0				
line 267	"Line MCCONICO	230.0 to HARRIS	230.0 Circuit 1"	
1.000				
line 19056	19651 "1 " 1 0			
0				
line 268	"Line ORACLE	115.0 to ORACLEAZ	115.0 Circuit 1"	
1.000				
line 19057	19652 "1 " 1 0			
0				
line 269	"Line ADAMS TP	115.0 to NOGALES	115.0 Circuit 1"	
1.000				
line 19060	19221 "1 " 1 0			
0				
line 270	"Line PHXWAPA	230.0 to LONE BUT	230.0 Circuit 1"	
1.000				
line 19061	19055 "1 " 1 0			
0				
line 271	"Line PINPK	230.0 to PINPKSRP	230.0 Circuit 1"	
1.000				
line 19062	15211 "1 " 1 0			
0				
line 272	"Line PINPK	230.0 to PINPKSRP	230.0 Circuit 2"	
1.000				
line 19062	15211 "2 " 1 0			
0				
line 273	"Line WLTNMOHK	161.0 to GILA	161.0 Circuit 1"	
1.000				
line 19063	19050 "1 " 1 0			
0				
line 274	"Line WLTNMOHK	161.0 to DOME TAP	161.0 Circuit 1"	
1.000				
line 19063	19070 "1 " 1 0			
0				
line 275	"Line TUCSON	115.0 to DEL BAC	115.0 Circuit 1"	
1.000				
line 19064	19047 "1 " 1 0			
0				
line 276	"Line TUCSON	115.0 to ORACLE	115.0 Circuit 1"	
1.000				
line 19064	19057 "1 " 1 0			
0				
line 277	"Line ED-2	115.0 to SIGNAL	115.0 Circuit 1"	
1.000				
line 19065	19066 "1 " 1 0			
0				
line 278	"Line ED-2	115.0 to ED-4	115.0 Circuit 1"	
1.000				
line 19065	19071 "1 " 1 0			
0				
line 279	"Line ED-2	115.0 to BRADY	115.0 Circuit 1"	
1.000				
line 19065	19202 "1 " 1 0			
0				
line 280	"Line ED-5	115.0 to ED-5B	115.0 Circuit 1"	
1.000				
line 19067	19069 "1 " 1 0			
0				
line 281	"Line TESTTRAK	230.0 to CASAGRND	230.0 Circuit 1"	
1.000				
line 19068	19218 "1 " 1 0			

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0				
line 282	"Line ED-5B	115.0 to EMPIRE	115.0 Circuit 1"	
1.000				
line 19069	19048 "1 " 1 0			
0				
line 283	"Line ED-4	115.0 to ED-5	115.0 Circuit 1"	
1.000				
line 19071	19067 "1 " 1 0			
0				
line 284	"Line HILLTOP	230.0 to MCCONICO	230.0 Circuit 1"	
1.000				
line 19072	19056 "1 " 1 0			
0				
line 285	"Line N.HAVASU	230.0 to PARKER	230.0 Circuit 1"	
1.000				
line 19074	19042 "1 " 1 0			
0				
line 286	"Line N.HAVASU	230.0 to TOPOCK	230.0 Circuit 1"	
1.000				
line 19074	19320 "1 " 1 0			
0				
line 287	"Line HOVRN7N8	230.0 to MEAD S	230.0 Circuit 1"	
1.000				
line 19079	19012 "1 " 1 0			
0				
line 288	"Line HOVRN5N6	230.0 to MEAD S	230.0 Circuit 1"	
1.000				
line 19080	19012 "1 " 1 0			
0				
line 289	"Line HOVRN3N4	230.0 to MEAD S	230.0 Circuit 1"	
1.000				
line 19081	19012 "1 " 1 0			
0				
line 290	"Line HOVRN1N2	230.0 to MEAD S	230.0 Circuit 1"	
1.000				
line 19082	19012 "1 " 1 0			
0				
line 291	"Line HOVRA1A2	230.0 to MEAD S	230.0 Circuit 1"	
1.000				
line 19083	19012 "1 " 1 0			
0				
line 292	"Line KOFA	161.0 to DOME TAP	161.0 Circuit 1"	
1.000				
line 19100	19070 "1 " 1 0			
0				
line 293	"Line GLT TAP	161.0 to KNOB	161.0 Circuit 1"	
1.000				
line 19105	19051 "1 " 1 0			
0				
line 294	"Line PRSCOTWA	230.0 to PRESCOTT	230.0 Circuit 1"	
1.000				
line 19106	14222 "1 " 1 0			
0				
line 295	"Line PRSCOTWA	230.0 to RNDVLYTP	230.0 Circuit 1"	
1.000				
line 19106	19501 "1 " 1 0			
0				
line 296	"Line GAVLINWA	230.0 to GAVILNPK	230.0 Circuit 1"	
1.000				
line 19107	14243 "1 " 1 0			
0				
line 297	"Line GAVLINWA	230.0 to PINPK	230.0 Circuit 1"	
1.000				
line 19107	19062 "1 " 1 0			
0				
line 298	"Line GAVLINWA	230.0 to PRSCOTWA	230.0 Circuit 1"	
1.000				

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0	line	19107	19106 "1 " 1 0	
0	line 299		"Line RACEWYWA 230.0 to WESTWNGE 230.0 Circuit 1"	
1.000	line	19115	14259 "1 " 1 0	
0	line 300		"Line SLRC 230.0 to GILA 230.0 Circuit 1"	
1.000	line	19120	19124 "1 " 1 0	
0	line 301		"Line SLRC 230.0 to GILA 230.0 Circuit 2"	
1.000	line	19120	19124 "2 " 1 0	
0	line 302		"Line GILA 230.0 to NGL-E 230.0 Circuit 1"	
1.000	line	19124	19125 "1 " 1 0	
0	line 303		"Line GILA 230.0 to NGL-W 230.0 Circuit 1"	
1.000	line	19124	19126 "1 " 1 0	
0	line 304		"Line BLACKMTN 115.0 to BLKMTNAZ 115.0 Circuit 1"	
1.000	line	19201	15182 "1 " 1 0	
0	line 305		"Line BLACKMTN 115.0 to DEL BAC 115.0 Circuit 1"	
1.000	line	19201	19047 "1 " 1 0	
0	line 306		"Line BLACKMTN 115.0 to SNYDHILL 115.0 Circuit 1"	
1.000	line	19201	19214 "1 " 1 0	
0	line 307		"Line BRADY 115.0 to BRADYAZ 115.0 Circuit 1"	
1.000	line	19202	15174 "1 " 1 0	
0	line 308		"Line BRADY 115.0 to PICACHOW 115.0 Circuit 1"	
1.000	line	19202	19209 "1 " 1 0	
0	line 309		"Line BRAWLEY 115.0 to BRAWLYAZ 115.0 Circuit 1"	
1.000	line	19203	15179 "1 " 1 0	
0	line 310		"Line BRAWLEY 115.0 to SANXAVER 115.0 Circuit 1"	
1.000	line	19203	19213 "1 " 1 0	
0	line 311		"Line HARCUVAR 230.0 to HARC AZ 230.0 Circuit 1"	
1.000	line	19204	15172 "1 " 1 0	
0	line 312		"Line HARCUVAR 230.0 to HASSYTAP 230.0 Circuit 1"	
1.000	line	19204	19500 "1 " 1 0	
0	line 313		"Line N.WADDEL 230.0 to RACEWYWA 230.0 Circuit 1"	
1.000	line	19208	19115 "1 " 1 0	
0	line 314		"Line PICACHOW 115.0 to PICACHAZ 115.0 Circuit 1"	
1.000	line	19209	15175 "1 " 1 0	
0	line_315		"Line PICACHOW 115.0 to RED ROCK 115.0 Circuit 1"	

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1.000	line	19209	19211 "1 " 1 0	
0	line 316		"Line RATTLSNK 115.0 to TUCSON 115.0 Circuit 1"	
1.000	line	19210	19064 "1 " 1 0	
0	line_317		"Line RATTLSNK 115.0 to TWINPEAK 115.0 Circuit 1"	
1.000	line	19210	19216 "1 " 1 0	
0	line 318		"Line RED ROCK 115.0 to SAG.EAST 115.0 Circuit 1"	
1.000	line	19211	14356 "1 " 1 0	
0	line 319		"Line RED ROCK 115.0 to REDRCKAZ 115.0 Circuit 1"	
1.000	line	19211	15176 "1 " 1 0	
0	line 320		"Line SANDARIO 115.0 to BRAWLEY 115.0 Circuit 1"	
1.000	line	19212	19203 "1 " 1 0	
0	line 321		"Line SANDARIO 115.0 to SANDARAZ 115.0 Circuit 1"	
1.000	line	19212	15178 "1 " 1 0	
0	line 322		"Line SANXAVER 115.0 to SANXAVAZ 115.0 Circuit 1"	
1.000	line	19213	15180 "1 " 1 0	
0	line 323		"Line SANXAVER 115.0 to SNYDHILL 115.0 Circuit 1"	
1.000	line	19213	19214 "1 " 1 0	
0	line 324		"Line SPKHILTP 230.0 to COOLIDGE 230.0 Circuit 1"	
1.000	line	19215	19045 "1 " 1 0	
0	line 325		"Line TWINPEAK 115.0 to TWINPKAZ 115.0 Circuit 1"	
1.000	line	19216	15177 "1 " 1 0	
0	line_326		"Line TWINPEAK 115.0 to SANDARIO 115.0 Circuit 1"	
1.000	line	19216	19212 "1 " 1 0	
0	line 327		"Line LONGTIN 230.0 to TOPOCK 230.0 Circuit 1"	
1.000	line	19224	19320 "1 " 1 0	
0	line 328		"Line GRIFFITH 230.0 to PEACOCK 230.0 Circuit 1"	
1.000	line	19310	19314 "1 " 1 0	
0	line_329		"Line PEACOCK 230.0 to HILLTOP 230.0 Circuit 1"	
1.000	line	19314	19072 "1 " 1 0	
0	line 330		"Line PEACOCK 345.0 to MEAD 345.0 Circuit 1"	
1.000	line	19315	19037 "1 " 1 0	
0	line 331		"Line TOPOCK 230.0 to BLK MESA 230.0 Circuit 1"	
1.000	line	19320	19019 "1 " 1 0	
0				

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line 332	"Line TOPOCK	230.0 to SOPOINT	230.0 Circuit 1"	
1.000				
line 19320	19316 "1 " 1 0			
0				
line 333	"Line TOPOCK	230.0 to SOPOINT	230.0 Circuit 2"	
1.000				
line 19320	19316 "2 " 1 0			
0				
line 334	"Line SUN ARIZ	230.0 to PINAL_C	230.0 Circuit 1"	
1.000				
line 19410	15231 "1 " 1 0			
0				
line 335	"Line HASSYTAP	230.0 to HASSY AZ	230.0 Circuit 1"	
1.000				
line 19500	15173 "1 " 1 0			
0				
line 336	"Line HASSYTAP	230.0 to LIBERTY	230.0 Circuit 1"	
1.000				
line 19500	19052 "1 " 1 0			
0				
line 337	"Line RNDVLYTP	230.0 to ROUNDVLY	230.0 Circuit 1"	
1.000				
line 19501	14223 "1 " 1 0			
0				
line 338	"Line RNDVLYTP	230.0 to PEACOCK	230.0 Circuit 1"	
1.000				
line 19501	19314 "1 " 1 0			
0				
line 339	"Line ROGSWAPA	230.0 to PINPK	230.0 Circuit 1"	
1.000				
line 19502	19062 "1 " 1 0			
0				
line 340	"Line ROGSWAPA	230.0 to PINPK	230.0 Circuit 2"	
1.000				
line 19502	19062 "2 " 1 0			
0				
line 341	"Line ROGSWAPA	230.0 to SPKHILTP	230.0 Circuit 1"	
1.000				
line 19502	19215 "1 " 1 0			
0				
line 342	"Line TURLY_S	115.0 to BLANCO	115.0 Circuit 1"	
1.000				
line 19573	19574 "1 " 1 0			
0				
line 343	"Line GALLEGOS	115.0 to BERGIN	115.0 Circuit 1"	
1.000				
line 19700	19702 "1 " 1 0			
0				
line 344	"Line ANIMAS	115.0 to SULLIVAN	115.0 Circuit 1"	
1.000				
line 19701	19712 "1 " 1 0			
0				
line 345	"Line ANIMAS	115.0 to BLUFVIEW	115.0 Circuit 1"	
1.000				
line 19701	19720 "1 " 1 0			
0				
line 346	"Line BERGIN	115.0 to LAKEVIEW	115.0 Circuit 1"	
1.000				
line 19702	19721 "1 " 1 0			
0				
line 347	"Line BERGIN	115.0 to WESTFORK	115.0 Circuit 1"	
1.000				
line 19702	19724 "1 " 1 0			
0				
line 348	"Line FOOTHILS	115.0 to HOODMESA	115.0 Circuit 1"	
1.000				
line 19703	19707 "1 " 1 0			

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0				
line 349	"Line FOOTHILS	115.0 to LAKEVIEW	115.0 Circuit 1"	
1.000				
line 19703	19721 "1 " 1 0			
0				
line 350	"Line FRUITAP	115.0 to FRUITLND	115.0 Circuit 1"	
1.000				
line 19704	19705 "1 " 1 0			
0				
line 351	"Line FRUITAP	115.0 to HOODMESA	115.0 Circuit 1"	
1.000				
line 19704	19707 "1 " 1 0			
0				
line 352	"Line GLADETAP	115.0 to LAPLATA	115.0 Circuit 1"	
1.000				
line 19706	19708 "1 " 1 0			
0				
line 353	"Line GLADETAP	115.0 to BLKGLADS	115.0 Circuit 1"	
1.000				
line 19706	72774 "1 " 1 0			
0				
line 354	"Line GLADETAP	115.0 to ELPASOTP	115.0 Circuit 1"	
1.000				
line 19706	79260 "1 " 1 0			
0				
line 355	"Line NAVAJO	115.0 to SAN JUAN	115.0 Circuit 1"	
1.000				
line 19710	19711 "1 " 1 0			
0				
line 356	"Line BLUFVIEW	115.0 to MESA FM	115.0 Circuit 1"	
1.000				
line 19720	19709 "1 " 1 0			
0				
line 357	"Line COLLTAP	115.0 to HOODMESA	115.0 Circuit 1"	
1.000				
line 19722	19707 "1 " 1 0			
0				
line 358	"Line COLLTAP	115.0 to SULLIVAN	115.0 Circuit 1"	
1.000				
line 19722	19712 "1 " 1 0			
0				
line 359	"Line COLLTAP	115.0 to COLLEG	115.0 Circuit 1"	
1.000				
line 19722	19723 "1 " 1 0			
0				
line 360	"Line HARE	115.0 to TURLY_S	115.0 Circuit 1"	
1.000				
line 19725	19573 "1 " 1 0			
0				
line 361	"Line HARE	115.0 to WESTFORK	115.0 Circuit 1"	
1.000				
line 19725	19724 "1 " 1 0			
0				
line 362	"Line HARE	115.0 to MILAGR	115.0 Circuit 1"	
1.000				
line 19725	19726 "1 " 1 0			
0				
line 363	"Line HARE	115.0 to ENRON	115.0 Circuit 1"	
1.000				
line 19725	19731 "1 " 1 0			
0				
line 364	"Line HARTCYN	115.0 to GLADETAP	115.0 Circuit 1"	
1.000				
line 19727	19706 "1 " 1 0			
0				
line 365	"Line HARTCYN	115.0 to H-H	115.0 Circuit 1"	
1.000				

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0	
line 19727	19728 "1 " 1 0
0	
line 366	"Line H-H 115.0 to HARE 115.0 Circuit 1"
1.000	
line 19728	19725 "1 " 1 0
0	
line 367	"Line WESTLOOP 115.0 to HOGBAK 115.0 Circuit 1"
1.000	
line 19729	19572 "1 " 1 0
0	
line 368	"Line WESTLOOP 115.0 to GLADETAP 115.0 Circuit 1"
1.000	
line 19729	19706 "1 " 1 0
0	
line 369	"Line WESTLOOP 115.0 to HOODMESA 115.0 Circuit 1"
1.000	
line 19729	19707 "1 " 1 0
0	
line 370	"Line WESTLOOP 115.0 to MESA FM 115.0 Circuit 1"
1.000	
line 19729	19709 "1 " 1 0
0	
line 371	"Line WESTLOOP 115.0 to PRAXAR 115.0 Circuit 1"
1.000	
line 19729	19730 "1 " 1 0
0	
line 372	"Line A-R 115.0 to TURLY_S 115.0 Circuit 1"
1.000	
line 19732	19573 "1 " 1 0
0	
line 373	"Line A-R 115.0 to SAN JUAN 115.0 Circuit 1"
1.000	
line 19732	19711 "1 " 1 0
0	
line 374	"Line CAMINO 230.0 to MEAD S 230.0 Circuit E"
1.000	
line 24019	19012 "E " 1 0
0	
line 375	"Line CAMINO 230.0 to MEAD S 230.0 Circuit W"
1.000	
line 24019	19012 "W " 1 0
0	
line 376	"Line FOURCORN 345.0 to PINTO PS 345.0 Circuit 1"
1.000	
line 14101	66235 "1 " 1 0
0	
line 377	"Line SIGURDPS 230.0 to GLENCANY 230.0 Circuit 1"
1.000	
line 66355	79031 "1 " 1 0
0	
line 378	"Line FLAGSTAF 345.0 to GLENCANY 345.0 Circuit 1"
1.000	
line 79024	79032 "1 " 1 0
0	
line 379	"Line FLAGSTAF 345.0 to GLENCANY 345.0 Circuit 2"
1.000	
line 79024	79032 "2 " 1 0
0	
line 380	"Line FLAGSTAF 345.0 to PINPKBRB 345.0 Circuit 1"
1.000	
line 79024	79053 "1 " 1 0
0	
line 381	"Line FLAGSTAF 345.0 to PINPKBRB 345.0 Circuit 2"
1.000	
line 79024	79053 "2 " 1 0
0	
line_382	"Line GLEN PS 230.0 to NAVAJO 230.0 Circuit 1"

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1.000	
line 79028	79093 "1 " 1 0
0	
line 383	"Line KAYENTA 230.0 to SHIPROCK 230.0 Circuit 1"
1.000	
line 79043	79063 "1 " 1 0
0	
line 384	"Line KAYENTA 230.0 to LNGHOUSE 230.0 Circuit 1"
1.000	
line 79043	79096 "1 " 1 0
0	
line 385	"Line SHIPROCK 115.0 to FRUITAP 115.0 Circuit 1"
1.000	
line 79062	19704 "1 " 1 0
0	
line 386	"Line SHIPROCK 115.0 to PRAXAR 115.0 Circuit 1"
1.000	
line 79062	19730 "1 " 1 0
0	
line 387	"Line SHIPROCK 230.0 to BLKGLADE 230.0 Circuit 1"
1.000	
line 79063	72770 "1 " 1 0
0	
line 388	"Line SHIPROCK 345.0 to SAN_JUAN 345.0 Circuit 1"
1.000	
line 79064	10292 "1 " 1 0
0	
line 389	"Line SHIPROCK 345.0 to FOURCORN 345.0 Circuit 1"
1.000	
line 79064	14101 "1 " 1 0
0	
line 390	"Line NAVAJO 230.0 to LNGHOUSE 230.0 Circuit 1"
1.000	
line 79093	79096 "1 " 1 0
0	
line 391	"Line ABEL 230.0 to RANDOLPH 230.0 Circuit 1"
1.000	
line 15224	15240 "1 " 1 0
0	
line 392	"Line LIBERTY 230.0 to LIBTYPHS 230.0 Circuit 1"
1.000	
line 19052	19054 "1 " 1 0
line 19053	19315 "1 " 1 0
line 19053	19315 "1 " 2 0
0	
line 393	"Line PINAL_C 500.0 to TORTOLIT 500.0 Circuit 1"
1.000	
line 15080	16000 "1 " 1 0
0	
line 394	"Line SAGUARO 500.0 to TORTLIT2 500.0 Circuit 1"
1.000	
line 14004	16001 "1 " 1 0
0	
line 395	"Line SAGUARO 500.0 to TORTOLIT 500.0 Circuit 1"
1.000	
line 14004	16000 "1 " 1 0
0	
line 396	"Line SAGUARO 500.0 to TORTOLIT 500.0 Circuit 2"
1.000	
line 14004	16000 "2 " 1 0
0	
line 398	"Line GREENLEE 345.0 to COPPERVR 345.0 Circuit 1"
1.000	
line 16101	16900 "1 " 1 0
0	
line 399	"Line GREENLEE 345.0 to WILLOW 345.0 Circuit 1"
1.000	

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line 16101 16112 "1 " 1 0
0
line 400 "Line GREENLEE 345.0 to WINCHSTR 345.0 Circuit 1"
1.000
line 16101 16109 "1 " 1 0
0
line 401 "Line HIDALGO 345.0 to GREENLEE 345.0 Circuit 1"
1.000
line 11080 16101 "1 " 1 0
0
line 402 "Line MCKINLEY 345.0 to SPRINGR 345.0 Circuit 1"
1.000
line 16102 16104 "1 " 1 0
0
line 403 "Line MCKINLEY 345.0 to SPRINGR 345.0 Circuit 2"
1.000
line 16102 16104 "2 " 1 0
0
#line_404 "Line PINALWES 345.0 to 3PTS345 345.0 Circuit 1"
1.000
# line 16114 16126 "1 " 1 0
#0
line 405 "Line PINALWES 345.0 to SOUTH 345.0 Circuit 1"
1.000
line 16114 16103 "1 " 1 0
0
line 406 "Line SAN_JUAN 345.0 to MCKINLEY 345.0 Circuit 1"
1.000
line 10292 16102 "1 " 1 0
0
line 407 "Line SAN_JUAN 345.0 to MCKINLEY 345.0 Circuit 2"
1.000
line 10292 16102 "2 " 1 0
0
line 408 "Line SOUTH 345.0 to GATEWAY 345.0 Circuit 1"
1.000
line 16103 16108 "1 " 1 0
0
line 409 "Line SOUTH 345.0 to GATEWAY 345.0 Circuit 2"
1.000
line 16103 16108 "2 " 1 0
0
line 410 "Line SPRINGR 345.0 to CORONADO 345.0 Circuit 1"
1.000
line 16104 16100 "1 " 1 0
0
line 411 "Line SPRINGR 345.0 to GREENLEE 345.0 Circuit 1"
1.000
line 16104 16101 "1 " 1 0
0
line 412 "Line SPRINGR 345.0 to LUNA 345.0 Circuit 1"
1.000
line 16104 11093 "1 " 1 0
0
line 413 "Line SPRINGR 345.0 to VAIL2 345.0 Circuit 1"
1.000
line 16104 16106 "1 " 1 0
0
line 414 "Line TORTOLIT 345.0 to NLOOP345 345.0 Circuit 1"
1.000
line 16115 16124 "1 " 1 0
0
line 415 "Line VAIL 345.0 to SOUTH 345.0 Circuit 1"
1.000
line 16105 16103 "1 " 1 0
0
line_416 "Line WESTWING 345.0 to PINALWES 345.0 Circuit 1"

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1.000
line 16107 16114 "1 " 1 0
0
line 417 "Line WILLOW 345.0 to BOWIE 345.0 Circuit 1"
1.000
line 16112 16111 "1 " 1 0
0
line 418 "Line WILLOW 345.0 to BOWIE 345.0 Circuit 2"
1.000
line 16112 16111 "2 " 1 0
0
line 419 "Line WINCHSTR 345.0 to VAIL 345.0 Circuit 1"
1.000
line 16109 16105 "1 " 1 0
shunt "NEWTUCSN 230.00" "b2" 1 .0720
shunt "KARTCHNR 69.00" "b2" 1 .1440
0
line 420 "Line WINCHSTR 345.0 to WILLOW 345.0 Circuit 1"
1.000
line 16109 16112 "1 " 1 0
0
line 421 "Line CANEZ 138.0 to SONOITA 138.0 Circuit 1"
1.000
line 16721 16722 "1 " 1 0
0
line 422 "Line CIENEGA 138.0 to S.TRAIL 138.0 Circuit 1"
1.000
line 16243 16213 "1 " 1 0
0
line 423 "Line CORONA 138.0 to IRVNGTN 138.0 Circuit 1"
1.000
line 16238 16204 "1 " 1 0
0
line 424 "Line CORONA 138.0 to SOUTH 138.0 Circuit 1"
1.000
line 16238 16216 "1 " 1 0
0
line 425 "Line CRYCROFT 138.0 to NE.LOOP 138.0 Circuit 1"
1.000
line 16239 16208 "1 " 1 0
0
line 426 "Line DELCERRO 138.0 to WESTINA 138.0 Circuit 1"
1.000
line 16229 16221 "1 " 1 0
0
line 427 "Line DMP 138.0 to ANKLAM 138.0 Circuit 1"
1.000
line 16200 16253 "1 " 1 0
0
line 428 "Line DMP 138.0 to NL. EXP 138.0 Circuit 1"
1.000
line 16200 16999 "1 " 1 0
0
line 429 "Line DMP 138.0 to N. LOOP 138.0 Circuit 1"
1.000
line 16200 16207 "1 " 1 0
0
line 430 "Line DMP 138.0 to NE.LOOP 138.0 Circuit 1"
1.000
line 16200 16208 "1 " 1 0
0
line 431 "Line DMP 138.0 to SN.CRUIZ 138.0 Circuit 1"
1.000
line 16200 16214 "1 " 1 0
0
line 432 "Line DMP 138.0 to TUCSON 138.0 Circuit 1"
1.000

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0	line	16200	16218	"1 "	1 0			
0	line 433		"Line DREXEL		138.0 to IRVNGTN	138.0	Circuit 1"	
1.000	line	16201	16204	"1 "	1 0			
0	line 434		"Line DREXEL		138.0 to MIDVALE	138.0	Circuit 1"	
1.000	line	16201	16206	"1 "	1 0			
0	line 435		"Line E. LOOP		138.0 to HARRISON	138.0	Circuit 1"	
1.000	line	16202	16247	"1 "	1 0			
0	line 436		"Line E. LOOP		138.0 to NE.LOOP	138.0	Circuit 1"	
1.000	line	16202	16208	"1 "	1 0			
0	line 437		"Line E. LOOP		138.0 to PANTANO	138.0	Circuit 1"	
1.000	line	16202	16224	"1 "	1 0			
0	line 438		"Line E. LOOP		138.0 to ROBERTS	138.0	Circuit 1"	
1.000	line	16202	16211	"1 "	1 0			
0	line 439		"Line GATEWAY		138.0 to VALNCIA	138.0	Circuit 1"	
1.000	line	16724	16723	"1 "	1 0			
0	line 440		"Line GREENVLY		138.0 to CANOARCH	138.0	Circuit 1"	
1.000	line	16232	16227	"1 "	1 0			
0	line 441		"Line HARTT		138.0 to GREENVLY	138.0	Circuit 1"	
1.000	line	16242	16232	"1 "	1 0			
0	line 442		"Line IRVNGTN		138.0 to KINO	138.0	Circuit 1"	
1.000	line	16204	16246	"1 "	1 0			
0	line 443		"Line IRV_RING		138.0 to SOUTH	138.0	Circuit 1"	
1.000	line	16261	16216	"1 "	1 0			
0	line 444		"Line IRVNGTN		138.0 to TECHPARK	138.0	Circuit 1"	
1.000	line	16204	16233	"1 "	1 0			
0	line 445		"Line IRVNGTN		138.0 to TUCSON	138.0	Circuit 1"	
1.000	line	16204	16218	"1 "	1 0			
0	line 446		"Line IRVNGTN		138.0 to VAIL	138.0	Circuit 2"	
1.000	line	16204	16220	"2 "	1 0			
0	line 447		"Line KANTOR		138.0 to CANEZ	138.0	Circuit 1"	
1.000	line	16720	16721	"1 "	1 0			
0	line 448		"Line KANTOR		138.0 to TUBAC	138.0	Circuit 1"	
1.000	line	16720	16725	"1 "	1 0			
0	line_449		"Line LOSREALS		138.0 to VAIL	138.0	Circuit 1"	

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1.000	line	16223	16220	"1 "	1 0			
0	line 450		"Line MIDVALE		138.0 to RAYTHEON	138.0	Circuit 1"	
1.000	line	16206	16257	"1 "	1 0			
0	line 451		"Line MIDVALE		138.0 to SPNCER	138.0	Circuit 1"	
1.000	line	16206	16235	"1 "	1 0			
0	line 452		"Line N. LOOP		138.0 to NL. EXP	138.0	Circuit 1"	
1.000	line	16207	16999	"1 "	1 0			
0	line 453		"Line NL. EXP		138.0 to MARANA	138.0	Circuit 1"	
1.000	line	16999	16244	"1 "	1 0			
0	line 454		"Line N. LOOP		138.0 to RANVISTO	138.0	Circuit 1"	
1.000	line	16207	16209	"1 "	1 0			
0	line 455		"Line NL. EXP		138.0 to RILLITO	138.0	Circuit 1"	
1.000	line	16999	16210	"1 "	1 0			
0	line 456		"Line NL. EXP		138.0 to WESTINA	138.0	Circuit 1"	
1.000	line	16999	16221	"1 "	1 0			
0	line 457		"Line NE.LOOP		138.0 to NELP_SVC	138.0	Circuit 1"	
1.000	line	16208	16298	"1 "	1 0			
0	line 458		"Line NE.LOOP		138.0 to RILLITO	138.0	Circuit 1"	
1.000	line	16208	16210	"1 "	1 0			
0	line 459		"Line NOGALES		138.0 to KANTOR	138.0	Circuit 1"	
1.000	line	16719	16720	"1 "	1 0			
0	line 460		"Line ORNGROVE		138.0 to EASTINA	138.0	Circuit 1"	
1.000	line	16251	16254	"1 "	1 0			
0	line 461		"Line ORNGROVE		138.0 to LACANADA	138.0	Circuit 1"	
1.000	line	16251	16205	"1 "	1 0			
0	line 462		"Line ORNGROVE		138.0 to RILLITO	138.0	Circuit 1"	
1.000	line	16251	16210	"1 "	1 0			
0	line 463		"Line PANTANO		138.0 to LOSREALS	138.0	Circuit 1"	
1.000	line	16224	16223	"1 "	1 0			
0	line 464		"Line RANVISTO		138.0 to LACANADA	138.0	Circuit 1"	
1.000	line	16209	16205	"1 "	1 0			
0	line 465		"Line RANVISTO		138.0 to NARANJA	138.0	Circuit 1"	
1.000	line	16209	16245	"1 "	1 0			
0								

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line 466	"Line RANVISTO	138.0 to CATALINA	138.0 Circuit 1"	
1.000				
line 16209	16226 "1 " 1 0			
0				
line 467	"Line RAYTHEON	138.0 to MEDINA	138.0 Circuit 1"	
1.000				
line 16257	16255 "1 " 1 0			
0				
line 468	"Line RBWILMOT	138.0 to IRVNGTN	138.0 Circuit 1"	
1.000				
line 16222	16204 "1 " 1 0			
0				
line 469	"Line RBWILMOT	138.0 to VAIL	138.0 Circuit 1"	
1.000				
line 16222	16220 "1 " 1 0			
0				
line 470	"Line RILLITO	138.0 to LACANADA	138.0 Circuit 1"	
1.000				
line 16210	16205 "1 " 1 0			
0				
line 471	"Line ROBERTS	138.0 to HARRISON	138.0 Circuit 1"	
1.000				
line 16211	16247 "1 " 1 0			
0				
line 472	"Line S.TRAIL	138.0 to ROBERTS	138.0 Circuit 1"	
1.000				
line 16213	16211 "1 " 1 0			
0				
line 473	"Line SN.CRUIZ	138.0 to ANKLAM	138.0 Circuit 1"	
1.000				
line 16214	16253 "1 " 1 0			
0				
line 474	"Line SN.CRUIZ	138.0 to IRVNGTN	138.0 Circuit 1"	
1.000				
line 16214	16204 "1 " 1 0			
0				
line 475	"Line SNYDER	138.0 to CRYCROFT	138.0 Circuit 1"	
1.000				
line 16215	16239 "1 " 1 0			
0				
line 476	"Line SNYDER	138.0 to E. LOOP	138.0 Circuit 1"	
1.000				
line 16215	16202 "1 " 1 0			
0				
line 477	"Line SNYDER	138.0 to NE.LOOP	138.0 Circuit 1"	
1.000				
line 16215	16208 "1 " 1 0			
0				
line 478	"Line SONOITA	138.0 to VALNCIA	138.0 Circuit 1"	
1.000				
line 16722	16723 "1 " 1 0			
0				
line 479	"Line SOUTH	138.0 to ASARCO	138.0 Circuit 1"	
1.000				
line 16216	16225 "1 " 1 0			
0				
line 480	"Line SOUTH	138.0 to CYPRUS	138.0 Circuit 1"	
1.000				
line 16216	16228 "1 " 1 0			
0				
line 481	"Line SOUTH	138.0 to GREENVLY	138.0 Circuit 1"	
1.000				
line 16216	16232 "1 " 1 0			
0				
line 482	"Line SOUTH	138.0 to HARTT	138.0 Circuit 1"	
1.000				
line 16216	16242 "1 " 1 0			

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0				
line 483	"Line SOUTH	138.0 to MEDINA	138.0 Circuit 1"	
1.000				
line 16216	16255 "1 " 1 0			
0				
line 484	"Line SOUTH	138.0 to MIDVALE	138.0 Circuit 1"	
1.000				
line 16216	16206 "1 " 1 0			
0				
line 485	"Line SOUTH	138.0 to RAYTHEON	138.0 Circuit 1"	
1.000				
line 16216	16257 "1 " 1 0			
0				
line 486	"Line SOUTH	138.0 to SPNCER	138.0 Circuit 1"	
1.000				
line 16216	16235 "1 " 1 0			
0				
line 487	"Line SPNCER	138.0 to MEDINA	138.0 Circuit 1"	
1.000				
line 16235	16255 "1 " 1 0			
0				
line 488	"Line TECHPARK	138.0 to VAIL	138.0 Circuit 1"	
1.000				
line 16233	16220 "1 " 1 0			
0				
line 489	"Line TORTOLIT	138.0 to MARANA	138.0 Circuit 1"	
1.000				
line 16217	16244 "1 " 1 0			
0				
line 490	"Line TORTOLIT	138.0 to N. LOOP	138.0 Circuit 4"	
1.000				
line 16217	16207 "4 " 1 0			
0				
line 491	"Line TORTOLIT	138.0 to NL. EXP	138.0 Circuit 4"	
1.000				
line 16217	16999 "4 " 1 0			
0				
line 492	"Line TORTOLIT	138.0 to NL. EXP	138.0 Circuit 3"	
1.000				
line 16217	16999 "3 " 1 0			
0				
line 493	"Line TORTOLIT	138.0 to NL. EXP	138.0 Circuit 2"	
1.000				
line 16217	16999 "2 " 1 0			
0				
line 494	"Line TORTOLIT	138.0 to NL. EXP	138.0 Circuit 1"	
1.000				
line 16217	16999 "1 " 1 0			
0				
line 495	"Line TORTOLIT	138.0 to N. LOOP	138.0 Circuit 3"	
1.000				
line 16217	16207 "3 " 1 0			
0				
line 496	"Line TORTOLIT	138.0 to RANVISTO	138.0 Circuit 1"	
1.000				
line 16217	16209 "1 " 1 0			
0				
line 497	"Line TUBAC	138.0 to CANEZ	138.0 Circuit 1"	
1.000				
line 16725	16721 "1 " 1 0			
0				
line 498	"Line TUCSON	138.0 to DELCERRO	138.0 Circuit 1"	
1.000				
line 16218	16229 "1 " 1 0			
0				
line 499	"Line TUCSON	138.0 to KINO	138.0 Circuit 1"	
1.000				

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0	line 16218	16246	"1 " 1 0		
0	line 500	"Line TWNTYSEC	138.0 to E. LOOP	138.0	Circuit 1"
1.000	line 16219	16202	"1 " 1 0		
0	line 501	"Line TWNTYSEC	138.0 to IRVNGTN	138.0	Circuit 1"
1.000	line 16219	16204	"1 " 1 0		
0	line 502	"Line UA MED	138.0 to KINO	138.0	Circuit 1"
1.000	line 16256	16246	"1 " 1 0		
0	line 503	"Line UA MED	138.0 to TUCSON	138.0	Circuit 1"
1.000	line 16256	16218	"1 " 1 0		
0	line 504	"Line VAIL	138.0 to CIENEGA	138.0	Circuit 1"
1.000	line 16220	16243	"1 " 1 0		
0	line 505	"Line VAIL	138.0 to FT.HUACH	138.0	Circuit 1"
1.000	line 16220	16230	"1 " 1 0		
0	line 506	"Line VAIL	138.0 to NOGALES	138.0	Circuit 1"
1.000	line 16220	16719	"1 " 1 0		
0	line 507	"Line VAIL	138.0 to S.TRAIL	138.0	Circuit 1"
1.000	line 16220	16213	"1 " 1 0		
0	line 508	"Line BLACKMTN	115.0 to SPNCER	115.0	Circuit 1"
1.000	line 19201	16414	"1 " 1 0		
0	line 509	"Line ROSEMONT	138.0 to GRTRVL	138.0	Circuit 1"
1.000	line 16920	16259	"1 " 1 0		
0	line 510	"Line SANRIT_S	138.0 to GREENVLY	138.0	Circuit 1"
1.000	line 16258	16232	"1 " 1 0		
0	line 511	"Line SANRIT_S	138.0 to HARTT	138.0	Circuit 1"
1.000	line 16258	16242	"1 " 1 0		
0	line 512	"Line SANRIT_S	138.0 to ROSEMONT	138.0	Circuit 1"
1.000	line 16258	16920	"1 " 1 0		
1.000	line 16258	16920	"1 " 2 0		
0	line 513	"Line SOUTH	138.0 to SANRIT_S	138.0	Circuit 1"
1.000	line 16216	16258	"1 " 1 0		
0	line 514	"Line TORTOLIT	138.0 to NARANJA	138.0	Circuit 1"
1.000	line 16217	16245	"1 " 1 0		
0	line 515	"Line SOUTH	138.0 to CLEAR	138.0	Circuit 1"
1.000	line 16216	16260	"1 " 1 0		
0					

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0	line 516	"Line CANOARCH	138.0 to CLEAR	138.0	Circuit 1"
1.000	line 16227	16260	"1 " 1 0		
0	line 517	"Line CYPRUS	138.0 to CLEAR	138.0	Circuit 1"
1.000	line 16228	16260	"1 " 1 0		
0	line 518	"Line KANTOR	115.0 to CANEZ	115.0	Circuit 1"
1.000	line 16700	16701	"1 " 1 0		
0	line 519	"Line CANEZ	115.0 to SONOITA	115.0	Circuit 1"
1.000	line 16701	16702	"1 " 1 0		
0	line 520	"Line SONOITA	115.0 to VALNCIA	115.0	Circuit 1"
1.000	line 16702	16703	"1 " 1 0		
0	line 521	"Line GATEWAY	115.0 to VALNCIA	115.0	Circuit 1"
1.000	line 16704	16703	"1 " 1 0		
0	line 522	"Line NOGALES	115.0 to KANTOR	115.0	Circuit 1"
1.000	line 19221	16700	"1 " 1 0		
0	line 523	"Line SAG.EAST	115.0 to MARANATP	115.0	Circuit 1"
1.000	line 14356	17013	"1 " 1 0		
0	line 524	"Line APACHE	230.0 to BUTERFLD	230.0	Circuit 1"
1.000	line 17002	17007	"1 " 1 0		
1.000	shunt "NEWTUCSN	230.00" "b1"	1 .1440		
1.000	shunt "NEWTUCSN	230.00" "b2"	1 .0720		
1.000	shunt "KARTCHNR	69.00" "b1"	1 .1800		
1.000	shunt "KARTCHNR	69.00" "b2"	1 .1440		
0	line 525	"Line APACHE	230.0 to RED TAIL	230.0	Circuit 1"
1.000	line 17002	17018	"1 " 1 0		
1.000	shunt "RED TAIL	230.00" "b "	1 .1280		
0	line 526	"Line APACHE	230.0 to WINCHSTR	230.0	Circuit 1"
1.000	line 17002	17105	"1 " 1 0		
0	line 527	"Line BICKNELL	115.0 to THREEPNT	115.0	Circuit 1"
1.000	line 17006	17022	"1 " 1 0		
0	line 528	"Line BUTERFLD	230.0 to SAN RAF	230.0	Circuit 1"
1.000	line 17007	17020	"1 " 1 0		
0	line 529	"Line DOSCONDO	230.0 to HACKBERY	230.0	Circuit 1"
1.000	line 17008	17044	"1 " 1 0		
0	line 530	"Line PANTANO	115.0 to KARTCHNR	115.0	Circuit 1"
1.000	line 17015	17039	"1 " 1 0		
0	line 531	"Line PANTANO	230.0 to NEWTUCSN	230.0	Circuit 1"
1.000					

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line 17016 17676 "1 " 1 0
0
line 532 1.000 "Line THREEPNT 115.0 to VALEN-SW 115.0 Circuit 1"
line 17022 17023 "1 " 1 0
0
line 533 1.000 "Line APACHE 115.0 to SNM1 115.0 Circuit 1"
line 17001 17037 "1 " 1 0
0
line 534 1.000 "Line AVRA 115.0 to SNDARIO 115.0 Circuit 1"
line 17003 17089 "1 " 1 0
0
line 535 1.000 "Line BUTERFLD 230.0 to PANTANO 230.0 Circuit 1"
line 17007 17016 "1 " 1 0
0
line 537 1.000 "Line MARANA 115.0 to AVRA 115.0 Circuit 1"
line 17012 17003 "1 " 1 0
shunt "AVRA 115.00" "b1" 1 .1890
0
line 538 1.000 "Line MARANATP 115.0 to MARANA 115.0 Circuit 1"
line 17013 17012 "1 " 1 0
shunt "AVRA 115.00" "b1" 1 .1890
shunt "AVRA 115.00" "b2" 1 .1890
0
line 539 1.000 "Line MORENCI 230.0 to PD-MORNC 230.0 Circuit 1"
line 17014 16903 "1 " 1 0
0
line 540 1.000 "Line MORENCI 230.0 to GREEN-SW 230.0 Circuit 1"
line 17014 17009 "1 " 1 0
0
line 541 1.000 "Line RED TAIL 230.0 to DOSCONDO 230.0 Circuit 1"
line 17018 17008 "1 " 1 0
0
line 542 1.000 "Line THREEPNT 115.0 to SNDARIO 115.0 Circuit 1"
line 17022 17089 "1 " 1 0
0
line 543 1.000 "Line SNM1 115.0 to SNMANUEL 115.0 Circuit 1"
line 17037 14358 "1 " 1 0
0
line 544 1.000 "Line SNM1 115.0 to HAYDENAZ 115.0 Circuit 1"
line 17037 15108 "1 " 1 0
0
line 545 1.000 "Line HACKBERY 230.0 to MORENCI 230.0 Circuit 1"
line 17044 17014 "1 " 1 0
0
line 546 1.000 "Line SAHUARIT 230.0 to BICKNELL 230.0 Circuit 1"
line 17102 17004 "1 " 1 0
0
line 547 1.000 "Line S.BRKRCH 115.0 to SNMANUEL 115.0 Circuit 1"
line 17608 14358 "1 " 1 0
0
line 548 1.000 "Line NEWTUCSN 230.0 to SAHUARIT 230.0 Circuit 1"

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line 17676 17102 "1 " 1 0
0
line 550 1.000 "Line BICKNELL 345.0 to VAIL 345.0 Circuit 1"
line 17005 16105 "1 " 1 0
0
line 552 1.000 "Line MARANATP 115.0 to RATTLSNK 115.0 Circuit 1"
line 17013 19210 "1 " 1 0
0
line 553 1.000 "Line DAVIS 230.0 to RIVIERA 230.0 Circuit 1"
line 19022 17087 "1 " 1 0
0
line 554 1.000 "Line ORACLE 115.0 to S.BRKRCH 115.0 Circuit 1"
line 19057 17608 "1 " 1 0
0
line 555 1.000 "Line ADAMS TP 115.0 to APACHE 115.0 Circuit 1"
line 19060 17001 "1 " 1 0
0
line 556 1.000 "Line BROWNING 230.0 to SANTAN 230.0 Circuit 1"
line 15222 15213 "1 " 1 0
0
line 557 1.000 "Line KYRENE 500.0 to BROWNING 500.0 Circuit 1"
line 15011 15051 "1 " 1 0
0
#line_558 1.000 "Line PERK PS2 500.0 to PERKINPS 500.0 Circuit 1"
# line 15032 15033 "1 " 1 0
#0
#line_559 1.000 "Line PERKINPS 500.0 to PERK PS1 500.0 Circuit 1"
# line 15033 15031 "1 " 1 0
#0
#line_560 1.000 "Line PERKINS 500.0 to PERKINPS 500.0 Circuit 1"
# line 15034 15033 "1 " 1 0
#0
line 561 1.000 "Line BROWNING 500.0 to SILVERKG 500.0 Circuit 1"
line 15051 15041 "1 " 1 0
0
line 562 1.000 "Line PINAL_C 500.0 to DUKE 500.0 Circuit 1"
line 15080 15087 "1 " 1 0
0
line 563 1.000 "Line PINAL_W 500.0 to DUKE 500.0 Circuit 1"
line 15088 15087 "1 " 1 0
0
line 564 1.000 "Line HASSYAMP 500.0 to MESQUIT2 500.0 Circuit 2"
line 15090 15091 "2 " 1 0
0
line 565 1.000 "Line ASARCOSR 115.0 to ASARCOTP 115.0 Circuit 1"
line 15101 15102 "1 " 1 0
0
line 566 1.000 "Line ASARCOTP 115.0 to HAYDENAZ 115.0 Circuit 1"
line 15102 15108 "1 " 1 0
0
line_567 "Line ASARCOTP 115.0 to CRUSHER 115.0 Circuit 1"

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1.000
line 15102 15138 "1 " 1 0
0
line 568 "Line BONNEYTP 115.0 to CRUSHER 115.0 Circuit 1"
1.000
line 15103 15138 "1 " 1 0
0
line 569 "Line CARLOTA 115.0 to PINTOVLY 115.0 Circuit 1"
1.000
line 15104 15121 "1 " 1 0
0
line 570 "Line CARLOTA 115.0 to SILVERK2 115.0 Circuit 1"
1.000
line 15104 15125 "1 " 1 0
0
line 571 "Line FRAZIER 115.0 to HORSMESA 115.0 Circuit 1"
1.000
line 15106 15109 "1 " 1 0
0
line 572 "Line GOLDFELD 115.0 to 461E5.1N 115.0 Circuit 1"
1.000
line 15107 15139 "1 " 1 0
0
line 573 "Line GASCLEAN 115.0 to 843E2.7N 115.0 Circuit 1"
1.000
line 15110 15133 "1 " 1 0
0
line 574 "Line KEARNY 115.0 to KEARNYTP 115.0 Circuit 1"
1.000
line 15111 15112 "1 " 1 0
0
line 575 "Line MIAMI 115.0 to MIAMI 3 115.0 Circuit 1"
1.000
line 15114 15137 "1 " 1 0
0
line 576 "Line OAKFLAT 115.0 to TRASK 115.0 Circuit 1"
1.000
line 15118 15131 "1 " 1 0
0
line 577 "Line SILVERK2 115.0 to PINTOVLY 115.0 Circuit 1"
1.000
line 15125 15121 "1 " 1 0
0
line 578 "Line SUPERIOR 115.0 to TRASK 115.0 Circuit 1"
1.000
line 15129 15131 "1 " 1 0
0
line 579 "Line CARREL 115.0 to GOLDFELD 115.0 Circuit 1"
1.000
line 15130 15107 "1 " 1 0
0
line 580 "Line CARREL 115.0 to SPURLOCK 115.0 Circuit 1"
1.000
line 15130 15127 "1 " 1 0
0
line 581 "Line MIAMI 4 115.0 to 843E2.7N 115.0 Circuit 1"
1.000
line 15135 15133 "1 " 1 0
0
line 582 "Line MIAMI 3 115.0 to PINAL 115.0 Circuit 1"
1.000
line 15137 15119 "1 " 1 0
0
line 583 "Line MIAMI 3 115.0 to MIAMI 4 115.0 Circuit 1"
1.000
line 15137 15135 "1 " 1 0
0

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line 584 "Line 461E5.1N 115.0 to MRMNPLAT 115.0 Circuit 1"
1.000
line 15139 15117 "1 " 1 0
0
line 585 "Line 461E5.1N 115.0 to STEWMTN1 115.0 Circuit 1"
1.000
line 15139 15128 "1 " 1 0
0
line 586 "Line MESQUITE 230.0 to MESQUI S 230.0 Circuit 1"
1.000
line 15163 15156 "1 " 1 0
0
line 587 "Line MESQUITE 230.0 to MESQUI S 230.0 Circuit 2"
1.000
line 15163 15156 "2 " 1 0
0
line 588 "Line SANTAN 230.0 to RS-24 230.0 Circuit 1"
1.000
line 15213 15225 "1 " 1 0
0
line 589 "Line SCHRADER 230.0 to RS-24 230.0 Circuit 1"
1.000
line 15214 15225 "1 " 1 0
0
line 590 "Line BROWNING 230.0 to DINOSAUR 230.0 Circuit 1"
1.000
line 15222 15223 "1 " 1 0
0
line 591 "Line ABEL 230.0 to RS-24 230.0 Circuit 2"
1.000
line 15224 15225 "2 " 1 0
0
line 592 "Line LIBERTY 230.0 to RUDD 230.0 Circuit 1"
1.000
line 19052 15230 "1 " 1 0
0
line 593 "Line HASSYAMP 500.0 to HDWSH 500.0 Circuit 1"
1.000
line 15090 14013 "1 " 1 0
0
line 594 "Line Q043B1 500.0 to HDWSH 500.0 Circuit 1"
1.000
line 94350 14013 "1 " 1 0
0
line 595 "Line Q043B2 500.0 to HDWSH 500.0 Circuit 1"
1.000
line 94360 14013 "1 " 1 0
0
line 596 "Line Q044 230.0 to GILARIVR 230.0 Circuit 1"
1.000
line 94410 14238 "1 " 1 0
0
line 597 "Line PRESCOTT 115.0 to BAGCAP 115.0 Circuit 1"
1.000
line 14355 14361 "1 " 1 0
0
line 598 "Line BAGCAP 115.0 to BAGDAD 115.0 Circuit 1"
1.000
line 14361 14351 "1 " 1 0
tran 14351 85646 "1 " 0 0
shunt "BAGCAP 115.00" "b1" 1 0
shunt "BAGCAP 115.00" "b3" 1 0
load "BAGDAD 115.00" "AP" 0
load "BAGDAD 12.50" "AP" 0
0
line 599 "Line EAGLEYE 230.0 to BUCKEYE2 230.0 Circuit 1"
1.000

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line 14209 14213 "1 " 1 0
0
line 600 "Line BUCKEYE2 230.0 to LIBERTY 230.0 Circuit 1"
1.000
line 14213 19052 "1 " 1 0
0
line 601 "Line BOUSE 161.0 to BLACK PK 161.0 Circuit 1"
1.000
line 19046 14301 "1 " 1 0
0
line 602 "Line TS12 230.0 to SAGUARO 230.0 Circuit 1"
1.000
line 14277 14225 "1 " 1 0
0
line 603 "Line MILLIGAN 230.0 to TS12 230.0 Circuit 1"
1.000
line 14271 14277 "1 " 1 0
0
line 604 "Line WILLOW 500.0 to PINAL_C 500.0 Circuit 1"
1.000
line 16012 15080 "1 " 1 0
0
line 605 "Line WILLOW 500.0 to PINAL_C 500.0 Circuit 2"
1.000
line 16012 15080 "2 " 1 0
0
line 606 "Line WILLOW 500.0 to SUNZIA S 500.0 Circuit 1"
1.000
line 16012 16020 "1 " 1 0
0
line 607 "Line WILLOW 500.0 to SUNZIA S 500.0 Circuit 2"
1.000
line 16012 16020 "2 " 1 0
0
line 608 "Line SUNZIA E 500.0 to SUNZIA S 500.0 Circuit 1"
1.000
line 16030 16020 "1 " 1 0
0
line 609 "Line SUNZIA E 500.0 to SUNZIA S 500.0 Circuit 2"
1.000
line 16030 16020 "2 " 1 0
0
tran 610 "Tran GALLEGOS 230.00 to GALLEGOS 115.00 Circuit 1
0.00" 1.000
tran 10111 19700 "1 " 0 -1
0
tran 611 "Tran SAN_JUAN 230.00 to HOGBAK 115.00 Circuit 1
0.00" 1.000
tran 10291 19572 "1 " 0 -1
0
tran 612 "Tran WESTWING 500.00 to WESTWNGW 230.00 Circuit
2WESTWG 4 34.50" 1.000
tran 14005 14231 "2 " 0 14409
0
tran 613 "Tran WESTWING 500.00 to WESTWNGW 230.00 Circuit
3WESTWG10 34.50" 1.000
tran 14005 14231 "3 " 0 14410
0
tran 614 "Tran WESTWING 500.00 to WESTWNGE 230.00 Circuit
1WESTWG 1 34.50" 1.000
tran 14005 14259 "1 " 0 14408
line 14231 14259 "1 " 1 1 /* "Line WESTWNGW 230.0 to
WESTWNGE 230.0 Circuit 1" */
0
tran 615 "Tran GILARIVR 500.00 to GILARIVR 230.00 Circuit 1
0.00" 1.000
tran 14007 14238 "1 " 0 -1

```

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```

0
tran 616 "Tran PNPKAPS 500.00 to PPAPS W 230.00 Circuit 1PP
W 34.50" 1.000
tran 14016 14221 "1 " 0 85739
0
tran 617 "Tran PNPKAPS 500.00 to PPAPS E 230.00 Circuit 1PP
E 34.50" 1.000
tran 14016 14261 "1 " 0 85737
0
tran 618 "Tran PNPKAPS 500.00 to PPAPS N 230.00 Circuit 1PP
N 34.50" 1.000
tran 14016 14278 "1 " 0 85738
0
tran 619 "Tran N.GILA 500.00 to N.GILA 230.00 Circuit
1N.GIL10T 34.50" 1.000
tran 22536 14267 "1 " 0 85795
0
tran 620 "Tran PNPKAPS 345.00 to PPAPS C 230.00 Circuit
1PNPK 7T 14.40" 1.000
tran 14102 14260 "1 " 0 85911
0
tran 621 "Tran PNPKAPS 345.00 to PPAPS E 230.00 Circuit
3PNPK T14 14.40" 1.000
tran 14102 14261 "3 " 0 14402
0
tran 622 "Tran PNPKAPS 345.00 to PPAPS N 230.00 Circuit
2PNPK T4 14.40" 1.000
tran 14102 14278 "2 " 0 14403
0
tran 623 "Tran SAGUARO 230.00 to SAG.EAST 115.00 Circuit
1SAG 10T 12.50" 1.000
tran 14225 14356 "1 " 0 85915
0
tran 624 "Tran SAGUARO 230.00 to SAG.WEST 115.00 Circuit
1SAG 1T 12.50" 1.000
tran 14225 14357 "1 " 0 85921
0
tran 625 "Tran KYRENE 500.00 to KYR-NEW 230.00 Circuit
6KYRENE6 34.50" 1.000
tran 15011 14236 "6 " 0 15013
0
tran 626 "Tran KYRENE 500.00 to KYRENE 230.00 Circuit
7KYRENE7 34.50" 1.000
tran 15011 15207 "7 " 0 15015
0
tran 627 "Tran KYRENE 500.00 to KYRENE 230.00 Circuit
8KYRENE8 34.50" 1.000
tran 15011 15207 "8 " 0 15017
0
tran 628 "Tran SILVERKG 500.00 to SILVERKG 230.00 Circuit
1SILVERKG 34.50" 1.000
tran 15041 15215 "1 " 0 15043
0
tran 629 "Tran BROWNING 500.00 to BROWNING 230.00 Circuit
1BROWNIN1 12.47" 1.000
tran 15051 15222 "1 " 0 15053
0
tran 630 "Tran BROWNING 500.00 to BROWNING 230.00 Circuit
2BROWNIN2 12.47" 1.000
tran 15051 15222 "2 " 0 15055
0
tran 631 "Tran RUDD 500.00 to RUDD 230.00 Circuit
1RUDD1 12.47" 1.000
tran 15061 15230 "1 " 0 15063
0
tran 632 "Tran RUDD 500.00 to RUDD 230.00 Circuit
2RUDD2 12.47" 1.000

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tran 15061 15230 "2 " 0 15064
0
tran 633 "Tran RUDD 500.00 to RUDD 230.00 Circuit
3RUDD3 12.47" 1.000
tran 15061 15230 "3 " 0 15066
0
tran 634 "Tran RUDD 500.00 to RUDD 230.00 Circuit 4
0.00" 1.000
tran 15061 15230 "4 " 0 -1
0
tran 635 "Tran ABEL 500.00 to ABEL 230.00 Circuit 1
0.00" 1.000
tran 15070 15224 "1 " 0 -1
0
tran 636 "Tran ABEL 500.00 to ABEL 230.00 Circuit 2
0.00" 1.000
tran 15070 15224 "2 " 0 -1
0
tran 637 "Tran PINAL_C 500.00 to PINAL_C 230.00 Circuit 1
0.00" 1.000
tran 15080 15231 "1 " 0 -1
0
tran 638 "Tran PINAL_C 500.00 to PINAL_C 230.00 Circuit 2
0.00" 1.000
tran 15080 15231 "2 " 0 -1
0
tran 639 "Tran MESQUITE 500.00 to MESQUITE 230.00 Circuit 1
0.00" 1.000
tran 15094 15163 "1 " 0 -1
0
tran 640 "Tran GOLDFELD 230.00 to GOLDFELD 115.00 Circuit 1
0.00" 1.000
tran 15206 15107 "1 " 0 -1
0
tran 641 "Tran GOLDFELD 230.00 to GOLDFELD 115.00 Circuit 2
0.00" 1.000
tran 15206 15107 "2 " 0 -1
0
tran 642 "Tran SILVERKG 230.00 to SILVERK1 115.00 Circuit 1
0.00" 1.000
tran 15215 15124 "1 " 0 -1
0
tran 643 "Tran SILVERKG 230.00 to SILVERK2 115.00 Circuit 1
0.00" 1.000
tran 15215 15125 "1 " 0 -1
0
tran 644 "Tran COPPERVR 345.00 to COPPERVR 230.00 Circuit 1
0.00" 1.000
tran 16900 16901 "1 " 0 -1
0
tran 645 "Tran COPPERVR 345.00 to COPPERVR 230.00 Circuit 2
0.00" 1.000
tran 16900 16901 "2 " 0 -1
0
tran 646 "Tran MEAD S 230.00 to MEAD 287.00 Circuit 1
0.00" 1.000
tran 19012 26051 "1 " 0 -1
0
tran 647 "Tran MEAD 345.00 to MEAD N 230.00 Circuit 1
0.00" 1.000
tran 19037 19011 "1 " 0 -1
0
tran 648 "Tran MEAD 500.00 to MEAD N 230.00 Circuit 1
0.00" 1.000
tran 19038 19011 "1 " 0 -1
0
tran_649 "Tran MEAD 500.00 to MEAD N 230.00 Circuit 2

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11_BTA.otg                                     10/19/2011
0.00" 1.000
tran 19038 19011 "2 " 0 -1
0
tran 650 "Tran PARKER 161.00 to PARKER 230.00 Circuit 1
0.00" 1.000
tran 19041 19042 "1 " 0 -1
0
tran 651 "Tran PARKER 161.00 to PARKER 230.00 Circuit 2
0.00" 1.000
tran 19041 19042 "2 " 0 -1
0
tran 652 "Tran COOLIDGE 230.00 to COOLIDGE 115.00 Circuit 1
0.00" 1.000
tran 19045 19044 "1 " 0 -1
0
tran 653 "Tran COOLIDGE 230.00 to COOLIDGE 115.00 Circuit 2
0.00" 1.000
tran 19045 19044 "2 " 0 -1
0
tran 654 "Tran GILA 161.00 to GILA 230.00 Circuit 1
0.00" 1.000
tran 19050 19124 "1 " 0 -1
0
tran 655 "Tran LIBERTY 345.00 to LIBTYPHS 230.00 Circuit 1
0.00" 1.000
tran 19053 19054 "1 " 0 -1
line 19053 19315 "1 " 1 0
line 19053 19315 "1 " 2 0
0
tran 656 "Tran NGL-E 230.00 to N.GILA 500.00 Circuit 1
0.00" 1.000
tran 19125 22536 "1 " 0 -1
0
tran 657 "Tran NGL-W 230.00 to N.GILA 500.00 Circuit 1
0.00" 1.000
tran 19126 22536 "1 " 0 -1
0
tran 658 "Tran CASAGRND 230.00 to CASAGRND 115.00 Circuit 1
0.00" 1.000
tran 19218 19222 "1 " 0 -1
0
tran 659 "Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
0.00" 1.000
tran 19315 19314 "1 " 0 -1
0
tran 660 "Tran GLEN PS 230.00 to GLENCANY 230.00 Circuit 1
0.00" 1.000
tran 79028 79031 "1 " 0 -1
0
tran 661 "Tran GLENCANY 345.00 to GLENCANY 230.00 Circuit 1
0.00" 1.000
tran 79032 79031 "1 " 0 -1
0
tran 662 "Tran GLENCANY 345.00 to GLENCANY 230.00 Circuit 2
0.00" 1.000
tran 79032 79031 "2 " 0 -1
0
tran 663 "Tran PINPKBRB 345.00 to PINPK 230.00 Circuit 1
0.00" 1.000
tran 79053 19062 "1 " 0 -1
0
tran 664 "Tran PINPKBRB 345.00 to PINPK 230.00 Circuit 2
0.00" 1.000
tran 79053 19062 "2 " 0 -1
0
tran 665 "Tran PINPKBRB 345.00 to PINPK 230.00 Circuit 3
0.00" 1.000

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tran 79053 19062 "3 " 0 -1
0
tran 666 "Tran SHIP PS 230.00 to SHIPROCK 230.00 Circuit 1
0.00" 1.000
tran 79061 79063 "1 " 0 -1
0
tran 667 "Tran SHIPROCK 230.00 to SHIPROCK 115.00 Circuit 1
0.00" 1.000
tran 79063 79062 "1 " 0 -1
0
tran 668 "Tran SHIPROCK 345.00 to SHIPROCK 230.00 Circuit 1
0.00" 1.000
tran 79064 79063 "1 " 0 -1
0
tran 669 "Tran LIBTYPHS 230.00 to LIBERTY 230.00 Circuit 2
0.00" 1.000
tran 19054 19052 "2 " 0 -1
0
tran 670 "Tran CORONADO 500.00 to CORONADO 345.00 Circuit 1
0.00" 1.000
tran 15001 16100 "1 " 0 -1
0
tran 671 "Tran CORONADO 500.00 to CORONADO 345.00 Circuit 2
0.00" 1.000
tran 15001 16100 "2 " 0 -1
0
tran 672 "Tran PINAL_W 500.00 to PINALWES 345.00 Circuit 1
0.00" 1.000
tran 15088 16114 "1 " 0 -1
0
tran 673 "Tran TORTOLIT 500.00 to TORTOLIT 345.00 Circuit 1
0.00" 1.000
tran 16000 16115 "1 " 0 -1
0
tran 674 "Tran WESTWING 500.00 to WESTWING 345.00 Circuit
1WESTWING 34.50" 1.000
tran 14005 16107 "1 " 0 16637
0
tran 675 "Tran MCKINLEY 345.00 to YAHTAHEY 115.00 Circuit 1
0.00" 1.000
tran 16102 10382 "1 " 0 -1
0
tran 676 "Tran SOUTH 345.00 to SOUTH 138.00 Circuit
1SOUTH2 13.80" 1.000
tran 16103 16216 "1 " 0 16627
0
tran 677 "Tran SOUTH 345.00 to SOUTH 138.00 Circuit
2SOUTH2 13.80" 1.000
tran 16103 16216 "2 " 0 16627
0
tran 678 "Tran VAIL 345.00 to VAIL 138.00 Circuit
1VAIL 13.80" 1.000
tran 16105 16220 "1 " 0 16630
0
tran 679 "Tran VAIL 345.00 to VAIL 138.00 Circuit
3VAIL 13.80" 1.000
tran 16105 16220 "3 " 0 16630
0
tran 680 "Tran VAIL2 345.00 to VAIL 138.00 Circuit 1
0.00" 1.000
tran 16106 16220 "1 " 0 -1
0
tran 681 "Tran VAIL2 345.00 to VAIL 138.00 Circuit 2
0.00" 1.000
tran 16106 16220 "2 " 0 -1
0
tran_682 "Tran GATEWAY 138.00 to GATEWAY 345.00 Circuit 1

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0.00" 1.000
tran 16724 16108 "1 " 0 -1
0
tran 683 "Tran IRVMID3 138.00 to IRVNGTN 138.00 Circuit 1
0.00" 1.000
tran 16333 16204 "1 " 0 -1
0
tran 684 "Tran IRVMID4 138.00 to IRVNGTN 138.00 Circuit 1
0.00" 1.000
tran 16334 16204 "1 " 0 -1
0
tran 685 "Tran SPNCER 138.00 to SPNCER 115.00 Circuit
1SPNCER 13.80" 1.000
tran 16235 16414 "1 " 0 16669
0
tran 686 "Tran TORTOLIT 138.00 to SAG.EAST 115.00 Circuit 1
0.00" 1.000
tran 16217 14356 "1 " 0 -1
0
tran 687 "Tran TORTOLIT 138.00 to SAG.WEST 115.00 Circuit 1
0.00" 1.000
tran 16217 14357 "1 " 0 -1
0
tran 688 "Tran TORTOLIT 138.00 to TORTLIT2 500.00 Circuit 1
0.00" 1.000
tran 16217 16001 "1 " 0 -1
0
tran 689 "Tran TORTOLIT 138.00 to TORTOLIT 500.00 Circuit 1
0.00" 1.000
tran 16217 16000 "1 " 0 -1
0
tran 690 "Tran TORTOLIT 138.00 to TORTOLIT 500.00 Circuit 2
0.00" 1.000
tran 16217 16000 "2 " 0 -1
0
tran 691 "Tran TORTOLIT 138.00 to TORTOLIT 500.00 Circuit 3
0.00" 1.000
tran 16217 16000 "3 " 0 -1
0
tran 692 "Tran TORTOLIT 138.00 to TORTOLIT 500.00 Circuit 4
0.00" 1.000
tran 16217 16000 "4 " 0 -1
0
tran 693 "Tran MCKINLEY 345.00 to YAHTAHEY 115.00 Circuit 2
0.00" 1.000
tran 16102 10382 "2 " 0 -1
0
tran 694 "Tran APACHE 230.00 to APACHE 115.00 Circuit 1
0.00" 1.000
tran 17002 17001 "1 " 0 -1
0
tran 695 "Tran APACHE 230.00 to APACHE 115.00 Circuit 2
0.00" 1.000
tran 17002 17001 "2 " 0 -1
0
tran 696 "Tran BICKNELL 230.00 to BICKNELL 115.00 Circuit 1
0.00" 1.000
tran 17004 17006 "1 " 0 -1
0
tran 697 "Tran BICKNELL 230.00 to BICKNELL 115.00 Circuit 2
0.00" 1.000
tran 17004 17006 "2 " 0 -1
0
tran 698 "Tran BICKNELL 345.00 to BICKNELL 230.00 Circuit 1
0.00" 1.000
tran 17005 17004 "1 " 0 -1
0

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11_BTA.otg                                10/19/2011
tran 700      "Tran GREEN-SW      345.00 to GREEN-SW      230.00 Circuit 1
0.00" 1.000
tran 17010    17009 "1 " 0      -1
0
tran 701      "Tran GREEN-SW      345.00 to GREEN-SW      230.00 Circuit 2
0.00" 1.000
tran 17010    17009 "2 " 0      -1
0
tran 702      "Tran PANTANO        230.00 to PANTANO        115.00 Circuit 1
0.00" 1.000
tran 17016    17015 "1 " 0      -1
0
tran 703      "Tran WINCHSTR       345.00 to WINCHSTR       230.00 Circuit 1
0.00" 1.000
tran 16109    17105 "1 " 0      -1
0
#tran_704     "Tran PERKINS        500.00 to PERK PS1      500.00 Circuit 1
0.00" 1.000
# tran 15034   15031 "1 " 0      -1
#0
#tran_705     "Tran PERKINS        500.00 to PERK PS2      500.00 Circuit 1
0.00" 1.000
# tran 15034   15032 "1 " 0      -1
#0
tran 706      "Tran RUDD           500.00 to RUDD          230.00 Circuit
3ARUDD 3a    34.50" 1.000
tran 15061    15230 "3A" 0      15068
0
tran 707      "Tran DUKE           500.00 to TESTTRAK     230.00 Circuit 1
0.00" 1.000
tran 15087    19068 "1 " 0      -1
0
tran 708      "Tran DUKE           500.00 to TESTTRAK     230.00 Circuit 2
0.00" 1.000
tran 15087    19068 "2 " 0      -1
0
tran_709      "Tran MESQUIT2       500.00 to MESQUITE      230.00 Circuit 2
0.00" 1.000
tran 15091    15163 "2 " 0      -1
0
tran 710      "Tran PRESCOTT       230.00 to PRESCOTT      115.00 Circuit
1PRECT1T     12.50" 1.000
tran 14222    14355 "1 " 0      85913
0
tran 711      "Tran PRESCOTT       230.00 to PRESCOTT      115.00 Circuit
2PRECT2T     12.50" 1.000
tran 14222    14355 "2 " 0      85914
0
#tran_712     "Tran SNMANUEL       115.00 to SNMANUEL      100.00 Circuit 1
0.00" 1.000
# tran 14358   14550 "1 " 0      -1
#0
tran 713      "Tran FOURCORN       500.00 to FOURCORN     345.00 Circuit 14C
1AA T        13.80" 1.000
tran 14001    14101 "1 " 0      85903
0
tran 714      "Tran FOURCORN       345.00 to FOURCORN     230.00 Circuit
1FOURCN4T    14.40" 1.000
tran 14101    14211 "1 " 0      85909
0
tran 715      "Tran FOURCORN       345.00 to FOURCORN     230.00 Circuit
2FOURCN8T    14.40" 1.000
tran 14101    14211 "2 " 0      85910
0
tran 716      "Tran CHOLLA         500.00 to CHOLLA       345.00 Circuit
1CHOLLA3T    34.50" 1.000
tran 14000    14100 "1 " 0      85901

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11_BTA.otg                                10/19/2011
0
tran 717      "Tran CHOLLA         500.00 to CHOLLA       345.00 Circuit
2CHOLLA6T    34.50" 1.000
tran 14000    14100 "2 " 0      85902
0
tran 718      "Tran CHOLLA         345.00 to CHOLLA       230.00 Circuit
1CHOLLA7T    12.50" 1.000
tran 14100    14204 "1 " 0      85908
0
tran 719      "Tran MORGAN         500.00 to RACEWAY       230.00 Circuit
1MOR1        34.50" 1.000
tran 14011    14246 "1 " 0      85740
0
tran 720      "Tran MORGAN         500.00 to RACEWAY       230.00 Circuit
2MOR2        34.50" 1.000
tran 14011    14246 "2 " 0      85741
0
tran 721      "Tran YAVAPAI        500.00 to YAVAPAI      230.00 Circuit
1YAVAP 1T    12.47" 1.000
tran 14006    14234 "1 " 0      85906
0
tran 722      "Tran YAVAPAI        500.00 to YAVAPAI      230.00 Circuit
2YAVAP 3T    12.47" 1.000
tran 14006    14234 "2 " 0      85907
0
tran 723      "Tran SAGUARO        500.00 to SAG.EAST     115.00 Circuit
1SAGUAR7T    34.50" 1.000
tran 14004    14356 "1 " 0      85904
0
tran 724      "Tran SAGUARO        500.00 to SAG.WEST     115.00 Circuit
1SAGUAR4T    34.50" 1.000
tran 14004    14357 "1 " 0      85905
0
tran 725      "Tran SNVLY          500.00 to SNVLY        230.00 Circuit
1SNVLYT1T    12.47" 1.000
tran 14010    14265 "1 " 0      85988
0
tran 726      "Tran SNVLY          500.00 to SNVLY        230.00 Circuit
2SNVLYT2T    12.47" 1.000
tran 14010    14265 "2 " 0      85989
0
tran 727      "Tran SUNZIA S       500.00 to LUNA         345.00 Circuit 1
0.00" 1.000
tran 16020    11093 "1 " 0      -1
0
tran 728      "Tran SUNZIA S       500.00 to LUNA         345.00 Circuit 2
0.00" 1.000
tran 16020    11093 "2 " 0      -1
0
tran 729      "Tran WILLOW         500.00 to WILLOW       345.00 Circuit 1
0.00" 1.000
tran 16012    16112 "1 " 0      -1
0
tran 730      "Tran WILLOW         500.00 to WILLOW       345.00 Circuit 2
0.00" 1.000
tran 16012    16112 "2 " 0      -1
0
svd 800       "SVD KNOLL 115.0" "v" 0
svd "KNOLL 115.0" "v" 0
0
svd 801       "SVD NELSVC 138.0" "sv" 0
svd "NELP_SVC 138.0" "sv" 0
0
svd 802       "SVD NE.LOOP 138.0" "MS" 0
svd "NE.LOOP 138.0" "MS" 0
0
svd_803      "SVD KYRENE 230

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11_BTA.otg                                10/19/2011
svd "KYRENE 230.0" "v " 0
0
svd 804          "SVD WARD 230
svd "WARD 230.0" "v " 0
"
0
svd 822          "SVD RUDD 230
svd "RUDD 230.0" "v " 0
"
0
end
# End of Contingency List, 753 Contingencies Added to List
```

Appendix B: Contingency Results

Central Arizona Transmission System - 2021 BTA Study Work

No Solves (contingencies that resulted in no solves)

Outage	CONTINGENCY DESCRIPTION	BASE	SRP01	SRP02	SRP03	SRP04	SWP01	TEP01
line_1	Line CHOLLA 500.0 to SAGUARO 500.0 Ckt 1	solved	solved	solved	Pmis 16725 TUBAC 138.00 = 8546.0 Qmis 1	solved	solved	solved
line_410	Line SPRINGR 345.0 to CORONADO 345.0 Ckt 1	solved	solved	solved	Pmis 16333 IRVMID3 138.00 = 13502.1 Qmis 1	solved	solved	solved
line_413	Line SPRINGR 345.0 to VAIL2 345.0 Ckt 1	solved	solved	solved	Pmis 16722 SONOITA 138.00 = 126583.3 Qmis 1	solved	solved	solved
line_419	Line WINCHSTR 345.0 to VAIL 345.0 Ckt 1	solved	solved	solved	Pmis 16114 PINALWES 345.00 = 461.0 Qmis 1	solved	solved	Pmis 16400 DMP 47.20 = 63808.4 Qmis 1
line_420	Line WINCHSTR 345.0 to WILLOW 345.0 Ckt 1	solved	solved	solved	Pmis 16410 N. LOOP2 47.20 = 50323.4 Qmis 1	solved	solved	solved
line_462	Line ORNGROVE 138.0 to RILLITO 138.0 Ckt 1	solved	solved	solved	Pmis 16216 SOUTH 138.00 = 62356.7 Qmis 1	solved	solved	solved
tran_680	Tran VAIL2 345.00 to VAIL 138.00 Ckt 1	solved	solved	solved	Pmis 17501 B.VISTA 69.00 = 1290195.8 Qmis 1	solved	solved	solved

Colored cells indicate where no solves occurred

Central Arizona Transmission System - 2021 BTA Study Work

Thermal Violations for APS Cases (overloads, per unit)

FName	FkV	TName	TkV	Ckt	Outage	CONTINGENCY DESCRIPTION	RTG	MVA RTG	BASE	APS01	APS02	APS03	APS04	APS05	APS06	APS07
TECHPARK	138	VAIL	138	1	line_415	Line VAIL 345.0 to SOUTH 345.0 Ckt 1	2	418	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
IRVNGTN	138	TECHPARK	138	1	line_415	Line VAIL 345.0 to SOUTH 345.0 Ckt 1	2	418	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Colored cells indicate where flows increased by 5% or more, as compared to the base case flows

Central Arizona Transmission System - 2021 BTA Study Work

Thermal Violations for SRP, TEP, and SWP Cases (overloads, per unit)

FName	FkV	TName	TkV	Ckt	Outage	CONTINGENCY DESCRIPTION	RTG	MVA RTG	BASE	SRP01	SRP02	SRP03	SRP04	SWP01	TEP01
TECHPARK	138	VAIL	138	1	line_415	Line VAIL 345.0 to SOUTH 345.0 Ckt 1	2	418	1.05	1.05	1.05	1.59 ^A	1.05	0.93	1.13
TECHPARK	138	VAIL	138	1	line_449	Line LOSREALS 138.0 to VAIL 138.0 Ckt 1	2	418	0.93	0.93	0.93	1.25 ^A	0.93	< 0.90	1.03
TECHPARK	138	VAIL	138	1	line_463	Line PANTANO 138.0 to LOSREALS 138.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	1.20 ^A	< 0.90	< 0.90	0.98
TECHPARK	138	VAIL	138	1	line_1	Line CHOLLA 500.0 to SAGUARO 500.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	NoSolve	< 0.90	< 0.90	1.05
IRVNGTN	138	TECHPARK	138	1	line_415	Line VAIL 345.0 to SOUTH 345.0 Ckt 1	2	418	1.00	1.00	1.00	1.54 ^A	1.00	< 0.90	1.08
IRVNGTN	138	TECHPARK	138	1	line_449	Line LOSREALS 138.0 to VAIL 138.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	1.20 ^A	< 0.90	< 0.90	0.98
IRVNGTN	138	TECHPARK	138	1	line_463	Line PANTANO 138.0 to LOSREALS 138.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	1.16 ^A	< 0.90	< 0.90	0.94
IRVNGTN	138	TECHPARK	138	1	line_1	Line CHOLLA 500.0 to SAGUARO 500.0 Ckt 1	2	418	< 0.90	< 0.90	< 0.90	NoSolve	< 0.90	< 0.90	1.01
WINCHSTR	345	WILLOW	345	1	base	Base system (n-0)	1	925	0.81	0.81	0.80	1.42	0.81	0.63	0.87
WINCHSTR	345	WILLOW	345	1	line_115	Line CORONADO 500.0 to SILVERKG 500.0 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	1.29 ^A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	WILLOW	345	1	line_3	Line FOURCORN 500.0 to MOENKOPI 500.0 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	1.25 ^A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	WILLOW	345	1	line_545	Line HACKBERY 230.0 to MORENCI 230.0 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	1.29 ^A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	WILLOW	345	1	line_413	Line SPRINGR 345.0 to VAIL2 345.0 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	NoSolve	< 0.90	< 0.90	0.95
WINCHSTR	345	WILLOW	345	1	tran_680	Tran VAIL2 345.00 to VAIL 138.00 Ckt 1	2	1110	< 0.90	< 0.90	< 0.90	NoSolve	< 0.90	< 0.90	0.95
WINCHSTR	345	VAIL	345	1	line_524	Line APACHE 230.0 to BUTERFLD 230.0 Ckt 1	2	1195	< 0.90	< 0.90	< 0.90	1.37 ^A	< 0.90	< 0.90	0.95
WINCHSTR	345	VAIL	345	1	line_115	Line CORONADO 500.0 to SILVERKG 500.0 Ckt 1	2	1195	< 0.90	< 0.90	< 0.90	1.31 ^A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	VAIL	345	1	line_535	Line BUTERFLD 230.0 to PANTANO 230.0 Ckt 1	2	1195	< 0.90	< 0.90	< 0.90	1.30 ^A	< 0.90	< 0.90	< 0.90
WINCHSTR	345	VAIL	345	1	base	Base system (n-0)	1	1195	0.76	0.76	0.75	1.21	0.76	0.62	0.81
WINCHSTR	345	VAIL	345	1	line_413	Line SPRINGR 345.0 to VAIL2 345.0 Ckt 1	2	1195	0.98	0.98	0.98	NoSolve	0.98	< 0.90	1.05
WINCHSTR	345	VAIL	345	1	tran_680	Tran VAIL2 345.00 to VAIL 138.00 Ckt 1	2	1195	0.98	0.98	0.98	NoSolve	0.98	< 0.90	1.05
WINCHSTR	345	VAIL	345	1	line_1	Line CHOLLA 500.0 to SAGUARO 500.0 Ckt 1	2	1195	< 0.90	< 0.90	< 0.90	NoSolve	< 0.90	< 0.90	0.95
LOSREALS	138	VAIL	138	1	line_415	Line VAIL 345.0 to SOUTH 345.0 Ckt 1	2	406	< 0.90	< 0.90	< 0.90	1.08	< 0.90	< 0.90	< 0.90
LOSREALS	138	VAIL	138	1	line_488	Line TECHPARK 138.0 to VAIL 138.0 Ckt 1	2	406	< 0.90	< 0.90	< 0.90	1.06	< 0.90	< 0.90	< 0.90
LOSREALS	138	VAIL	138	1	line_444	Line IRVNGTN 138.0 to TECHPARK 138.0 Ckt 1	2	406	< 0.90	< 0.90	< 0.90	1.04	< 0.90	< 0.90	< 0.90
WILLOW	500	WILLOW	345	1	tran_730	Tran WILLOW 500.00 to WILLOW 345.00 Ckt 2	2	806	< 0.90	< 0.90	< 0.90	1.06	< 0.90	< 0.90	< 0.90
WILLOW	500	WILLOW	345	2	tran_729	Tran WILLOW 500.00 to WILLOW 345.00 Ckt 1	2	806	< 0.90	< 0.90	< 0.90	1.06	< 0.90	< 0.90	< 0.90
CORONADO	500	CORONADO	345	2	tran_670	Tran CORONADO 500.00 to CORONADO 345.00 Ckt 1	2	806	< 0.90	< 0.90	< 0.90	1.02	< 0.90	< 0.90	< 0.90
FLAGSTAF	345	GLENCANY	345	1	line_379	Line FLAGSTAF 345.0 to GLENCANY 345.0 Ckt 2	2	1089	0.98	0.98	0.98	1.02	0.99	0.97	0.98
FLAGSTAF	345	GLENCANY	345	2	line_378	Line FLAGSTAF 345.0 to GLENCANY 345.0 Ckt 1	2	1089	0.98	0.98	0.98	1.01	0.98	0.96	0.97
COPPERVR	345	COPPERVR	230	1	line_540	Line MORENCI 230.0 to GREEN-SW 230.0 Ckt 1	2	224	< 0.90	< 0.90	< 0.90	1.01	< 0.90	< 0.90	0.91
COPPERVR	345	COPPERVR	230	2	line_540	Line MORENCI 230.0 to GREEN-SW 230.0 Ckt 1	2	224	< 0.90	< 0.90	< 0.90	1.01	< 0.90	< 0.90	0.91
NL EXP	138	RILLITO	138	1	line_514	Line TORTOLIT 138.0 to NARANJA 138.0 Ckt 1	2	382	0.99	0.99	0.99	< 0.90	0.99	1.01	0.92
APACHE	230	BUTERFLD	230	1	line_419	Line WINCHSTR 345.0 to VAIL 345.0 Ckt 1	2	431	0.92	0.92	0.92	NoSolve	0.92	< 0.90	NoSolve

Colored cells indicate where flows increased by 5% or more, as compared to the base case flows

^[A] The top three most heavily loaded (worst) thermal violations shown for that specific line segment. Reporting of overloads was limited to control the volume of data in the report.

Central Arizona Transmission System - Sensitivity Study Results of SWP02

Thermal Violations (overloads, per unit)

Fname	FkV	TName	TkV	Ckt	Outage	CONTINGENCY DESCRIPTION	RTG	MVA RTG	BASE	SWP01	SRP03	SWP02
TECHPARK	138	VAIL	138	1	line_1	Line CHOLLA 500.0 to SAGUARO 500.0 Ckt 1	2	418	< 0.90	< 0.90	NoSolve	1.03
TECHPARK	138	VAIL	138	1	line_415	Line VAIL 345.0 to SOUTH 345.0 Ckt 1	2	418	1.05	0.93	1.59	1.01
TECHPARK	138	VAIL	138	1	line_449	Line LOSREALS 138.0 to VAIL 138.0 Ckt 1	2	418	0.93	< 0.90	1.25	0.98
FLAGSTAF	345	GLENCANY	345	1	line_379	Line FLAGSTAF 345.0 to GLENCANY 345.0 Ckt 2	2	1089	0.98	0.97	1.02	0.96
FLAGSTAF	345	GLENCANY	345	2	line_378	Line FLAGSTAF 345.0 to GLENCANY 345.0 Ckt 1	2	1089	0.98	0.96	1.01	0.96
IRVNGTN	138	TECHPARK	138	1	line_415	Line VAIL 345.0 to SOUTH 345.0 Ckt 1	2	418	1.00	< 0.90	1.54	0.96
NL. EXP	138	RILLITO	138	1	line_514	Line TORTOLIT 138.0 to NARANJA 138.0 Ckt 1	2	382	0.99	1.01	< 0.90	0.95
IRVNGTN	138	TECHPARK	138	1	line_449	Line LOSREALS 138.0 to VAIL 138.0 Ckt 1	2	418	< 0.90	< 0.90	1.2	0.93
TECHPARK	138	VAIL	138	1	line_463	Line PANTANO 138.0 to LOSREALS 138.0 Ckt 1	2	418	< 0.90	< 0.90	1.20	0.93
WINCHSTR	345	VAIL	345	1	line_115	Line CORONADO 500.0 to SILVERKG 500.0 Ckt 1	2	1195	< 0.90	< 0.90	1.31	< 0.90
WINCHSTR	345	VAIL	345	1	line_524	Line APACHE 230.0 to BUTERFLD 230.0 Ckt 1	2	1195	< 0.90	< 0.90	1.37	< 0.90
WINCHSTR	345	VAIL	345	1	line_535	Line BUTERFLD 230.0 to PANTANO 230.0 Ckt 1	2	1195	< 0.90	< 0.90	1.30	< 0.90
WINCHSTR	345	WILLOW	345	1	line_3	Line FOURCORN 500.0 to MOENKOPI 500.0 Ckt 1	2	1110	< 0.90	< 0.90	1.25	< 0.90
WINCHSTR	345	WILLOW	345	1	line_115	Line CORONADO 500.0 to SILVERKG 500.0 Ckt 1	2	1110	< 0.90	< 0.90	1.29	< 0.90
WINCHSTR	345	WILLOW	345	1	line_545	Line HACKBERY 230.0 to MORENCI 230.0 Ckt 1	2	1110	< 0.90	< 0.90	1.29	< 0.90
IRVNGTN	138	TECHPARK	138	1	line_463	Line PANTANO 138.0 to LOSREALS 138.0 Ckt 1	2	418	< 0.90	< 0.90	1.16	< 0.90
LOSREALS	138	VAIL	138	1	line_415	Line VAIL 345.0 to SOUTH 345.0 Ckt 1	2	406	< 0.90	< 0.90	1.08	< 0.90
LOSREALS	138	VAIL	138	1	line_444	Line IRVNGTN 138.0 to TECHPARK 138.0 Ckt 1	2	406	< 0.90	< 0.90	1.04	< 0.90
LOSREALS	138	VAIL	138	1	line_488	Line TECHPARK 138.0 to VAIL 138.0 Ckt 1	2	406	< 0.90	< 0.90	1.06	< 0.90
COPPERVR	345	COPPERVR	230	1	line_540	Line MORENCI 230.0 to GREEN-SW 230.0 Ckt 1	2	224	< 0.90	< 0.90	1.01	< 0.90
COPPERVR	345	COPPERVR	230	2	line_540	Line MORENCI 230.0 to GREEN-SW 230.0 Ckt 1	2	224	< 0.90	< 0.90	1.01	< 0.90
CORONADO	500	CORONADO	345	2	tran_670	Tran CORONADO 500.00 to CORONADO 345.00 Ckt 1	2	806	< 0.90	< 0.90	1.02	< 0.90
WILLOW	500	WILLOW	345	1	tran_730	Tran WILLOW 500.00 to WILLOW 345.00 Ckt 2	2	806	< 0.90	< 0.90	1.06	< 0.90
WILLOW	500	WILLOW	345	2	tran_729	Tran WILLOW 500.00 to WILLOW 345.00 Ckt 1	2	806	< 0.90	< 0.90	1.06	< 0.90
WINCHSTR	345	WILLOW	345	1	base	Base system (n-0)	1	925	0.81	0.63	1.42	0.66
WINCHSTR	345	VAIL	345	1	base	Base system (n-0)	1	1195	0.76	0.62	1.21	0.64

Colored cells indicate where flows increased by 5% or more, as compared to the base case flows

Central Arizona Transmission System - 2021 BTA Study Work

Delta Voltage Violations for APS Cases (voltage drop, per unit)

Bus #	Name	kV	Outage	CONTINGENCY DESCRIPTION	BASE	APS01	APS02	APS03	APS04	APS05	APS06	APS07
16254	EASTINA	138	line_462	Line ORNGROVE 138.0 to RILLITO 138.0 Ckt 1	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
16251	ORNGROVE	138	line_462	Line ORNGROVE 138.0 to RILLITO 138.0 Ckt 1	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
16205	LACANADA	138	line_462	Line ORNGROVE 138.0 to RILLITO 138.0 Ckt 1	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16
16209	RANVISTO	138	line_462	Line ORNGROVE 138.0 to RILLITO 138.0 Ckt 1	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14
16245	NARANJA	138	line_462	Line ORNGROVE 138.0 to RILLITO 138.0 Ckt 1	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12	-0.12
16720	KANTOR	138	line_478	Line SONOITA 138.0 to VALNCIA 138.0 Ckt 1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
16725	TUBAC	138	line_478	Line SONOITA 138.0 to VALNCIA 138.0 Ckt 1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
16720	KANTOR	138	line_448	Line KANTOR 138.0 to TUBAC 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16720	KANTOR	138	line_459	Line NOGALES 138.0 to KANTOR 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16720	KANTOR	138	line_506	Line VAIL 138.0 to NOGALES 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16720	KANTOR	138	line_421	Line CANEZ 138.0 to SONOITA 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16720	KANTOR	138	line_497	Line TUBAC 138.0 to CANEZ 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16721	CANEZ	138	line_478	Line SONOITA 138.0 to VALNCIA 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16725	TUBAC	138	line_448	Line KANTOR 138.0 to TUBAC 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16725	TUBAC	138	line_459	Line NOGALES 138.0 to KANTOR 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16725	TUBAC	138	line_506	Line VAIL 138.0 to NOGALES 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16725	TUBAC	138	line_421	Line CANEZ 138.0 to SONOITA 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16725	TUBAC	138	line_497	Line TUBAC 138.0 to CANEZ 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16722	SONOITA	138	line_478	Line SONOITA 138.0 to VALNCIA 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16721	CANEZ	138	line_448	Line KANTOR 138.0 to TUBAC 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16721	CANEZ	138	line_459	Line NOGALES 138.0 to KANTOR 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16721	CANEZ	138	line_497	Line TUBAC 138.0 to CANEZ 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16721	CANEZ	138	line_506	Line VAIL 138.0 to NOGALES 138.0 Ckt 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
16721	CANEZ	138	line_421	Line CANEZ 138.0 to SONOITA 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16722	SONOITA	138	line_421	Line CANEZ 138.0 to SONOITA 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16722	SONOITA	138	line_448	Line KANTOR 138.0 to TUBAC 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16722	SONOITA	138	line_459	Line NOGALES 138.0 to KANTOR 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16722	SONOITA	138	line_497	Line TUBAC 138.0 to CANEZ 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16722	SONOITA	138	line_506	Line VAIL 138.0 to NOGALES 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16723	VALNCIA	138	line_421	Line CANEZ 138.0 to SONOITA 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16723	VALNCIA	138	line_448	Line KANTOR 138.0 to TUBAC 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16723	VALNCIA	138	line_459	Line NOGALES 138.0 to KANTOR 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16723	VALNCIA	138	line_478	Line SONOITA 138.0 to VALNCIA 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16723	VALNCIA	138	line_497	Line TUBAC 138.0 to CANEZ 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16723	VALNCIA	138	line_506	Line VAIL 138.0 to NOGALES 138.0 Ckt 1	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
16106	VAIL2	345	tran_680	Tran VAIL2 345.00 to VAIL 138.00 Ckt 1	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14

Colored cells indicate where voltage deviation increased by >3% as compared to voltage deviation in the base case.

Central Arizona Transmission System - 2021 BTA Study Work

Delta Voltage Violations for SRP, TEP, and SWP Cases (voltage drop, per unit)

Bus #	Name	kV	Outage	CONTINGENCY DESCRIPTION			BASE	SRP01	SRP02	SRP03	SRP04	SWP01	TEP01
16254	EASTINA	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.17	-0.17	-0.17	NoSolve	-0.17	-0.14	-0.19
16251	ORNGROVE	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.17	-0.17	-0.17	NoSolve	-0.17	-0.14	-0.19
16205	LACANADA	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.16	-0.16	-0.16	NoSolve	-0.16	-0.13	-0.18
16209	RANVISTO	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.14	-0.14	-0.14	NoSolve	-0.14	-0.12	-0.16
16245	NARANJA	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Ckt 1	-0.12	-0.12	-0.12	NoSolve	-0.12	-0.09	-0.14
16106	VAIL2	345	line_419	Line WINCHSTR	345.0 to VAIL	345.0 Ckt 1	-0.05	-0.05	-0.05	NoSolve	-0.05	-0.04	NoSolve
17012	MARANA	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.05	-0.05	-0.05	-0.07	-0.05	-0.05	-0.05
17013	MARANATP	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.05	-0.05	-0.05	-0.07	-0.05	-0.05	-0.05
16900	COPPERVR	345	line_398	Line GREENLEE	345.0 to COPPERVR	345.0 Ckt 1	-0.05	-0.05	-0.05	-0.06	-0.05	-0.05	-0.05
16247	HARRISON	138	line_435	Line E. LOOP	138.0 to HARRISON	138.0 Ckt 1	-0.05	-0.05	-0.05	-0.08	-0.05	-0.04	-0.05
17005	BICKNELL	345	line_550	Line BICKNELL	345.0 to VAIL	345.0 Ckt 1	-0.04	-0.04	-0.04	-0.02	-0.04	-0.05	-0.04
19203	BRAWLEY	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
15179	BRAWLYAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
15178	SANDARAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
19212	SANDARIO	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
15180	SANXAVAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
19213	SANXAVER	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
19214	SNYDHILL	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
19201	BLACKMTN	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
15182	BLKMTNAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
19210	RATTLNKN	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
15181	SNYDHLAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
19216	TWINPEAK	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
15177	TWINPKAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.05	-0.05
17020	SAN RAF	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.04	-0.04	-0.04	-0.11	-0.04	-0.03	-0.05
17003	AVRA	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.06	-0.04	-0.04	-0.04
16211	ROBERTS	138	line_435	Line E. LOOP	138.0 to HARRISON	138.0 Ckt 1	-0.04	-0.04	-0.04	-0.07	-0.04	-0.04	-0.04
17007	BUTERFLD	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.04	-0.04	-0.04	-0.10	-0.04	-0.03	-0.04
17089	SNDARIO	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.04	-0.05	-0.04	-0.04	-0.04
17018	RED TAIL	230	line_525	Line APACHE	230.0 to RED TAIL	230.0 Ckt 1	-0.04	-0.04	-0.04	-0.07	-0.04	-0.03	-0.03
16213	S.TRAIL	138	line_435	Line E. LOOP	138.0 to HARRISON	138.0 Ckt 1	-0.03	-0.03	-0.03	-0.05	-0.03	-0.03	-0.04
17039	KARTCHNR	115	line_535	Line BUTERFLD	230.0 to PANTANO	230.0 Ckt 1	-0.03	-0.03	-0.03	-0.07	-0.03	-0.02	-0.03
17015	PANTANO	115	line_535	Line BUTERFLD	230.0 to PANTANO	230.0 Ckt 1	-0.02	-0.02	-0.02	-0.06	-0.02	-0.02	-0.03
17016	PANTANO	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.02	-0.02	-0.02	-0.07	-0.02	-0.01	-0.02
17676	NEWTUCSN	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.02	-0.02	-0.02	-0.06	-0.02	-0.01	-0.02
16722	SONOITA	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	-0.01	-0.01
16723	VALNCIA	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.06	-0.01	-0.01	-0.01
16721	CANEZ	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	-0.01	-0.01
16725	TUBAC	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	-0.01	-0.01
16720	KANTOR	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	-0.01	-0.01
17023	VALEN-SW	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.08	-0.01	0.00	-0.01
17022	THREEPNT	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.07	-0.01	0.00	-0.01
17089	SNDARIO	115	line_534	Line AVRA	115.0 to SNDARIO	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.06	-0.01	0.00	-0.01
17023	VALEN-SW	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	0.00	-0.01
17022	THREEPNT	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	-0.01	-0.01	-0.01	-0.05	-0.01	0.00	-0.01
17015	PANTANO	115	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.01	-0.01	-0.01	-0.06	-0.01	0.00	-0.01
17012	MARANA	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	0.00	0.00	0.00	-0.11	0.00	0.01	-0.01
17089	SNDARIO	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	0.00	0.00	0.00	-0.07	0.00	0.01	-0.01
17003	AVRA	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	0.00	0.00	0.00	-0.07	0.00	0.01	0.00
17089	SNDARIO	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	0.00	0.00	0.00	-0.09	0.00	0.02	0.00
17039	KARTCHNR	115	line_530	Line PANTANO	115.0 to KARTCHNR	115.0 Ckt 1	0.01	0.01	0.01	0.05	0.01	0.00	0.01
17039	KARTCHNR	115	tran_702	Tran PANTANO	230.00 to PANTANO	115.00 Ckt 1	0.01	0.01	0.01	0.05	0.01	0.00	0.01
17003	AVRA	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	0.01	0.01	0.01	-0.09	0.01	0.02	0.00
16106	VAIL2	345	tran_680	Tran VAIL2	345.00 to VAIL	138.00 Ckt 1	0.14	0.14	0.14	NoSolve	0.14	0.13	0.14
16259	GRTRVL	138	line_512	Line SANRIT_S	138.0 to ROSEMONT	138.0 Ckt 1	NoSolve	0.01	0.01	0.06	0.01	0.00	0.02
16920	ROSEMONT	138	line_512	Line SANRIT_S	138.0 to ROSEMONT	138.0 Ckt 1	NoSolve	0.02	0.02	0.07	0.02	0.01	0.03

Colored cells indicate where voltage deviation increased by >3% as compared to voltage deviation in the base case

Central Arizona Transmission System - Sensitivity Study Results of SWP02

Delta Voltage Violations (voltage drop, per unit)

Bus #	Name	kV	Outage	CONTINGENCY DESCRIPTION			BASE	SWP01	SRP03	SWP02
16254	EASTINA	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Circuit 1	-0.17	-0.14	NoSolve	-0.19
16251	ORNGROVE	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Circuit 1	-0.17	-0.14	NoSolve	-0.18
16205	LACANADA	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Circuit 1	-0.16	-0.13	NoSolve	-0.18
16209	RANVISTO	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Circuit 1	-0.14	-0.12	NoSolve	-0.16
16245	NARANJA	138	line_462	Line ORNGROVE	138.0 to RILLITO	138.0 Circuit 1	-0.12	-0.09	NoSolve	-0.13
17012	MARANA	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Circuit 1	-0.05	-0.05	-0.07	-0.05
17013	MARANATP	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Circuit 1	-0.05	-0.05	-0.07	-0.05
16900	COPPERVR	345	line_398	Line GREENLEE	345.0 to COPPERVR	345.0 Circuit 1	-0.05	-0.05	-0.06	-0.05
17020	SAN RAF	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.04	-0.03	-0.11	-0.04
17012	MARANA	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	0.00	0.01	-0.11	0.01
17007	BUTERFLD	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.04	-0.03	-0.10	-0.04
17003	AVRA	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	0.01	0.02	-0.09	0.02
17089	SNDARIO	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	0.00	0.02	-0.09	0.01
16247	HARRISON	138	line_435	Line E. LOOP	138.0 to HARRISON	138.0 Ckt 1	-0.05	-0.04	-0.08	-0.04
17023	VALEN-SW	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	-0.01	0.00	-0.08	-0.01
17022	THREEPNT	115	line_538	Line MARANATP	115.0 to MARANA	115.0 Ckt 1	-0.01	0.00	-0.07	-0.01
17018	RED TAIL	230	line_525	Line APACHE	230.0 to RED TAIL	230.0 Ckt 1	-0.04	-0.03	-0.07	-0.03
17003	AVRA	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	0.00	0.01	-0.07	0.01
17016	PANTANO	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.02	-0.01	-0.07	-0.02
16211	ROBERTS	138	line_435	Line E. LOOP	138.0 to HARRISON	138.0 Ckt 1	-0.04	-0.04	-0.07	-0.04
17089	SNDARIO	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	0.00	0.01	-0.07	0.00
17039	KARTCHNR	115	line_535	Line BUTERFLD	230.0 to PANTANO	230.0 Ckt 1	-0.03	-0.02	-0.07	-0.02
17003	AVRA	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.06	-0.04
17676	NEWTUCSN	230	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.02	-0.01	-0.06	-0.01
19203	BRAWLEY	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
15179	BRAWLYAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
15180	SANXAVAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
19213	SANXAVER	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
19214	SNYDHILL	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
15178	SANDARAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
19212	SANDARIO	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
19201	BLACKMTN	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
15182	BLKMTNAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
15181	SNYDHLAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
19216	TWINPEAK	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
15177	TWINPKAZ	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
19210	RATTL5NK	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.05	-0.06	-0.04
17089	SNDARIO	115	line_534	Line AVRA	115.0 to SNDARIO	115.0 Ckt 1	-0.01	0.00	-0.06	-0.01
17015	PANTANO	115	line_524	Line APACHE	230.0 to BUTERFLD	230.0 Ckt 1	-0.01	0.00	-0.06	-0.01
17015	PANTANO	115	line_535	Line BUTERFLD	230.0 to PANTANO	230.0 Ckt 1	-0.02	-0.02	-0.06	-0.02
16723	VALNCIA	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.06	-0.01
16213	S.TRAIL	138	line_435	Line E. LOOP	138.0 to HARRISON	138.0 Ckt 1	-0.03	-0.03	-0.05	-0.03
17089	SNDARIO	115	line_523	Line SAG.EAST	115.0 to MARANATP	115.0 Ckt 1	-0.04	-0.04	-0.05	-0.04
16722	SONOITA	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.05	-0.01
16721	CANEZ	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.05	-0.01
17023	VALEN-SW	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	-0.01	0.00	-0.05	-0.01
16725	TUBAC	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.05	-0.01
17022	THREEPNT	115	line_537	Line MARANA	115.0 to AVRA	115.0 Ckt 1	-0.01	0.00	-0.05	-0.01
16720	KANTOR	138	line_115	Line CORONADO	500.0 to SILVERKG	500.0 Ckt 1	-0.01	-0.01	-0.05	-0.01
17005	BICKNELL	345	line_550	Line BICKNELL	345.0 to VAIL	345.0 Ckt 1	-0.04	-0.05	-0.02	-0.05
17039	KARTCHNR	115	line_530	Line PANTANO	115.0 to KARTCHNR	115.0 Ckt 1	0.01	0.00	0.05	0.01
17039	KARTCHNR	115	tran_702	Tran PANTANO	230.00 to PANTANO	115.00 Ckt 1	0.01	0.00	0.05	0.01
16259	GRTRVL	138	line_512	Line SANRIT_S	138.0 to ROSEMONT	138.0 Ckt 1	NoSolve	0.00	0.06	0.01
16920	ROSEMONT	138	line_512	Line SANRIT_S	138.0 to ROSEMONT	138.0 Ckt 1	NoSolve	0.01	0.07	0.02
16106	VAIL2	345	tran_680	Tran VAIL2	345.00 to VAIL	138.00 Ckt 1	0.14	0.13	NoSolve	0.14

Colored cells indicate where voltage deviation increased by >3% as compared to voltage deviation in the base case.