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2016 JAN 29 P 2: 31

AZ CORP COMMISSION
DOCKET CONTROL

January 29, 2016

Arizona Corporation Commission
DOCKETED
JAN 29 2016
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Docket Control
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007

Re: DG & EE Study Report
Ninth Biennial Transmission Assessment for 2016 through 2025
Docket No. E-00000D-15-0001

Dear Sir/Madam:

In the Eighth Biennial Transmission Assessment (8th BTA), Decision No. 74785 (October 24, 2014), the Arizona Corporation Commission directed the Arizona utilities with retail load to report, as part of the Ninth BTA, the effects of Distributed Generation (DG) and Energy Efficiency (EE) installations and/or programs on future transmission needs.[1] To satisfy such requirement, SRP is voluntarily submitting a separate technical study performed by SRP that studied any implications of DG and EE on SRP's transmission system.

If you have any questions concerning this study, please contact Mr. Mike Jones, Director, Transmission Planning Department at (602) 236-0882.

Sincerely,

Robert R. Taylor

Robert R. Taylor

RRT/jkb

Enclosures (14)

[1] Decision at 9-10.

2016 BTA EE/DG Study

BY

SALT RIVER PROJECT

TRANSMISSION PLANNING

January 25, 2016

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1.0 Executive Summary

This energy efficiency/distributed generation (EE/DG) study was performed in response to the Commission Decision No. 74785 (the Order) in the Eighth Biennial Transmission Assessment (BTA) docket. The Commission ordered Arizona utilities with retail load to report "the effects of DG and EE installations and/or programs on future transmission needs." The Order further specified:

> The technical study should be performed on the fifth year transmission plan by disaggregating the utilities' load forecasts from effects of DG and EE and performing contingency analysis with and without the disaggregate DG and EE. The technical study should at a minimum discuss DG and EE forecasting methodologies and transmission loading impacts. The study should monitor transmission down to and including the 115 kV level.

SRP assessed the performance of transmission facilities of 100kV or higher voltage using power flow analysis. The power flow study was conducted on the fifth year by performing contingency analysis on 2020 cases with and without DG and EE. The results were compared to show the effects of removing EE and DG.

The power flow analysis showed no overloads on SRP's system for N-1 outages of transmission lines and transformers when removing DG and EE. Also, no voltage violations occurred on SRP's system when EE and DG were removed.

This report documents the study work performed and concludes that SRP's transmission system plan meets all of SRP's internal criteria, and satisfies applicable WECC and NERC criteria, regardless of the future EE and DG.

2.0 Study Details

The goal of the EE/DG study was to determine the transmission impact should EE/DG not be developed as currently projected. Power flow studies were completed using General Electric's (GE's) Positive Sequence Load Flow (PSLF) software. The power flow studies monitored SRP facilities for thermal and voltage responses to transmission system disturbances. Following a contingency, SRP facilities greater than 100kV were monitored. The power flow studies evaluated the thermal and voltage response of the system. The following sections highlight the details of the analysis.

2.1 EE and DG Forecasting Methodologies

SRP's forecasting methodologies for energy efficiency and distributed generation are summarized below.

Energy Efficiency (EE): SRP's Forecasting department begins the forecast process by adding historical EE impacts to historical energy (MWh). Energy loads are then forecasted, and expected future EE is subtracted from the forecast, yielding a final load forecast with EE taken into account.

Distributed Generation (DG): For DG, SRP's Forecasting department utilizes EPRI's long-run DG forecast for forecasted years beyond SRP's six-year fiscal plan. DG forecasts within the fiscal plan are developed internally. Like EE, DG is subtracted from the preliminary energy load forecast, which further reduces the overall forecasted load.

2.2 Case Information

Three cases were developed for the BTA EE/DG study using PSLF v18.1. The first case is the 2020 base case that was derived from the Western Electricity Coordinating Council (WECC) 2020 HS2 case. The case represents a detailed Arizona system at approximately 5:00 pm on the peak day. The second case represents the same peak time with an increased amount of load to reflect the removal of forecasted EE and DG. The third case is a sensitivity case that simulates near-peak loads occurring after sunset (approximately 8:00 pm) with forecasted EE/DG removed and no utility solar generation online. The cases are summarized below:

Table 1 - Summary of Cases

Case	Scenario	Load	Approximate Hour of Day	EE	DG	Utility Solar
1	Base	Peak	5:00 PM	As Forecasted	As Forecasted	On
2	EE/DG	Peak	5:00 PM	Pre-2016 Only	Pre-2016 Only	On
3	Stressed	Near Peak	8:00 PM	Pre-2016 Only	Off	Off

The system ratings for SRP's facilities used in this study can be found in Appendix A.

2.3 Internal Planning Criteria

Described in detail below, SRP uses All Lines in Service and Single Contingency as the criteria for planning its system. Anomalies are noted in the results for situations in which the criteria is not met.

2.3.1 All Lines in Service

The following criteria must be met when operating with All Lines in Service (ALIS):

- 500/230kV, 230/115kV, and 230/69kV transformers will not be loaded more than 100% of the transformer nominal rating.
- 500kV, 230kV, and 115kV lines and substation conductors will not be loaded in excess of 100% of their summer normal limit.
- Equipment high voltage limits will not be exceeded.
- Customer service entrance voltage limits will not be violated. These limits are described below:
    - 230kV and above: the voltage shall not be below 1.0 per unit.
    - 115kV: the voltage magnitude will not drop below the minimum established by ANSI (standard #C84.1-1989 or most current edition, Ref 42) for service entrance voltages as reflected on the high side of the transformer.

2.3.2 Single Contingency (N-1)

The following criteria must be met when a single contingency event occurs:

- 500/230kV, 230/115kV, and 230/69kV transformers will not be loaded to more than 100% of the emergency limit.
- 500kV, 230kV, and 115kV lines and substation conductors will not be loaded in excess of 100% of their emergency limit.
- Equipment voltage limits (high or low) will not be exceeded.
- Outages at 100kV or higher system voltages (including 230/69kV transformers) will not result in loss of load.
- Customer service entrance voltage limits will not be violated. These limits are described below:
    - 230kV & above: the voltage deviation at any bus shall not exceed 5% of the pre-outage voltage.
    - 115kV: the voltage magnitude will not drop below the minimum established by ANSI (standard #C84.1-1989 or most current edition) for service entrance voltages as reflected on the high side of the transformer.

2.4 Contingencies

2.4.1 Power Flow

SRP developed the single contingency list used in the power flow to simulate outages of all the transmission lines and transformers in Arizona in accordance with NERC TPL-002. The contingency list includes transmission lines with voltages of 100kV and above, and transformers with a high side voltage of 100kV and above. The list of power flow contingencies used in the 2020 cases can be found in Appendix B.

3.0 Results

3.1 Power Flow

The power flow analysis found no overloads on SRP's facilities for the N-1 outages studied, even with EE and DG removed. Also, there were no voltage violations observed on SRP's facilities in the analysis. Appendix C shows results for SRP equipment loaded above 90%.

4.0 Conclusion

This study analyzed the effects of removing DG and EE on future transmission needs. Power flow analysis was performed on three 2020 cases: a peak base case, a peak case without EE/DG, and a stressed near-peak case without EE/DG or utility solar. Single contingencies were simulated on SRP's system according to the NERC TPL-002 standard, and SRP's system performed within the thermal and voltage boundaries. The study demonstrates that SRP's transmission system meets all of SRP's internal criteria, and satisfies applicable WECC and NERC criteria regardless of the future EE and DG.

5.0 Appendices

Appendix A – System Ratings in 2020

Voltage (KV)	From Bus	To Bus	Circuit	Section	Continuous Rating (MVA 1)	Emergency Rating (MVA 2)
500	BROWNING	KYRENE	1	1	2886.5	2886.5
500	BROWNING	PINAL_C	1	1	2598.1	2598.1
500	CORONADO	SGRLF	1	1	1732.1	1732.1
500	CORONADO	SILVERKG	1	1	1732.1	2338.3
500	CORONADO	SILVERKG	1	2	1957.2	2165.1
500	CORONADO	SILVERKG	1	3	1732.1	2338.3
500	DUKE	PINAL_C	1	1	2970.5	3550.8
500	DUKE	PINAL_W	1	1	2970.5	3550.8
500	HASSYAMP	ARLINTON	1	1	2598.1	2598.1
500	HASSYAMP	HARQUAHA	1	1	2625.8	2625.8
500	HASSYAMP	JOJOBA	1	1	2970.5	3550.7
500	HASSYAMP	JOJOBA	2	1	2970.5	3550.7
500	HASSYAMP	MESQUIT1	1	1	1732.1	1732.1
500	HASSYAMP	MESQUIT2	1	1	1732.1	1732.1
500	HASSYAMP	PALOVRDE	1	1	2823.2	3360.2
500	HASSYAMP	PALOVRDE	2	1	2970.5	3550.7
500	HASSYAMP	PINAL_W	2	1	2970.5	3550.7
500	JOJOBA	KYRENE	1	1	2823.2	2886.5
500	JOJOBA	PINAL_W	1	1	2970.5	3550.7
500	PALOVRDE	RUDD	1	1	2823.2	3360.2
500	PALOVRDE	WESTWING	1	1	2618.9	3013.8
500	PALOVRDE	WESTWING	2	1	2618.9	3013.8
500	PERK PS1	PERKINPS	1	1	1238	1238
500	PERK PS2	PERKINPS	1	1	1732.1	1732.1
500	PERKINS	WESTWING	1	1	2618.9	3013.8
500	SGRLF	CHOLLA	1	1	1732.1	1732.1
500	SILVERKG	BROWNING	1	1	2355.6	2788.6
230	ABEL	DINOSAUR	1	1	822.6	904.3
230	ABEL	RANDOLPH	1	1	1366.4	1501.9
230	AGUAFRIA	ALEXANDR	1	1	589.6	661.3
230	AGUAFRIA	WESTWNGW	1	1	772.8	912.3
230	AGUAFRIA	WHITETNK	1	1	772.8	912.3
230	ANDERSON	KYR-EAST	1	1	772.8	912.3

Voltage (KV)	From Bus	To Bus	Circuit	Section	Continuous Rating (MVA 1)	Emergency Rating (MVA 2)
230	BRANDOW	KYR-EAST	1	1	772.8	912.3
230	BRANDOW	PAPAGOBT	1	1	772.8	912.3
230	BRANDOW	WARD	2	1	362.5	432.2
230	BRANDOW	WARD	4	1	362.5	432.2
230	BROWNING	CORBELL	1	1	725	864.5
230	BROWNING	SANTAN	1	1	772.8	904.3
230	CORBELL	KYR-EAST	1	1	772.8	912.3
230	DEERVALY	PINPKSRP	1	1	724	797
230	DEERVALY	WESTWNGE	1	1	724	876
230	DINOSAUR	BROWNING	1	1	822.6	904.3
230	KNOX	RS-27	1	1	1195.1	1501.9
230	KNOX	RS-27	2	1	1195.1	1501.9
230	KYR-EAST	KYR-WEST	1	1	1195.1	1195.1
230	KYR-EAST	SCHRADER	1	1	725	864.5
230	KYR-WEST	KNOX	1	1	772.8	912.3
230	LIBERTY	ORME	1	1	498	498
230	ORME	ANDERSON	1	1	772.8	904.3
230	ORME	ANDERSON	2	1	772.8	904.3
230	ORME	RUDD	1	1	780.8	924.2
230	ORME	RUDD	2	1	780.8	924.2
230	PAPAGOBT	KYR-EAST	1	1	683.2	750.9
230	PAPAGOBT	PINPKSRP	1	1	772.8	868.5
230	PINAL_C	DBG	1	1	796.7	796.7
230	PINAL_C	RANDOLPH	1	1	1366.4	1633
230	PINPKSRP	BRANDOW	1	1	362.5	432.2
230	PINPKSRP	BRANDOW	2	1	362.5	432.2
230	ROGERS	ROGSWAPA	1	1	796.7	796.7
230	ROGERS	ROGSWAPA	2	1	796.7	796.7
230	ROGERS	THUNDRST	1	1	780	924.2
230	RS-27	RS-28	1	1	1195.1	1501.9
230	RS-27	RS-28	2	1	1195.1	1501.9
230	RUDD	WHITETNK	1	1	772.8	912.3
230	SANTAN	CORBELL	1	1	725	864.5
230	SANTAN	ROGERS	1	1	725	864.5
230	SANTAN	THUNDRST	1	1	772.8	904.3
230	SCHRADER	RS-28	1	1	1366.4	1501.9
230	SCHRADER	SANTAN	1	1	772.8	796.7
230	SCHRADER	SANTAN	2	1	725	772.8

Voltage (KV)	From Bus	To Bus	Circuit	Section	Continuous Rating (MVA 1)	Emergency Rating (MVA 2)
230	SILVERKG	GOLDFELD	1	1	645.4	768.9
230	SILVERKG	RS-29	1	1	822.6	904.3
230	SILVERKG	RS-29	2	1	822.6	904.3
230	THUNDRST	GOLDFELD	1	1	390.4	462.1
230	THUNDRST	GOLDFELD	2	1	390.4	462.1
115	ASARCOSR	ASARCOTP	1	1	83.7	98.6
115	ASARCOTP	CRUSHER	1	1	120.5	142.4
115	ASARCOTP	HAYDENAZ	1	1	120.5	142.4
115	BONNEYTP	CRUSHER	1	1	120.5	142.4
115	BONNEYTP	SANDSTONE	1	1	120.5	142.4
115	CARLOTA	PINTOVLY	1	1	159.4	159.4
115	CARLOTA	SILVERK2	1	1	161.3	192.2
115	CARREL	GOLDFELD	1	1	160.3	190.2
115	CARREL	SPURLOCK	1	1	137.4	153.4
115	ELLISON	ELLISOTP	1	1	119.5	119.5
115	FRAZIER	HORSMESA	1	1	161.3	192.2
115	FRAZIER	MOONSHIN	1	1	132.5	147.4
115	FRAZIER	ROOSEVLT	1	1	51.8	57.8
115	GASCLEAN	ELLISOTP	1	1	39.8	39.8
115	GOLDFELD	HORSMESA	1	1	181.3	216.1
115	GOLDFELD	MRMNFLAT	1	1	161.3	192.2
115	GOLDFELD	STEWMTN	1	1	34.9	49.8
115	HAYDENAZ	KEARNYTP	1	1	98.6	109.6
115	HORSMESA	MRMNFLAT	1	1	132.5	147.4
115	KEARNYTP	KEARNY	1	1	98.6	109.6
115	KEARNYTP	MORRISAZ	1	1	98.6	109.6
115	KNOLL	MORRISAZ	1	1	98.6	109.6
115	KNOLL	RS-30	1	1	203	203
115	MIAMI	MIAMI 3	1	1	203.2	203.2
115	MIAMI	PINTOVLY	1	1	132.5	147.4
115	MIAMI 3	MIAMI 4	1	1	159.4	159.4
115	MIAMI 3	PINAL	1	1	120.5	142.4
115	MIAMI 4	ELLISOTP	1	1	159.4	159.4
115	MOONSHIN	PINAL	1	1	132.5	147.4
115	MOONSHIN	REFINETP	1	1	119.5	119.5
115	OAKFLAT	SILVERT1	1	1	161.3	192.2
115	OAKFLAT	TRASK	1	1	161.3	192.2
115	PINAL	SILVERT1	1	1	161.3	192.2

Voltage (KV)	From Bus	To Bus	Circuit	Section	Continuous Rating (MVA 1)	Emergency Rating (MVA 2)
115	RAY	KNOLL	1	1	161.3	192.2
115	RAY	RS-30	1	1	341.6	375.6
115	RAY	SUPERIOR	1	1	132.5	147.4
115	REFINERY	REFINETP	1	1	39.8	39.8
115	REFINETP	ELLISOTP	1	1	120.5	142.4
115	RS-30	MORRISAZ	1	1	119.5	119.5
115	SANDSTONE	COOLIDGE	1	1	120.5	142.4
115	SILVERK1	SILVERT1	1	1	322.7	384.4
115	SILVERK2	SUPERIOR	1	1	161.3	192.2
115	SPURLOCK	SUPERIOR	1	1	132.5	147.4
115	SUPERIOR	TRASK	1	1	161.3	192.2

Appendix B – Contingency List

Single element contingencies evaluated for all 2020 cases include:

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	BROWNING	500	KYRENE	500	1
line	BROWNING	500	PINAL_C	500	1
line	CEDARMT	500	YAVAPAI	500	1
line	CHOLLA	500	SAGUARO	500	1
line	CHOLLA	500	SILVERKG	500	1
line	CORONADO	500	SGRLF	500	1
line	CORONADO	500	SILVERKG	500	1
line	DELANEY	500	SNVLY	500	1
line	DUGAS	500	MORGAN	500	1
line	DUKE	500	PINAL_C	500	1
line	DUKE	500	PINAL_W	500	1
line	FOURCORN	500	MOENKOPI	500	1
line	H ALLEN	500	MEAD	500	1
line	HASSYAMP	500	ARLINTON	500	1
line	HASSYAMP	500	HARQUAHA	500	1
line	HASSYAMP	500	HDWSH	500	1
line	HASSYAMP	500	JOJOBA	500	1
line	HASSYAMP	500	JOJOBA	500	2
line	HASSYAMP	500	N.GILA	500	1
line	HASSYAMP	500	PALOVRDE	500	1
line	HASSYAMP	500	PALOVRDE	500	2
line	HASSYAMP	500	PALOVRDE	500	3
line	HDWSH	500	N.GILA	500	1
line	JOJOBA	500	GILARIVR	500	1
line	JOJOBA	500	GILARIVR	500	2
line	JOJOBA	500	KYRENE	500	1
line	JOJOBA	500	PINAL_W	500	1
line	MEAD	500	MARKETPL	500	1
line	MEAD	500	PERKINS	500	1
line	MOENKOPI	500	CEDARMT	500	1
line	MOENKOPI	500	ELDORDO	500	1
line	MORGAN	500	PNPKAPS	500	r
line	NAVAJO	500	CRYSTAL	500	1
line	NAVAJO	500	DUGAS	500	1
line	NAVAJO	500	MOENKOPI	500	1
line	PALOVRDE	500	COLRIVER	500	1
line	PALOVRDE	500	DELANEY	500	1
line	PALOVRDE	500	RUDD	500	1
line	PALOVRDE	500	WESTWING	500	1
line	PALOVRDE	500	WESTWING	500	2
line	PERK PS2	500	PERKINPS	500	1
line	PINAL_C	500	TORTOLIT	500	1
line	Q043B1	500	HDWSH	500	1
line	SAGUARO	500	TORTLIT2	500	1
line	SAGUARO	500	TORTOLIT	500	1
line	SAGUARO	500	TORTOLIT	500	2
line	SGRLF	500	CHOLLA	500	1
line	SILVERKG	500	BROWNING	500	1
line	SILVERKG	500	SAGUARO	500	1
line	SNVLY	500	MORGAN	500	1
line	WESTWING	500	MORGAN	500	1
line	YAVAPAI	500	WESTWING	500	1
line	BICKNELL	345	VAIL	345	1

line	CHOLLA	345	MAZATZAL	345	1
line	CHOLLA	345	PRECHCYN	345	1
line	FLAGSTAF	345	GLENCANY	345	1
line	FLAGSTAF	345	GLENCANY	345	2
line	FLAGSTAF	345	PINPKBRB	345	1
line	FLAGSTAF	345	PINPKBRB	345	2
line	FLAGSTAF	345	YOUNGSCY	345	1
line	FOURCORN	345	CHOLLA	345	1
line	FOURCORN	345	CHOLLA	345	2
line	FOURCORN	345	RIOPUERC	345	1
line	FOURCORN	345	SAN_JUAN	345	1
line	GREENLEE	345	COPPERVR	345	1
line	GREENLEE	345	WILLOW	345	1
line	GREENLEE	345	WINCHSTR	345	1
line	HIDALGO	345	GREENLEE	345	1
line	LIBERTY	345	PEACOCK	345	1
line	MCHO_SPR	345	SPRINGR	345	1
line	MAZATZAL	345	PNPKAPS	345	1
line	MCKINLEY	345	SPRINGR	345	1
line	MCKINLEY	345	SPRINGR	345	2
line	PEACOCK	345	MEAD	345	1
line	PINALWES	345	SOUTH	345	1
line	PINTO PS	345	FOURCORN	345	1
line	PRECHCYN	345	PNPKAPS	345	1
line	SAN_JUAN	345	MCKINLEY	345	1
line	SAN_JUAN	345	MCKINLEY	345	2
line	SHIPROCK	345	FOURCORN	345	1
line	SHIPROCK	345	SAN_JUAN	345	1
line	SOCORO_W	345	SPRINGR	345	1
line	SPRINGR	345	CORONADO	345	1
line	SPRINGR	345	GREENLEE	345	1
line	SPRINGR	345	GREENLEE	345	1
line	SPRINGR	345	VAIL2	345	1
line	SPRINGR	345	VAIL2	345	1
line	TORTOLIT	345	NLOOP345	345	1
line	VAIL	345	SOUTH	345	1
line	WESTWING	345	PINALWES	345	1
line	WILLOW	345	BOWIE	345	1
line	WILLOW	345	BOWIE	345	2
line	WINCHSTR	345	VAIL	345	1
line	WINCHSTR	345	VAIL	345	1
line	WINCHSTR	345	WILLOW	345	1
line	ABEL	230	DINOSAUR	230	1
line	ABEL	230	RANDOLPH	230	1
line	AGUAFRIA	230	ALEXANDR	230	1
line	AGUAFRIA	230	WESTWNGW	230	1
line	AGUAFRIA	230	WHITETNK	230	1
line	ANDERSON	230	KYR-EAST	230	1
line	APACHE	230	BUTERFLD	230	1
line	APACHE	230	REDTAIL	230	1
line	APACHE	230	WINCHSTR	230	1
line	AVERY	230	RACEWAY	230	1
line	AVERY	230	SCTWSH	230	1
line	BC TAP	230	MEAD N	230	1
line	BLKGLADE	230	SHIPROCK	230	1
line	BOB SS	230	MEAD S	230	1
line	BRANDOW	230	KYR-EAST	230	1
line	BRANDOW	230	PAPAGOBT	230	1
line	BRANDOW	230	WARD	230	2
line	BRANDOW	230	WARD	230	4

line	BROWNING	230	CORBELL	230	1
line	BROWNING	230	SANTAN	230	1
line	BUCKEYE	230	LIBERTY	230	1
line	BUTERFLD	230	PANTANO	230	1
line	BUTERFLD	230	SAN RAF	230	1
line	CACTUS	230	OCOTILLO	230	1
line	CACTUS	230	PPAPS N	230	1
line	CAMINO	230	MEAD S	230	E
line	CAMINO	230	MEAD S	230	W
line	CASGRAPS	230	DBG	230	1
line	CHOLLA	230	LEUPP	230	1
line	COCONINO	230	VERDE S	230	1
line	COOLIDGE	230	SUN ARIZ	230	1
line	COOLIDGE	230	SUN ARIZ	230	2
line	COPPERVR	230	FRISCO	230	1
line	CORBELL	230	KYR-EAST	230	1
line	CTRYCLUB	230	GRNDTRML	230	1
line	CTRYCLUB	230	LINCSTRT	230	1
line	DAVIS	230	LONGTIN	230	1
line	DAVIS	230	MCCULLGH	230	1
line	DAVIS	230	MEAD N	230	1
line	DAVIS	230	RIVIERA	230	1
line	DAVIS	230	TOPOCK	230	2
line	DEERVALY	230	ALEXANDR	230	1
line	DEERVALY	230	PINPKSRP	230	1
line	DEERVALY	230	WESTWNGE	230	1
line	DINOSAUR	230	BROWNING	230	1
line	DOSCONDO	230	HACKBERY	230	1
line	EAGLEYE	230	LIBERTY	230	1
line	EL SOL	230	AGUAFRIA	230	1

line	FORTROCK	230	JUNIPRMT	230	1
line	FORTROCK	230	ROUNDVLY	230	1
line	FOURCORN	230	PILLAR	230	1
line	GAVLINWA	230	GAVILNPK	230	1
line	GAVLINWA	230	PINPK	230	1
line	GAVLINWA	230	PRSCOTWA	230	1
line	GLEN PS	230	NAVAJO	230	1
line	GLENDALE	230	GLENDALW	230	1
line	GLENDALE	230	GRNDTRML	230	1
line	GLENDALW	230	AGUAFRIA	230	1
line	GRIFFITH	230	PEACOCK	230	1
line	HACKBERY	230	MORENCI	230	1
line	HARCUVAR	230	HARCU AZ	230	1
line	HARCUVAR	230	HASSYTAP	230	1
line	HASSYTAP	230	HASSY AZ	230	1
line	HASSYTAP	230	LIBERTY	230	1
line	HENDRSON	230	MEAD N	230	1
line	HILLTOP	230	MCCONICO	230	1
line	HOVRA1A2	230	MEAD S	230	1
line	HOVRA5A6	230	MEAD S	230	1
line	HOVRA7-9	230	MEAD S	230	1
line	HOVRN1N2	230	MEAD S	230	1
line	HOVRN3N4	230	MEAD S	230	1
line	HOVRN5N6	230	MEAD S	230	1
line	HOVRN7N8	230	MEAD S	230	1
line	JOJOBA	230	PANDA	230	1
line	JUNIPRMT	230	SELIGMAN	230	1
line	KAYENTA	230	LNGHOUSE	230	1
line	KAYENTA	230	SHIPROCK	230	1
line	KNOX	230	RS-27	230	1

line	KNOX	230	RS-27	230	2
line	KNOX	230	SNTAROSA	230	1
line	KYR-EAST	230	SCHRADER	230	1
line	KYR-WEST	230	KNOX	230	1
line	KYR-WEST	230	OCOTILLO	230	1
line	LEUPP	230	COCONINO	230	1
line	LIBERTY	230	LIBTYPHS	230	1
line	LIBERTY	230	LONE BUT	230	1
line	LIBERTY	230	ORME	230	1
line	LIBERTY	230	PHXWAPA	230	1
line	LIBERTY	230	RUDD	230	2
line	LIBERTY	230	WESTWNGW	230	1
line	LINCSTRT	230	OCOTILLO	230	1
line	LINCSTRT	230	WPHXAPSN	230	1
line	LONE BUT	230	SUN ARIZ	230	1
line	LONE BUT	230	TESTTRAK	230	1
line	LONEPEAK	230	PPAPS E	230	1
line	LONEPEAK	230	SUNYSLOP	230	1
line	LONGTIN	230	TOPOCK	230	1
line	MCCONICO	230	DAVIS	230	1
line	MCCONICO	230	GRIFFITH	230	1
line	MCCONICO	230	HARRIS	230	1
line	MEAD N	230	ARDEN	230	1
line	MEAD N	230	EASTSIDE	230	1
line	MEAD N	230	EQUEST	230	2
line	MEAD N	230	HVRA3A4	230	1
line	MEAD N	230	NEWPORT	230	1
line	MEAD N	230	SINATRA	230	1
line	MEAD S	230	ELDORDO	230	1
line	MEAD S	230	ELDORDO	230	2
line	MEAD S	230	EQUEST	230	1
line	MEAD S	230	GREENWAY	230	1
line	MEAD S	230	MCCULLGH	230	1
line	MEAD S	230	MCCULLGH	230	2
line	MEAD S	230	MEAD N	230	1
line	MEADOWBK	230	CTRYCLUB	230	1
line	MEADOWBK	230	SUNYSLOP	230	1
line	MESQUITE	230	MESSOLAR	230	1
line	MESQUITE	230	MESSOLAR	230	2
line	MILLIGAN	230	CASGRAPS	230	1
line	MORENCI	230	GREEN-SW	230	1
line	MORENCI	230	PD-MORNC	230	1
line	N.GILA	230	ORCHRD	230	1
line	N.HAVASU	230	PARKER	230	1
line	N.HAVASU	230	TOPOCK	230	1
line	N.WADDEL	230	RACEWYWA	230	1
line	NAVAJO	230	LNGHOUSE	230	1
line	NEWPORT	230	EASTSIDE	230	1
line	NEWTUCSN	230	SAHUARIT	230	1
line	OCOTILLO	230	OCO1	230	1
line	OCOTILLO	230	OCO2	230	1
line	ORME	230	ANDERSON	230	1
line	ORME	230	ANDERSON	230	2
line	ORME	230	RUDD	230	1
line	ORME	230	RUDD	230	2
line	PANDA	230	GILABEND	230	1
line	PANTANO	230	NEWTUCSN	230	1
line	PAPAGOBT	230	KYR-EAST	230	1
line	PAPAGOBT	230	PINPKSRP	230	1
line	PARKER	230	BLK MESA	230	1

line	PARKER	230	EAGLEYE	230	1
line	PARKER	230	GENE	230	1
line	PARKER	230	HARCUVAR	230	1
line	PARKER	230	HAVASU	230	1
line	PD-MORNC	230	FRISCO	230	1
line	PEACOCK	230	HILLTOP	230	1
line	PHXWAPA	230	LONE BUT	230	1
line	PINAL_C	230	DBG	230	1
line	PINAL_C	230	RANDOLPH	230	1
line	PINPK	230	PINPKSRP	230	1
line	PINPK	230	PINPKSRP	230	2
line	PINPKSRP	230	BRANDOW	230	1
line	PINPKSRP	230	BRANDOW	230	2
line	PPAPS C	230	PPAPS E	230	1
line	PPAPS N	230	OCOTILLO	230	1
line	PPAPS N	230	PINPKSRP	230	1
line	PPAPS N	230	PINPKSRP	230	2
line	PPAPS N	230	PPAPS E	230	1
line	PPAPS W	230	PINPK	230	1
line	PPAPS W	230	PPAPS C	230	1
line	PRSCOTWA	230	PRESCOTT	230	1
line	PRSCOTWA	230	RNDVLYTP	230	1
line	RACEWAY	230	RACEWYWA	230	1
line	RACEWYWA	230	WESTWNGE	230	1
line	REACH	230	LONEPEAK	230	1
line	REACH	230	PPAPS C	230	1
line	REDTAIL	230	DOSCONDO	230	1
line	RNDVLYTP	230	PEACOCK	230	1
line	RNDVLYTP	230	ROUNDVLY	230	1
line	ROGERS	230	THUNDRST	230	1

line	ROGSWAPA	230	PINPK	230	1
line	ROGSWAPA	230	PINPK	230	2
line	ROGSWAPA	230	SPKHILTP	230	1
line	RS-27	230	RS-28	230	1
line	RS-27	230	RS-28	230	2
line	RUDD	230	PLMVLY	230	1
line	RUDD	230	WHITETNK	230	1
line	SAGUARO	230	MILLIGAN	230	1
line	SAGUARO	230	TATMOMLI	230	1
line	SAHUARIT	230	BICKNELL	230	1
line	SANTAN	230	CORBELL	230	1
line	SANTAN	230	ROGERS	230	1
line	SANTAN	230	THUNDRST	230	1
line	SCHRADER	230	RS-28	230	1
line	SCHRADER	230	SANTAN	230	1
line	SCHRADER	230	SANTAN	230	2
line	SCTWSH	230	PPAPS W	230	1
line	SIGURDPS	230	GLENCANY	230	1
line	SILVERKG	230	GOLDFELD	230	1
line	SILVERKG	230	RS-29	230	1
line	SILVERKG	230	RS-29	230	2
line	SNTAROSA	230	DBG	230	1
line	SNTAROSA	230	TATMOMLI	230	1
line	SNTAROSA	230	TESTTRAK	230	1
line	SNVLY	230	TRLBY	230	1
line	SOLANA	230	PANDA	230	1
line	SPKHILTP	230	COOLIDGE	230	1
line	SUN ARIZ	230	PINAL_C	230	1
line	SURPRISE	230	EL SOL	230	1
line	SURPRISE	230	WESTWNGW	230	1

line	TESTTRAK	230	CASAGRND	230	1
line	TESTTRAK	230	ED5-230	230	1
line	THUNDRST	230	GOLDFELD	230	1
line	THUNDRST	230	GOLDFELD	230	2
line	TOPOCK	230	BLK MESA	230	1
line	TOPOCK	230	SOPOINT	230	1
line	TOPOCK	230	SOPOINT	230	2
line	TRLBY	230	PLMVLY	230	1
line	TS4	230	JOJOBA	230	1
line	TS4	230	PLMVLY	230	1
line	VERDE S	230	VERDE N	230	1
line	WESTWNGW	230	EL SOL	230	1
line	WESTWNGW	230	PINPK	230	1
line	WESTWNGW	230	WESTWNGE	230	1
line	WHTNKAPS	230	EL SOL	230	1
line	WHTNKAPS	230	RUDD	230	1
line	WILOWLKE	230	PRESCOTT	230	1
line	WILOWLKW	230	PRSCOTWA	230	1
line	WILOWLKW	230	WILOWLKE	230	1
line	WPHXAPSN	230	WHTNKAPS	230	1
line	WPHXAPSS	230	RUDD	230	1
line	WPHXAPSS	230	WPHXAPSN	230	1
line	YAVAPAI	230	VERDE N	230	1
line	YAVAPAI	230	WILOWLKE	230	1
line	YUCCA	230	N.GILA	230	1
line	YUCCA	230	ORCHRD	230	1
line	BLYTHE	161	BLYTHEAZ	161	1
line	BLYTHE	161	BLYTHESC	161	1
line	BLYTHE	161	GLT TAP	161	1
line	BLYTHE	161	HEADGATE	161	1

line	BOUSE	161	BLACK PK	161	1
line	BOUSE	161	KOFA	161	1
line	GILA	161	DOME TAP	161	1
line	GILA	161	KNOB	161	1
line	GLT TAP	161	KNOB	161	1
line	KNOB	161	PILOTKNB	161	1
line	KOFA	161	DOME TAP	161	1
line	NILAND	161	BLYTHE	161	1
line	PARKER	161	BLYTHE	161	1
line	PARKER	161	BOUSE	161	1
line	PARKER	161	HEADGATE	161	1
line	WLTNMOHK	161	DOME TAP	161	1
line	WLTNMOHK	161	GILA	161	1
line	CANEZ	138	SONOITA	138	1
line	CANOARCH	138	CLEAR	138	1
line	CEDARMT2	138	CEDARMT3	138	1
line	CIENEGA	138	S.TRAIL	138	1
line	CORONA	138	IRVNGTN	138	1
line	CORONA	138	SOUTH	138	1
line	CRYCROFT	138	NE.LOOP	138	1
line	CYPRUS	138	CLEAR	138	1
line	DELCERRO	138	WESTINA	138	1
line	DELCERRO	138	WESTINA	138	1
line	DMP	138	ANKLAM	138	1
line	DMP	138	DMP_EXP	138	1
line	DMP	138	N. LOOP	138	1
line	DMP	138	N. LOOP	138	1
line	DMP	138	NE.LOOP	138	1
line	DMP	138	NE.LOOP	138	1
line	DMP	138	SN.CRUZ	138	1

line	DMP	138	TUCSON	138	1
line	DREXEL	138	IRVNGTN	138	1
line	DREXEL	138	IRVNGTN	138	1
line	DREXEL	138	MIDVALE	138	1
line	E. LOOP	138	HARRISON	138	1
line	E. LOOP	138	NE.LOOP	138	1
line	E. LOOP	138	PANTANO	138	1
line	E. LOOP	138	ROBERTS	138	1
line	GREENVLY	138	CANOARCH	138	1
line	HARTT	138	GREENVLY	138	1
line	IRV_RING	138	SOUTH	138	1
line	IRVNGTN	138	KINO	138	1
line	IRVNGTN	138	SOUTH	138	1
line	IRVNGTN	138	TECHPARK	138	1
line	IRVNGTN	138	TUCSON	138	1
line	IRVNGTN	138	VAIL	138	2
line	KANTOR	138	CANEZ	138	1
line	KANTOR	138	TUBAC	138	1
line	LOSREALS	138	VAIL	138	1
line	MIDVALE	138	MEDINA	138	1
line	MIDVALE	138	SPNCER	138	1
line	N. LOOP	138	MARANA	138	1
line	N. LOOP	138	NARANJA	138	1
line	N. LOOP	138	RANVISTO	138	1
line	N. LOOP	138	RANVISTO	138	1
line	N. LOOP	138	RILLITO	138	1
line	N. LOOP	138	WESTINA	138	1
line	N. LOOP	138	WESTINA	138	1
line	NE.LOOP	138	NELP_SVC	138	1
line	NE.LOOP	138	RILLITO	138	1

line	NOGALES	138	KANTOR	138	1
line	ORNGROVE	138	EASTINA	138	1
line	ORNGROVE	138	LACANADA	138	1
line	ORNGROVE	138	RILLITO	138	1
line	PANTANO	138	LOSREALS	138	1
line	RANVISTO	138	LACANADA	138	1
line	RANVISTO	138	NARANJA	138	1
line	RAYTHEON	138	MEDINA	138	1
line	RBWILMOT	138	IRVNGTN	138	1
line	RBWILMOT	138	VAIL	138	1
line	RILLITO	138	LACANADA	138	1
line	ROBERTS	138	HARRISON	138	1
line	S.TRAIL	138	ROBERTS	138	1
line	SN.CRUZ	138	ANKLAM	138	1
line	SN.CRUZ	138	IRVNGTN	138	1
line	SNYDER	138	CRYCROFT	138	1
line	SNYDER	138	E. LOOP	138	1
line	SNYDER	138	NE.LOOP	138	1
line	SONOITA	138	VALNCIA	138	1
line	SOUTH	138	ASARCO	138	1
line	SOUTH	138	CLEAR	138	1
line	SOUTH	138	CYPRUS	138	1
line	SOUTH	138	GREENVLY	138	1
line	SOUTH	138	MEDINA	138	1
line	SOUTH	138	MIDVALE	138	1
line	SOUTH	138	RAYTHEON	138	1
line	SOUTH	138	TORO	138	1
line	SPNCER	138	MEDINA	138	1
line	TECHPARK	138	VAIL	138	1
line	TORO	138	GREENVLY	138	1

line	TORO	138	HARTT	138	1
line	TORO	138	ROSEMONT	138	1
line	TORTOLIT	138	MARANA	138	1
line	TORTOLIT	138	N. LOOP	138	1
line	TORTOLIT	138	N. LOOP	138	2
line	TORTOLIT	138	N. LOOP	138	3
line	TORTOLIT	138	N. LOOP	138	4
line	TORTOLIT	138	N. LOOP	138	5
line	TORTOLIT	138	RANVISTO	138	1
line	TUBAC	138	CANEZ	138	1
line	TUCSON	138	DELCERRO	138	1
line	TUCSON	138	DELCERRO	138	1
line	TUCSON	138	KINO	138	1
line	TWNTYSEC	138	E. LOOP	138	1
line	TWNTYSEC	138	IRVNGTN	138	1
line	TWNTYSEC	138	IRVNGTN	138	1
line	UA MED	138	KINO	138	1
line	UA MED	138	TUCSON	138	1
line	VAIL	138	CIENEGA	138	1
line	VAIL	138	FT.HUACH	138	1
line	VAIL	138	KANTOR	138	1
line	ADAMS	115	ADAMSTAP	115	1
line	ADAMSTAP	115	APACHE	115	1
line	ADAMSTAP	115	NOGALES	115	1
line	ANIMAS	115	BLUFVIEW	115	1
line	ANIMAS	115	SULLIVAN	115	1
line	APACHE	115	HAYDENAZ	115	1
line	A-R	115	SAN JUAN	115	1
line	A-R	115	TURLY_S	115	1
line	ASARCOSR	115	ASARCOTP	115	1

line	ASARCOTP	115	CRUSHER	115	1
line	ASARCOTP	115	HAYDENAZ	115	1
line	AVRA	115	SNDARIO	115	1
line	AVSOLAR	115	AVSOLAR2	115	1
line	BAGCAP	115	BAGDAD	115	1
line	BAGDTWN	115	BAGCAP	115	1
line	BERGIN	115	LAKEVIEW	115	1
line	BERGIN	115	WESTFORK	115	1
line	BICKNELL	115	THREEPNT	115	1
line	BLACKMTN	115	BLKMTNAZ	115	1
line	BLACKMTN	115	DEL BAC	115	1
line	BLACKMTN	115	SNYDHILL	115	1
line	BLUFVIEW	115	MESA FM	115	1
line	BONNEYTP	115	BONNYBRK	115	1
line	BONNEYTP	115	CRUSHER	115	1
line	BONNEYTP	115	SANDSTONE	115	1
line	BONNYBKE	115	BONNYBRK	115	1
line	BOOTHILL	115	ADAMS	115	1
line	BOOTHILL	115	MURAL	115	1
line	BRADY	115	BRADYAZ	115	1
line	BRADY	115	PICACHOW	115	1
line	BRAWLEY	115	BRAWLYAZ	115	1
line	BRAWLEY	115	SANXAVER	115	1
line	CARLOTA	115	PINTOVLY	115	1
line	CARLOTA	115	SILVERK2	115	1
line	CARREL	115	GOLDFELD	115	1
line	CARREL	115	SPURLOCK	115	1
line	COLLTAP	115	COLLEG	115	1
line	COLLTAP	115	HOODMESA	115	1
line	COLLTAP	115	SULLIVAN	115	1

line	COOLIDGE	115	COOLDGAZ	115	1
line	COOLIDGE	115	ED-2	115	1
line	COOLIDGE	115	SIGNAL	115	1
line	COOLIDGE	115	VLYFARMS	115	1
line	DEL BAC	115	NOGALES	115	1
line	ED-2	115	BRADY	115	1
line	ED-2	115	ED-4	115	1
line	ED-2	115	SIGNAL	115	1
line	ED-4	115	ED-5	115	1
line	ED-5	115	EMPIRE	115	1
line	ELLISON	115	ELLISOTP	115	1
line	EMPIRE	115	CASAGRND	115	1
line	FOOTHILS	115	HOODMESA	115	1
line	FOOTHILS	115	LAKEVIEW	115	1
line	FRAZIER	115	HORSMESA	115	1
line	FRAZIER	115	MOONSHIN	115	1
line	FRAZIER	115	ROOSEVLT	115	1
line	FRUITAP	115	FRUITLND	115	1
line	FRUITAP	115	HOODMESA	115	1
line	GALLEGOS	115	BERGIN	115	1
line	GASCLEAN	115	ELLISOTP	115	1
line	GLADETAP	115	BLKGLADS	115	1
line	GLADETAP	115	LAPLATA	115	1
line	GOLDFELD	115	HORSMESA	115	1
line	GOLDFELD	115	MRMNFLAT	115	1
line	GOLDFELD	115	STEWMTN	115	1
line	HARE	115	ENRON	115	1
line	HARE	115	MILAGR	115	1
line	HARE	115	TURLY_S	115	1
line	HARE	115	WESTFORK	115	1

line	HARTCYN	115	GLADETAP	115	1
line	HARTCYN	115	H-H	115	1
line	HAYDENAZ	115	KEARNYTP	115	1
line	H-H	115	HARE	115	1
line	HORSMESA	115	MRMNFLAT	115	1
line	KEARNYTP	115	MORRISAZ	115	1
line	KNOLL	115	MORRISAZ	115	1
line	KNOLL	115	RS-30	115	1
line	MARANA	115	AVRA	115	1
line	MARANATP	115	MARANA	115	1
line	MARANATP	115	RATTLSNK	115	1
line	MIAMI	115	MIAMI 3	115	1
line	MIAMI	115	PINTOVLY	115	1
line	MIAMI 3	115	MIAMI 4	115	1
line	MIAMI 3	115	PINAL	115	1
line	MIAMI 4	115	ELLISOTP	115	1
line	MOONSHIN	115	PINAL	115	1
line	MOONSHIN	115	REFINETP	115	1
line	NAVAJO	115	SAN JUAN	115	1
line	OAKFLAT	115	SILVERT1	115	1
line	OAKFLAT	115	TRASK	115	1
line	ORACLE	115	ORACLEAZ	115	1
line	ORACLE	115	S.BRKRCH	115	1
line	PANTANO	115	KARTCHNR	115	1
line	PICACHOW	115	PICACHAZ	115	1
line	PICACHOW	115	RED ROCK	115	1
line	PINAL	115	SILVERT1	115	1
line	PRESCOTT	115	BAGDAD	115	1
line	PRESCOTT	115	BAGDTWN	115	1
line	RATTLSNK	115	TUCSON	115	1

line	RATTLSNK	115	TWINPEAK	115	1
line	RAY	115	KNOLL	115	1
line	RAY	115	RS-30	115	1
line	RAY	115	SUPERIOR	115	1
line	RED ROCK	115	REDRCKAZ	115	1
line	RED ROCK	115	SAG.EAST	115	1
line	REFINERY	115	REFINETP	115	1
line	REFINETP	115	ELLISOTP	115	1
line	RS-30	115	MORRISAZ	115	1
line	S.BRKRCH	115	SNMANUEL	115	1
line	SAG.EAST	115	MARANATP	115	1
line	SAG.EAST	115	ORACLE	115	1
line	SAG.EAST	115	SAG.WEST	115	1
line	SAG.WEST	115	ED-5	115	1
line	SAG.WEST	115	ED-5	115	2
line	SAG.WEST	115	SNMANUEL	115	1
line	SANDARIO	115	BRAWLEY	115	1
line	SANDARIO	115	SANDARAZ	115	1
line	SANDSTONE	115	COOLIDGE	115	1
line	SANXAVER	115	SANXAVAZ	115	1
line	SANXAVER	115	SNYDHILL	115	1
line	SHIPROCK	115	FRUITAP	115	1
line	SHIPROCK	115	PRAXAR	115	1
line	SILVERK1	115	SILVERT1	115	1
line	SILVERK2	115	SUPERIOR	115	1
line	SNYDHILL	115	SNYDHLAZ	115	1
line	SPURLOCK	115	SUPERIOR	115	1
line	SUPERIOR	115	TRASK	115	1
line	THREEPNT	115	SNDARIO	115	1
line	THREEPNT	115	VALEN-SW	115	1

line	TUCSON	115	DEL BAC	115	1
line	TUCSON	115	ORACLE	115	1
line	TURLY_S	115	BLANCO	115	1
line	TWINPEAK	115	SANDARIO	115	1
line	TWINPEAK	115	TWINPKAZ	115	1
line	VLYFARMS	115	ORACLE	115	1
line	WESTLOOP	115	GLADETAP	115	1
line	WESTLOOP	115	HOGBAK	115	1
line	WESTLOOP	115	HOODMESA	115	1
line	WESTLOOP	115	MESA FM	115	1
line	WESTLOOP	115	PRAXAR	115	1
tran	PERKINS	500	PERK PS1	500	1
tran	PERKINS	500	PERK PS2	500	1
tran	CHOLLA	500	CHOLLA	345	1
tran	CHOLLA	500	CHOLLA	345	2
tran	CORONADO	500	CORONADO	345	1
tran	CORONADO	500	CORONADO	345	2
tran	FOURCORN	500	FOURCORN	345	1
tran	PINAL_W	500	PINALWES	345	1
tran	TORTOLIT	500	TORTOLIT	345	1
tran	WESTWING	500	WESTWING	345	1
tran	BROWNING	500	BROWNING	230	1
tran	BROWNING	500	BROWNING	230	1
tran	DUKE	500	TESTTRAK	230	1
tran	GILARIVR	500	PANDA	230	1
tran	KYRENE	500	KYR-EAST	230	7
tran	KYRENE	500	KYR-EAST	230	8
tran	KYRENE	500	KYR-WEST	230	6
tran	MEAD	500	MEAD N	230	1
tran	MEAD	500	MEAD N	230	2

tran	MESQUIT1	500	MESQUITE	230	1
tran	MESQUIT2	500	MESQUITE	230	1
tran	MORGAN	500	RACEWAY	230	1
tran	MORGAN	500	RACEWAY	230	2
tran	N.GILA	500	N.GILA	230	1
tran	PINAL_C	500	PINAL_C	230	1
tran	PINAL_C	500	PINAL_C	230	2
tran	PNPKAPS	500	PPAPS E	230	1
tran	PNPKAPS	500	PPAPS N	230	1
tran	PNPKAPS	500	PPAPS W	230	1
tran	RUDD	500	RUDD	230	1
tran	RUDD	500	RUDD	230	1
tran	RUDD	500	RUDD	230	3
tran	RUDD	500	RUDD	230	3
tran	SILVERKG	500	SILVERKG	230	1
tran	SNVLY	500	SNVLY	230	1
tran	SNVLY	500	SNVLY	230	2
tran	WESTWING	500	WESTWNGE	230	1
tran	WESTWING	500	WESTWNGW	230	2
tran	WESTWING	500	WESTWNGW	230	3
tran	YAVAPAI	500	YAVAPAI	230	1
tran	YAVAPAI	500	YAVAPAI	230	2
tran	SAGUARO	500	SAG.EAST	115	1
tran	SAGUARO	500	SAG.WEST	115	1
tran	BICKNELL	345	BICKNELL	230	1
tran	CHOLLA	345	CHOLLA	230	1
tran	CHOLLA	345	CHOLLA	230	2
tran	COPPERVR	345	COPPERVR	230	1
tran	COPPERVR	345	COPPERVR	230	2
tran	FOURCORN	345	FOURCORN	230	1
tran	FOURCORN	345	FOURCORN	230	2
tran	GLENCANY	345	GLENCANY	230	1
tran	GLENCANY	345	GLENCANY	230	2
tran	GREEN-SW	345	GREEN-SW	230	1
tran	LIBERTY	345	LIBTYPHS	230	1
tran	MEAD	345	MEAD N	230	1
tran	MEAD	345	MEAD N	230	2
tran	PEACOCK	345	PEACOCK	230	1
tran	PINPKBRB	345	PINPK	230	1
tran	PINPKBRB	345	PINPK	230	2
tran	PINPKBRB	345	PINPK	230	3
tran	PNPKAPS	345	PPAPS C	230	1
tran	PNPKAPS	345	PPAPS E	230	3
tran	PNPKAPS	345	PPAPS N	230	2
tran	SHIPROCK	345	SHIPROCK	230	1
tran	WINCHSTR	345	WINCHSTR	230	1
tran	SOUTH	345	SOUTH	138	1
tran	SOUTH	345	SOUTH	138	2
tran	VAIL	345	VAIL	138	1
tran	VAIL	345	VAIL	138	3
tran	VAIL2	345	VAIL	138	1
tran	VAIL2	345	VAIL	138	2
tran	MCKINLEY	345	YAHTAHEY	115	1
tran	MCKINLEY	345	YAHTAHEY	115	2
tran	MEAD S	230	MEAD	287	1
tran	GLEN PS	230	GLENCANY	230	1
tran	LIBTYPHS	230	LIBERTY	230	2
tran	SHIP PS	230	SHIPROCK	230	1
tran	SHIP PS	230	SHIPROCK	230	2
tran	APACHE	230	APACHE	115	1

tran	APACHE	230	APACHE	115	2
tran	BICKNELL	230	BICKNELL	115	1
tran	BICKNELL	230	BICKNELL	115	2
tran	CASAGRND	230	CASAGRND	115	1
tran	COOLIDGE	230	COOLIDGE	115	1
tran	COOLIDGE	230	COOLIDGE	115	2
tran	ED5-230	230	ED-5	115	1
tran	GALLEGOS	230	GALLEGOS	115	1
tran	GOLDFELD	230	GOLDFELD	115	1
tran	GOLDFELD	230	GOLDFELD	115	2
tran	PANTANO	230	PANTANO	115	1
tran	PRESCOTT	230	PRESCOTT	115	1
tran	PRESCOTT	230	PRESCOTT	115	2
tran	PRESCOTT	230	PRESCOTT	115	3
tran	RS-29	230	RAY	115	1
tran	RS-29	230	RAY	115	2
tran	SAGUARO	230	SAG.EAST	115	1
tran	SAGUARO	230	SAG.WEST	115	1
tran	SAN_JUAN	230	HOGBAK	115	1
tran	SHIPROCK	230	SHIPROCK	115	1
tran	SILVERKG	230	SILVERK1	115	1
tran	SILVERKG	230	SILVERK2	115	1
tran	AGUAFRIA	230	AFRAAPSN	69	1
tran	ALEXANDR	230	ALEXANDR	69	3
tran	ALEXANDR	230	ALEXANDR	69	4
tran	ALEXANDR	230	ALEXNDR	69	1
tran	PARKER	161	PARKER	230	1
tran	PARKER	161	PARKER	230	2
tran	CEDARMT3	138	CEDARMT	500	1
tran	TORTOLIT	138	TORTLIT2	500	1

tran	TORTOLIT	138	TORTOLIT	500	1
tran	TORTOLIT	138	TORTOLIT	500	2
tran	TORTOLIT	138	TORTOLIT	500	3
tran	TORTOLIT	138	TORTOLIT	500	4
tran	IRVMID3	138	IRVNGTN	138	1
tran	IRVMID4	138	IRVNGTN	138	1
tran	SPNCER	138	SPNCER	115	1
tran	TORTOLIT	138	SAG.EAST	115	1
tran	TORTOLIT	138	SAG.WEST	115	1
tran	AVSOLAR	115	AVSOLAR	500	1
tran	SNMANUEL	115	SNMANUEL	100	1
tran	ABEL	69	ABEL	230	4
tran	AF-NORTH	69	AGUAFRIA	230	3
tran	AF-NORTH	69	AGUAFRIA	230	4
tran	ALEXANDR	69	ALEXANDR	230	1
tran	ALEXANDR	69	ALEXANDR	230	2
tran	ANDERSRS	69	ANDERSON	230	1
tran	ANDERSRS	69	ANDERSON	230	2
tran	ANDERSRS	69	ANDERSON	230	3
tran	ANDERSRS	69	ANDERSON	230	4
tran	BRANDOW	69	BRANDOW	230	1
tran	BRANDOW	69	BRANDOW	230	2
tran	BRANDOW	69	BRANDOW	230	3
tran	BROWNING	69	BROWNING	230	4
tran	BROWNING	69	BROWNING	230	5
tran	BROWNING	69	BROWNING	230	6
tran	CORBELRS	69	CORBELL	230	2
tran	CORBELRS	69	CORBELL	230	3
tran	CORBELRS	69	CORBELL	230	4
tran	DINOSAUR	69	DINOSAUR	230	1

tran	HOOPES	69	RS-28	230	3
tran	KNOX	69	KNOX	230	2
tran	KYRENEGT	69	KYR-EAST	230	2
tran	KYRENEGT	69	KYR-EAST	230	3
tran	KYRENEGT	69	KYR-EAST	230	4
tran	ORME RS	69	ORME	230	1
tran	ORME RS	69	ORME	230	2
tran	ORME RS	69	ORME	230	3
tran	ORME RS	69	ORME	230	4
tran	PAPAGOBT	69	PAPAGOBT	230	1
tran	PAPAGOBT	69	PAPAGOBT	230	2
tran	PAPAGOBT	69	PAPAGOBT	230	3
tran	PAPAGOBT	69	PAPAGOBT	230	4
tran	ROGERS	69	ROGERS	230	2
tran	ROGERS	69	ROGERS	230	4
tran	RUDD	69	RUDD	230	1
tran	SANTAN	69	SANTAN	230	3
tran	SANTAN	69	SANTAN	230	4
tran	SANTAN	69	SANTAN	230	5
tran	SCHRADER	69	SCHRADER	230	1
tran	SCHRADER	69	SCHRADER	230	3
tran	SCHRADER	69	SCHRADER	230	4
tran	THUNDRST	69	THUNDRST	230	1
tran	THUNDRST	69	THUNDRST	230	2
tran	THUNDRST	69	THUNDRST	230	3
tran	THUNDRST	69	THUNDRST	230	4
tran	WARD RS	69	WARD	230	1
tran	WARD RS	69	WARD	230	2
tran	WHITETNK	69	WHITETNK	230	1
tran	WHITETNK	69	WHITETNK	230	3

Appendix C – Power Flow Results

The following table shows SRP elements loaded at 90% of their emergency thermal limit or higher. The ratings of transformers are shown in MVA.

Case 1: 2020 Peak Case

Element	Rating	Actual	% Loading	Outage Element
Mesquite 500/230kV Transformer 1	1500.0	1422.0	94.8%	Mesquite 500/230kV Transformer 2
Mesquite 500/230kV Transformer 2	1500.0	1422.0	94.8%	Mesquite 500/230kV Transformer 1

Case 2: 2020 Peak Case without EE/DG

Element	Rating	Actual	% Loading	Outage Element
Mesquite 500/230kV Transformer 1	1500.0	1473.0	98.2%	Mesquite 500/230kV Transformer 2
Mesquite 500/230kV Transformer 2	1500.0	1473.0	98.2%	Mesquite 500/230kV Transformer 1

Case 3: 2020 Near-Peak Case without EE/DG or Utility Solar

Element	Rating	Actual	% Loading	Outage Element
None	n/a	n/a	n/a	n/a

Note: The loading on the Mesquite 500/230kV transformers is caused by new solar generation, and will be mitigated by a remedial action scheme that will trip generation.