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Arizona Corporation Commission
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January 31, 2017

Mr. Elijah Abinah
Acting Director, Utilities Division
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007

Re: Ten-Year Plan – Tenth Biennial Transmission Assessment for 2018 through 2027;
Docket No. E-00000D-17-0001

Dear Mr. Abinah:

Enclosed are an original and thirteen (13) copies of The Salt River Project's 2017-2026 Ten-Year Transmission Plan filed pursuant to A.R.S. Section §40-360-02.

Please contact Mr. Mike Jones, Director, Transmission Planning Department at (602) 236-0882 if you have any questions concerning this plan.

Sincerely,

Robert R Taylor

Robert R. Taylor

RRT/jkb

Enclosures (14)

2017

SRP Ten Year Transmission Plan 2017-2026

Prepared for the Arizona Corporation Commission

January 2017

Docket No. E-00000D-17-0001

Table of Contents

1. Introduction

This report updates and replaces the Ten Year Transmission Plan of the Salt River Project Agricultural Improvement and Power District (SRP), submitted in January 2016 pursuant to A.R.S. Section 40-360.02. The 2017-2026 plan describes planned transmission line projects of 115kV or higher that SRP may construct or participate in over the next ten years.

2. Planning Organizations

SRP continues to be involved in regional and sub-regional planning organizations. SRP's primary goal in these various planning activities is to ensure that a reliable and economical transmission system is connected to energy sources. Participation also allows SRP to coordinate its transmission plans with the plans of the other transmission providers.

2.1 Regional Planning Organizations

2.1.1 Western Electricity Coordinating Council (WECC)

WECC is a non-profit corporation approved by the Federal Energy Regulatory Commission (FERC) to serve as the Regional Entity tasked with assuring a reliable bulk electric system in the geographical area known as the Western Interconnection.

SRP is an active participant in the WECC committees that develop and integrate new system and generation models, develop WECC-wide base cases, develop WECC reliability criteria, and coordinate planning methodologies.

2.1.2 WestConnect

SRP participates in the regional transmission planning activities of WestConnect. WestConnect is comprised of utility companies and independent transmission developers with transmission assets or potential transmission projects in the western United States. Its members collaboratively assess stakeholder needs and develop cost-effective transmission and wholesale market enhancements. WestConnect is committed to coordinating its work with other regional and interregional industry efforts to ensure consistency within the Western Interconnection.

SRP continues to be an active participant in the WestConnect regional transmission planning and cost allocation processes established by FERC Order No. 1000. In August 2016, the 5th Circuit Court of Appeals vacated FERC's Compliance Orders on the WestConnect Order 1000 process. The WestConnect utilities continue to work through the regional transmission planning process while they wait for FERC to re-assess the compliance orders. While SRP is not required to participate in the Order No. 1000 process, SRP recognizes the importance of maintaining a collaborative and cooperative transmission planning process in the Western Interconnection. The Order No. 1000 planning process began January 1, 2015 with an abbreviated, one-year planning cycle. The regular, biennial regional transmission planning process began January 1, 2016. The outcome of Order No. 1000 regional transmission planning is a regional transmission plan that selects

regional transmission projects to meet identified reliability, economic, or public policy transmission needs. The regional participants did not identify any transmission needs in the 2015 Regional Transmission Plan.[1]

2.2 Sub-Regional Planning Organization

2.2.1 Southwest Area Transmission Planning Group (SWAT)

The SWAT, with its technical study subcommittees, work groups, and study groups, addresses future transmission needs on a sub-regional (desert southwest) basis. SRP is engaged in various SWAT activities and relies on the following SWAT entities to meet obligations for the Arizona Corporation Commission (ACC) and the Ten Year Transmission Plan filing: Arizona Transmission System (ATS)[2] subcommittee, Short Circuit Work Group, Eldorado Valley Study Group, Transmission Corridor Work Group, and the Coal Reduction Assessment Task Force. SWAT disseminates its work publicly and coordinates its studies and data with other sub-regional planning groups and WestConnect.

[1] WestConnect 2015 Regional Transmission Plan is available at: https://doc.westconnect.com/Documents.aspx?NID=17179

[2] The former Central Arizona Transmission System (CATS), Colorado River Transmission (CRT) and Southern Arizona Transmission System (SATS) subcommittees were merged to form the ATS subcommittee in February 2013.

3. Biennial Transmission Assessment (BTA) Order Requirements

3.1 9th BTA Order Requirements

On November 21, 2016, the ACC issued Decision No. 75817, which suspended the requirement from the 8th BTA that required utilities to provide the anticipated load level range at which each transmission project may be needed. Consistent with the 8th BTA, utilities must continue to describe whether each project is driven by load growth or reliability. Factors driving each of SRP's transmission projects may change over time as resource plans change.

3.2 Prior BTA Order Requirements

The following sections highlight SRP's responses to ongoing activities related to prior BTA orders.

As ordered by the ACC in its 7th BTA decision, entities are required to notify parties requesting generation or transmission interconnections to the Bulk Electric System of the appropriate ACC filing requirements. SRP placed an advisory notice on SRP's OASIS page on March 19, 2013 to satisfy this requirement:

http://www.oatioasis.com/SRP/SRPdocs/Potential_Additional_State_Requirements.pd.pdf

This notice continues to meet the requirements of the 7th BTA that was further affirmed in the 8th and 9th BTAs. SRP does not take responsibility for any third-party interconnector's compliance with ACC requirements.

The ACC's 6th BTA order adopted several requirements that remain in force. The ongoing requirements include:

a) Report relevant findings in future BTAs regarding compliance with transmission planning standards (e.g. TPL-001 through TPL-004)[3] from NERC/WECC reliability audits that have been finalized and filed with FERC.

   SRP was last audited on its compliance with NERC Standards TPL-001-0, TPL-002-0, and TPL-003-0 in August 2013. The WECC Audit team determined that SRP is in compliance with these three Standards. The next audit of TPL-001-4 has not been scheduled.

[3] NERC Standards TPL-001 through TPL-004 have been replaced with TPL-001-4.

b) Identify planned transmission re-conductor projects, transformer capacity upgrade projects, and reactive power compensation facility additions at 115kV and above in ten year plan filings.

SRP's planned transmission re-conductor, transformer capacity upgrades, and reactive power compensation additions in this ten year period are shown below. In-service dates may change to reflect load changes in the local system.

Reactive Devices

SRP's planned reactive device addition and anticipated in-service year:

- 12 Ohm Series Reactors on Palo Verde – Hassayampa 500kV Ties #1-3 (2017)

Transformers

SRP's planned transformer additions to existing stations to accommodate load growth and anticipated in-service year:

- Rudd 230/69kV Transformer (2021)
- Browning 230/69kV Transformer (2022)

Re-Conductor

- SRP does not have any planned re-conductor projects.

c) Discuss the effects of distributed renewable generation and energy efficiency programs on future transmission needs in ten year plan filings.

SRP includes the effects of energy efficiency programs and distributed generation (traditional and renewable) in its resource planning and transmission system models. Thus, each of the transmission projects identified in the Ten Year Transmission Plan includes the effects of energy efficiency and distributed generation.

4. SRP Ten Year Transmission Plan Study Work

Attachment 1 is a study that analyzed the impact on system reliability of the projects identified in the Ten Year Transmission Plan. Study work for joint projects relies on sub-regional and previously submitted studies.

5. Changes from Previous Plan

The following changes are noted between the Ten Year Transmission Plan submitted in January 2016 and this submittal. The changes include project or substation names, in-service dates, projects now in service, and newly identified projects.

5.1 Projects Placed in Service in 2016

SRP did not energize any projects in 2016.

5.2 Revised Projects

Revised Project	2016 Plan	2017 Revision
Price Road Corridor	2018 – TBD	2019 – TBD
Mesa Technology Corridor	TBD	2019
	"Ellsworth Technology Corridor"	"Mesa Technology Corridor"
Silver King – New Oak Flat – New Superior 230kV	TBD	2026
	Listed as two separate potential projects.	Combined into one potential project.

5.3 New Projects

New Project	Year	Purpose
Coolidge to Hayden 115kV Re-route	2019	Resolve tribal land lease issues.
Copper Crossing – Abel 230kV	2021	Accommodate new generation resources connecting in the Abel area.

5.4 Removed Projects

SRP did not remove any projects.

5.5 Potential Projects

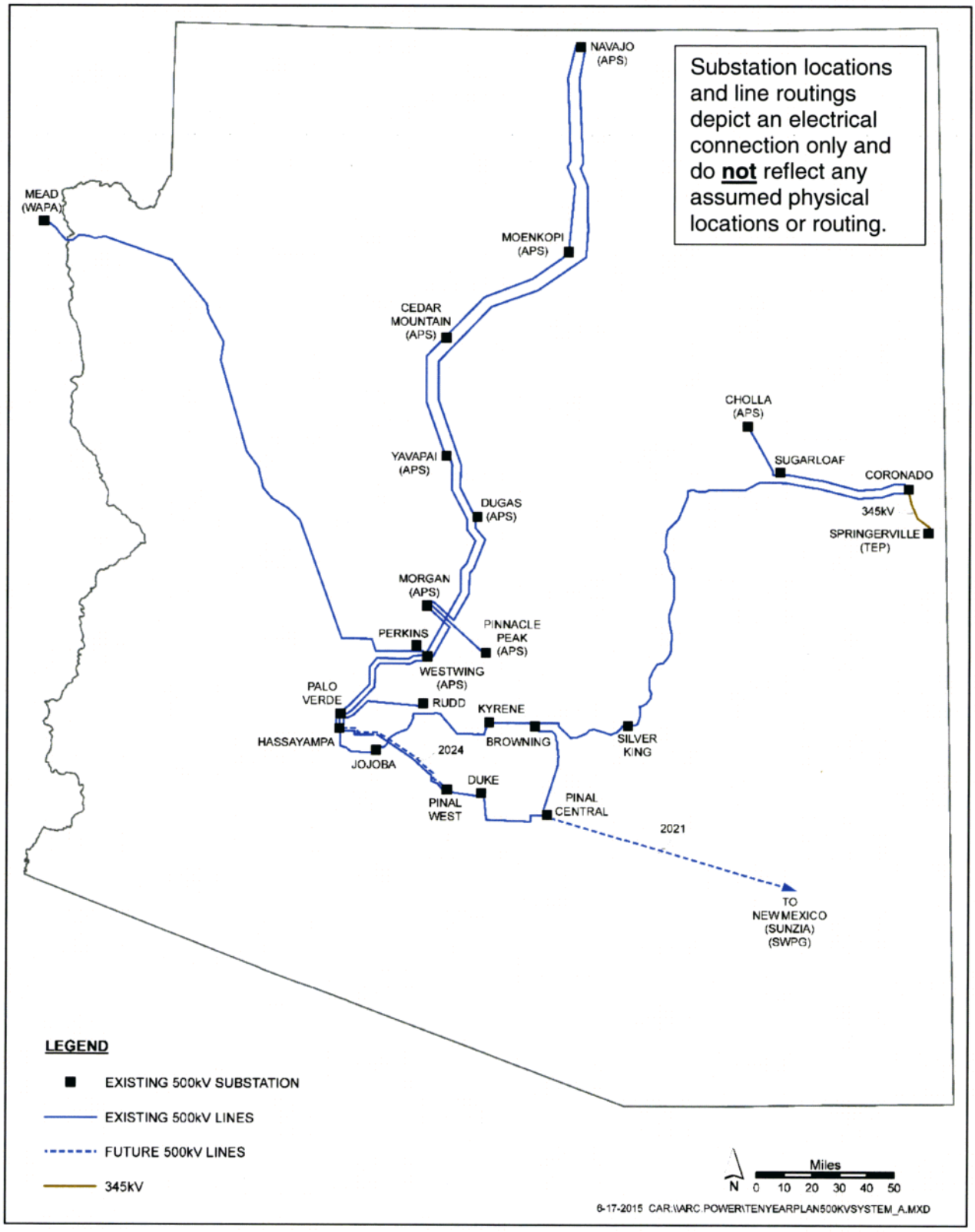
The following projects were included in previous plans with TBD in-service dates and have not advanced in SRP's planning process. In order to provide further transparency, SRP will continue to reflect these and other projects under consideration that fall outside of the ten year planning window as "Potential Projects" in future filings.

Potential Project	Purpose
Eastern Mining Expansion	Accommodate growing mining customer load in SRP's Eastern Mining Area.
Superior 230kV Loop-in	Provide adequate transmission capacity in the event of future load growth in SRP's eastern service territory.
Thunderstone – Browning 230kV	Provide additional transfer capability from the south and east to the north and central areas of SRP's service territory.
Silver King – Knoll – New Hayden 230kV	Increase the transmission capacity to serve new customer load in SRP's eastern service territory.
New Hayden 115kV Loop-in	Increase the transmission capacity to serve new customer load in SRP's eastern service territory.
RS25 Project	Serve growing Salt River Project – Maricopa Indian Community load.
RS26 Project	Serve load growth in the Fountain Hills area and to relieve stress on the lower voltage system that serves the Fountain Hills/Rio Verde area.
Pinal Central – Abel – RS-20 500kV	Deliver remote resources into the southeast portion of SRP's service territory.
Palo Verde – Saguaro 500kV	Increase the adequacy of the existing EHV transmission system and permit increased power delivery throughout the state.
Ball (RS17) 230kV Loop-in	Serve customer load in the Gilbert/Queen Creek area.
Pinnacle Peak – Brandow 230kV	Provide adequate transmission capacity to accommodate SRP customer load.
Abel 500kV Substation	Provide adequate transmission capacity for future load growth.

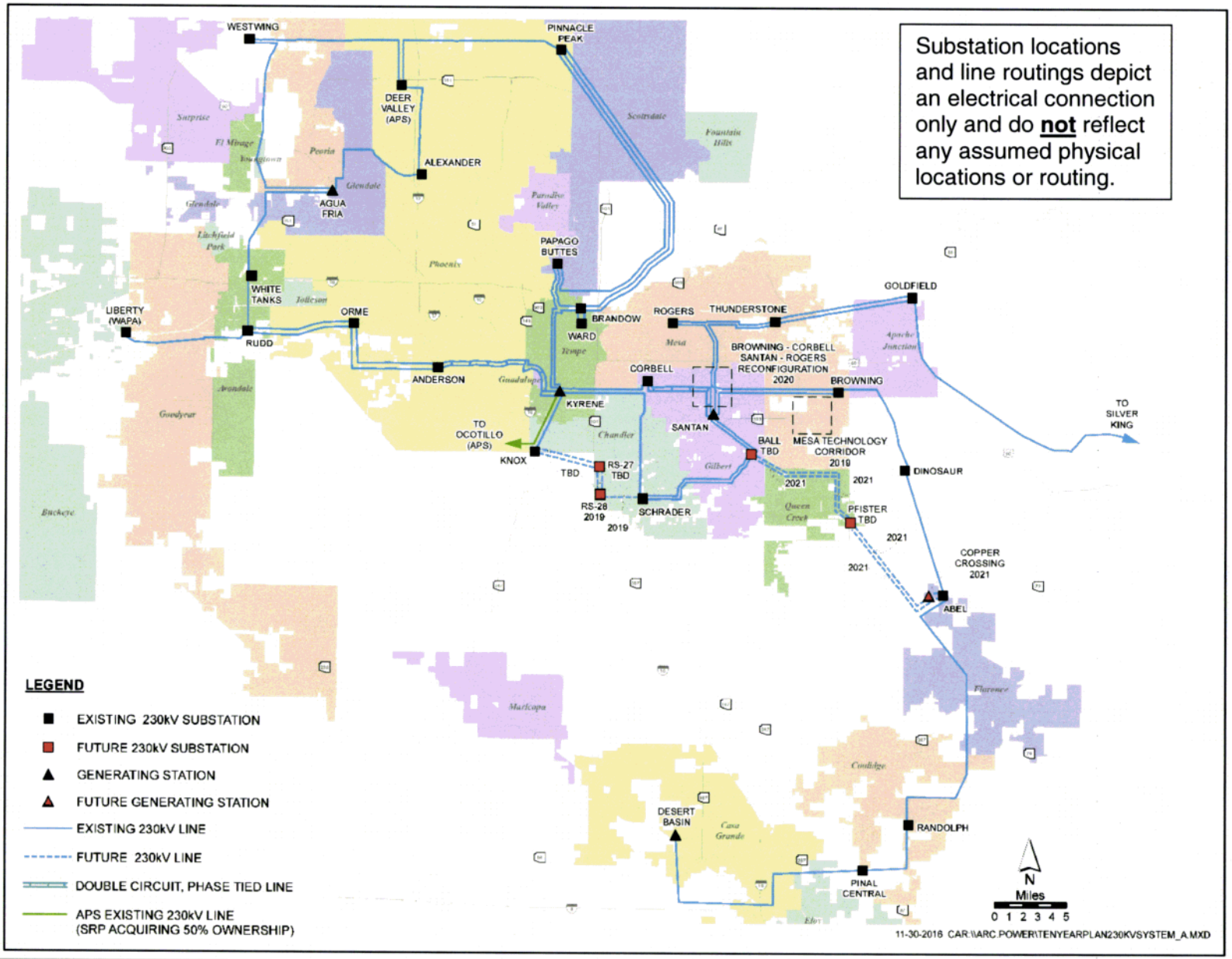
6. Project Maps

This section includes maps showing the general location of existing and future transmission projects. **Substation locations and line routings depict an electrical connection only and do not reflect any assumed physical locations or routing.** Separate maps are provided for the 500kV system (Figure 1), the 230kV system (Figure 2), and the 115 kV system (Figure 3). The 115kV map primarily covers the 115kV Eastern Mining Area of SRP's service territory; however, some 230kV projects are also included.

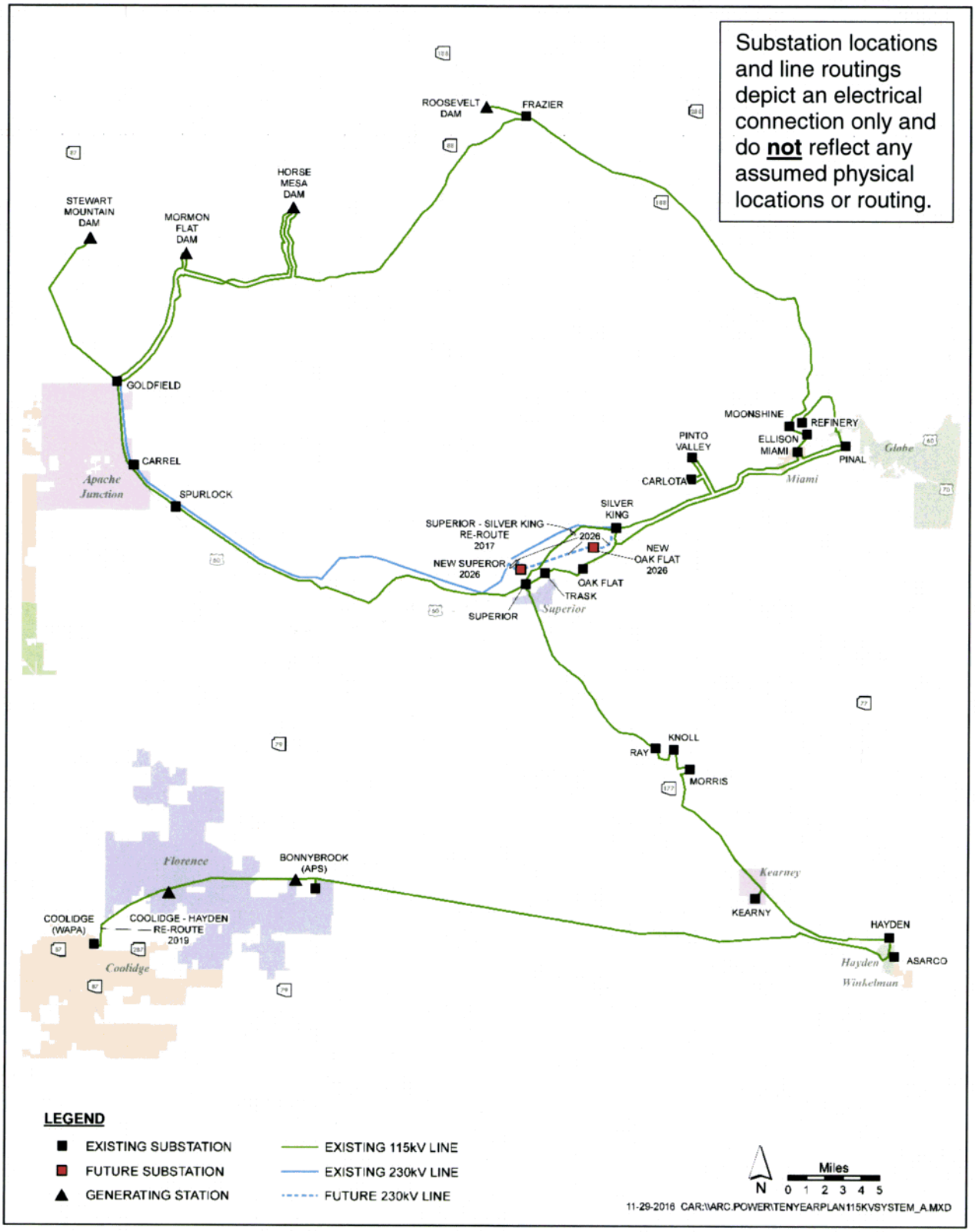
6.1 Figure 1 – SRP 500kV System



6.2 Figure 2 – SRP 230kV System



6.3 Figure 3 – SRP 115kV System (Eastern Mining Area)



The Superior – Silver King 115kV re-route and Coolidge – Hayden 115kV reroute are not shown in detail due to the scale of the map.

7. Project Descriptions

This section includes project details in accordance with the requirements of A.R.S. Section 40-360.02. Each project is identified by name, estimated in-service date, sizing details, routing, purpose, and major milestone dates.

7.1 Superior – Silver King 115kV Re-route (2017)

Size	
Voltage	115kV
Capacity	Approximately 165MVA
Point of Origin	Point on existing Superior – Silver King 115kV Line SEC 34, T1S, R12E
Intermediate Point	None
Point of Termination	Point on existing Superior – Silver King 115kV Line SEC 26, T1S, R12E
Length	Approximately 1.25 miles

Routing

The new alignment will traverse to the north and west of the historical line and adjacent to the existing Goldfield – Silver King 230kV circuit.

Purpose

To move an existing 115kV line on Customer's private property to accommodate Customer's land use needs. This is a customer driven project and is not triggered by system load growth.

Schedule	
Right of Way / Property Acquisition	2017
Construction Start	2017
Estimated In-Service	2017

Notes

SRP was granted a CEC for Case No. 166 on October 4, 2012 (Decision # 73551) which expires in 5 years (October 16, 2017). The timing of the 115kV line relocation is dependent upon the Customer's land use needs. If construction is not requested by the Customer by March 2017, SRP will submit an application to the ACC to extend the CEC term.

7.2 Mesa Technology Corridor (2019)

Size	
Voltage	230kV
Capacity	To be determined
Point of Origin	Browning 230kV Substation SEC 12, T1S, R7E
Intermediate Point	New RS-31 230kV Substation To be determined
Intermediate Point	New RS-32 230kV Substation To be determined
Point of Termination	Browning 230kV Substation SEC 12, T1S, R7E
Length	To be determined

Routing

Several options are under consideration to accommodate additional potential load in the Phoenix-Mesa Gateway Airport and Mesa Technology Corridor area located in southeast Mesa. Options under evaluation include adding new 230kV substations and lines in this area. The location of the 230kV substations and the length of any new lines will be driven by the location and type of load growth in the area.

Purpose

To meet potential growing industrial customer loads in the Mesa Technology Corridor and Phoenix-Mesa Gateway Airport areas.

Schedule	
Right of Way / Property Acquisition	2018
Construction Start	2019
Estimated In-Service	2019

Notes

SRP does not yet hold a CEC for this project but plans to begin pursuing one in 2017. Construction of the facilities will be dependent upon the load growth in this area. This project was formerly identified as the Ellsworth Technology Project.

7.3 Price Road Corridor (2019-TBD)

Size	
Voltage	230kV
Capacity	To be determined
Point of Origin	Knox 230kV Substation SEC 32, T1S, R4E
Intermediate Point	New RS-27 230kV Substation SEC 7, T2S, R5E
Intermediate Point	New RS-28 230kV Substation SEC 19, T2S, R5E
Point of Termination	Schrader 230kV Substation SEC 22, T2S, R5E
Length	Approximately 12-17 miles

Routing

Line routes will be determined through the CEC process. The project will consist of two new 230kV substations located within the Price Road Corridor (a five-square-mile area bounded by Chandler Boulevard, Chandler Heights Road, Dobson Road, Price Road and the Gila River Indian Community (GRIC)). The new RS-28 230kV substation will be located in the southern portion of the Price Road Corridor, and the new RS-27 230kV substation will be located in the northern portion. The project will consist of a new single circuit Schrader – RS-28 230kV line; a new double circuit Knox – RS-27 230kV line; and a new double circuit RS-27 – RS-28 230kV line.

Purpose

To serve growing industrial and commercial customer loads along the Price Road Corridor, adjacent to Price Road in south Tempe and Chandler.

Schedule	
Right of Way / Property Acquisition	2017-2018
Construction Start	Late 2018
Estimated In-Service	2019: Schrader – RS-28 230kV Line 2019: RS-28 230kV Substation TBD: Knox – RS-27 – RS-28 230kV Lines TBD: RS-27 230kV Substation

Notes

SRP does not yet hold a CEC for this project, but began seeking a Certificate in 2015 and expects to complete the process in 2017. SRP temporarily suspended the CEC process in May 2015 to allow SRP leadership to continue its discussions with the GRIC elected officials to seek a reasonable resolution that would benefit SRP's customers, the Indian Community, and the City of Chandler. SRP has not been able to reach an agreement with the GRIC. SRP has resumed efforts to identify possible routes on private land and expects to begin the public process to site all phases of the proposed project in 2017.

7.4 Coolidge – Hayden 115kV Re-route (2019)

Size	
Voltage	115kV
Capacity	To be determined
Point of Origin	Coolidge 115kV Substation SEC 16, T1S, R13E
Intermediate Point	None
Point of Termination	N/A as this is a reroute of an intermediate portion of the line. SEC 16, T1S, R13E
Length	Approximately 1.5 miles

Routing

The portion of the line that may be relocated begins about ½ mile northeast of the Coolidge substation and runs north along the Union Pacific Railroad (UPRR) until it crosses the Gila River where it turns northeast following a canal and drainage feature. The portion to be rerouted is 1.25 miles in length. The new line will be from 1.25 to 2.0 miles long.

Purpose

A short segment of the subject 115kV line is located on Gila River Indian Community (GRIC) land. SRP is negotiating an extension of the current land lease for the line. SRP may elect to move this portion of the line onto private land if negotiations with the GRIC are unsuccessful or if SRP determines it is in the best interest of its customers.

Schedule	
Right of Way / Property Acquisition	2018
Construction Start	2019
Estimated In-Service	2019

Notes

SRP plans to pursue a CEC for this project in 2017. SRP will begin the relocation of the impacted portion of the line once a certificate is received.

7.5 Browning – Corbell 230kV & Santan – Rogers 230kV Line Reconfiguration (2020)

Size

	Browning – Corbell	Santan – Rogers
Voltage	230kV	230kV
Capacity	To be determined	To be determined
Point of Origin	Browning 230kV Substation SEC 12, T1S, R7E	Santan 230kV Substation SEC 21, T1S, R6E
Intermediate Point	NA	NA
Point of Termination	Corbell 230kV Substation SEC 10, T1S, R5E	Rogers 230kV Substation SEC 13, T1N, R5E
Length	Approximately 13 miles	Approximately 9 miles

Routing

The Browning – Corbell line reconfiguration will follow the current route of the Browning – Santan and Santan – Corbell 230kV lines. The Santan – Rogers line reconfiguration will follow the current route of the Santan – Thunderstone 230kV line. This project will use existing circuit positions on existing structures. Reconfiguration of these two lines will be done in tandem.

Purpose

To create a third 230kV circuit serving the Corbell 230/69kV substation and prevent the loss of the Corbell 69kV area in the event of multiple 230kV line outages. This is a reliability driven project and is not triggered by rising system load levels forecasted in the next ten years.

Schedule

Right of Way / Property Acquisition	NA
Construction Start	2019
Estimated In-Service	2020

Notes

A CEC is not expected to be needed at this time, pending final design.

7.6 SunZia Southwest Transmission 500kV Project (2021)

Size	
Voltage	500kV
Capacity	Approximately 3000MVA
Point of Origin	Central New Mexico
Intermediate Point	To be determined
Point of Termination	Pinal Central 500kV Substation SEC 30, T6S, R8E
Length	499 miles

Routing

From Lincoln County area in central New Mexico to the Pinal Central 500kV substation in Casa Grande, Arizona.

Purpose

To provide the opportunity to develop additional transmission from existing generation sources in eastern Arizona and western New Mexico to serve load in central Arizona. This is a reliability driven project and is not triggered by rising system load levels forecasted in the next ten years.

Schedule	
Right of Way / Property Acquisition	To be determined
Construction Start	To be determined
Estimated In-Service	2021

Notes

Southwestern Power Group is the project manager on the development of this project. SRP is a participant.

7.7 Copper Crossing – Abel 230kV (2021)

Size	
Voltage	230kV
Capacity	To be determined
Point of Origin	New Copper Crossing 230kV Switchyard SEC 24, T3S, R8E
Intermediate Point	NA
Point of Termination	Abel 230kV Substation SEC 19, T3S, R9E
Length	Less than 1 mile

Routing

This project is a double circuit 230kV line and a new 230kV switchyard that will loop into the future Abel – Pfister – Ball 230kV project. The future Santan – Abel and Schrader – Abel 230kV lines will be re-routed just west of the Abel 230kV substation to the new 230kV Copper Crossing switchyard. From there, the new double circuit 230kV line will be routed east from the new Copper Crossing 230kV switchyard to the Abel 230kV substation. This will create the following 230kV circuits: Santan – Copper Crossing – Abel and Schrader – Copper Crossing – Abel. The routing for the new double circuit 230kV line will be within SRP-owned property or in the Abel – Pfister – Ball right-of-way.

Purpose

To accommodate near term new generation resources connecting in the Abel area. This is a reliability driven project and is not triggered by rising system load levels forecasted in the next ten years.

Schedule	
Right of Way / Property Acquisition	NA
Construction Start	2019-2021
Estimated In-Service	2021: Copper Crossing – Abel 230kV Line #1 2021: Copper Crossing – Abel 230kV Line #2 2021: Copper Crossing 230kV Switchyard

Notes

The need for the new 230kV switchyard will depend on the final generation output in the area. Should SRP determine that a new switchyard is not needed, a simple generation-tie may be constructed from the generation to the existing Abel 230kV substation.

7.8 Abel – Pfister – Ball 230kV (2021-TBD)

Size	
Voltage	230kV
Capacity	To be determined
Point of Origin	Santan – Schrader 230kV Line (near existing Moody 69kV substation and future Ball (RS-17) 230kV substation) SEC 1, T2S, R6E
Intermediate Point	New Pfister (RS-24) 230kV Substation SEC 25, T2S, R7E
Point of Termination	Abel 230kV Substation SEC 19, T3S, R9E
Length	Approximately 20 miles

Routing

This project is a double circuit 230kV line and a new 230kV substation that connects to the existing Santan – Schrader 230kV line. The new double circuit 230kV line will be routed generally south and east from a point on the Santan – Schrader 230kV line near the existing Moody 69kV substation and future Ball (RS-17) 230kV substation to the new Pfister (RS-24) 230kV substation in the southeastern portion of the town of Queen Creek. From the Pfister 230kV substation, the 230kV line will continue south and east to the Abel 230kV substation.

Purpose

To accommodate near term new generation resources connecting in the Abel area. Long term load growth in the Queen Creek area was originally identified as a driver for this project, but that is no longer the case with recent load forecasts. This is a reliability driven project and is not triggered by rising system load levels forecasted in the next ten years.

Schedule	
Right of Way/ Property Acquisition	2013-2020
Construction Start	2019-2020
Estimated In-Service	2021: Abel – Santan 230kV Line 2021: Abel – Schrader 230kV Line TBD: Pfister 230kV Substation TBD: Ball 230kV Substation

Notes

This project was formerly known as Abel – Moody. SRP received a CEC for this project on December 23, 2009, Case No. 148, Decision # 71441. The CEC expires December 23, 2021. The Pfister 230kV and Ball 230kV substations in-service dates are TBD depending on load growth in the Queen Creek area.

7.9 Hassayampa – Pinal West 500kV #2 Line (2024)

Size	
Voltage	500kV
Capacity	To be determined
Point of Origin	Hassayampa 500kV Switchyard SEC 15, T1S, R6W
Intermediate Point	Jojoba 500kV Switchyard SEC 25, T2S, R4W
Point of Termination	Pinal West 500kV Switchyard SEC 18, T5S, R2E
Length	Approximately 51 miles

Routing

South and east of the Hassayampa Switchyard along the existing Palo Verde – Kyrene 500kV line to a point where the gas pipeline splits from the transmission line, then generally along the pipeline (except in the Maricopa County Mobile Planning Area) to the Pinal West 500kV switchyard.

Purpose

The Central Arizona Transmission System (CATS) Study identified a number of system additions to provide access to energy sources in the central Arizona area. This project will accommodate new generation in western Arizona that may be needed depending on the EPA's ruling on Section 111(d) of the Clean Air Act. While future load growth was not identified as a driver, this project can accommodate increased access to existing load as well as potential load growth. This is a reliability driven project and is not triggered by rising system load levels forecasted in the next ten years.

Schedule

Right of Way / Property Acquisition	2004
Construction Start	2023
Estimated In-Service	2024

Notes

The CEC for Case No. 124 was awarded in May 2004 (ACC Decision # 67012). The CEC expires May 24, 2024. The first of the two permitted transmission lines was placed in service in October 2008.

7.10 Silver King – New Oak Flat – New Superior 230kV (2026)

Size	
Voltage	230kV
Capacity	To be determined
Point of Origin	Silver King 230kV Substation SEC 16, T1S, R13E
Intermediate Point	New 230kV Substation near the existing Oak Flat 115kV Substation, tentatively named "New Oak Flat" Near SEC32, T1S, R13E (exact location not determined)
Point of Termination	New 230kV Substation near the existing Goldfield – Silver King 230kV line, tentatively named "New Superior" Near SEC34, T1S, R12E (exact location not determined)
Length	Approximately 6.5 miles

Routing

The alignment will closely follow the existing 115kV circuit connecting Silver King to Oak Flat. The line starts at the Silver King Receiving Station, heading south and then turning southwest into the New Oak Flat 230kV Substation. The alignment will then traverse to the west into the New Superior 230kV Substation. In addition, the existing Goldfield – Silver King 230kV line will be looped into the New Superior 230kV Substation. The location of the New Oak Flat and the New Superior sites are still being determined.

Purpose

To serve growing customer loads at Oak Flat and Superior.

Schedule	
Right of Way / Property Acquisition	N/A
Construction Start	2024
Estimated In-Service	2026

Notes

SRP does not yet hold a CEC for this project. The timing of pursuing a Certificate will be dependent upon the load growth in this area.

8. Attachment

8.1 Attachment 1 – 2017 Ten Year Plan Technical Study

2017
TEN YEAR TRANSMISSION PLAN
TECHNICAL STUDY

BY

SALT RIVER PROJECT
TRANSMISSION PLANNING

January 2017

Table of Contents

1. Executive Summary

The purpose of the 2017 Ten Year Transmission Plan Technical Study is to provide supporting documentation to accompany the Ten Year Transmission Plan. Salt River Project (SRP) submits an updated ten year plan annually to the Arizona Corporation Commission. The 2017-2026 plan describes planned transmission lines that SRP may construct or participate in over the next ten years.

The technical study assesses the performance of transmission facilities of 100kV or higher voltage by using power flow and stability analyses. The power flow study is performed for each of the ten years, beginning with 2017. System improvements and upgrades proposed within the ten year plan are included in each case. SRP facilities are studied to meet SRP internal criteria and industry standards.

The power flow analysis showed one overload on SRP's system for N-1 outages of transmission lines and transformers of 115kV and above. The Rogers 230/69kV transformer overloads above its emergency rating starting in 2025 with the loss of the other 230/69kV transformer. This overload will need to be further studied to determine options for mitigations. There were no voltage violations observed on SRP's facilities in the analysis.

The stability study analyzes the transmission system for its ultimate ten year build-out in 2026 to ensure that the planned configuration will return to a stable state following a simulated outage. System improvements and upgrades proposed within the ten year plan are included in the case. The study results showed that the transmission system remained stable following each outage. This report documents the study work performed and concludes that SRP's transmission system plan for the coming ten years meets all of SRP's internal criteria, and satisfies applicable Western Electricity Coordinating Council (WECC) and North American Electric Reliability Corporation (NERC) criteria.

2. Study Details

Power flow and transient stability studies were completed using the General Electric (GE) Positive Sequence Load Flow (PSLF) software. The power flow studies monitor 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 evaluate the thermal and voltage response, and the transient stability analysis evaluates system stability following a contingency event. The following sections highlight the details of the analysis.

2.1 Case Information

The cases used to study each of the years are based on WECC cases. These cases represent the latest transmission, sub-transmission, load forecast, and resource plans. The cases are updated by SRP and APS to represent a more detailed Arizona system.

The WECC 2018 HS3A (heavy summer) case was used for the 2017 – 2020 cases; the WECC 2021 HS2A (heavy summer) case was used for years 2021 – 2025; and the WECC 2025 HS1A (heavy summer) case was used for the 2026 case. The system ratings for SRP's facilities used in this study can be found in Appendix A.

Each year's case is developed with the corresponding Ten Year Transmission Plan proposed projects included to ensure that the proposed system changes will result in a stable and compliant transmission system. These projects include:

- Superior – Silver King 115kV Re-route (2017)
- Mesa Technology Corridor (2019)
- Price Road Corridor (2019-TBD)
- Coolidge – Hayden 115kV Re-route (2019)
- Browning – Corbell 230kV & Santan – Rogers 230kV Line Reconfiguration (2020)
- SunZia Southwest Transmission 500kV Project (2021)
- Copper Crossing – Abel 230kV (2021)
- Abel – Pfister – Ball 230kV (2021-TBD)
- Hassayampa – Pinal West 500kV #2 Line (2024)
- Silver King – New Oak Flat – New Superior 230kV (2026)

2.2 Internal Planning Criteria

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

2.2.1 All Lines in Service (N-0)

The following criteria must be met when operating with ALIS:

- 500/230kV, 230/115kV, and 230/69kV transformer will not be loaded more than 100% of the transformer's summer continuous limit.
- 500kV, 230kV, and 115kV line or substation conductor will not be loaded more than 100% of the line's or conductor's summer continuous limit.
- Equipment high voltage limits will not be exceeded.
- Customer service entrance voltage limits (high or low) will not be violated. These limits are described below:
  - For 230kV and above, the voltage shall not be below 1.0 per unit.
  - For 115kV, the voltage magnitude will not drop below the minimum established by the current edition of the American National Standards Institute (ANSI) standard #C84.1 for service entrance voltages as reflected on the high side of the transformer.

2.2.2 Single Contingency (N-1)

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

- 500/230kV, 230/115kV, and 230/69kV transformer will not be loaded more than 100% of the transformer's summer emergency limit.
- 500kV, 230kV, and 115kV line or substation conductor will not be loaded more than 100% of the line's or conductor's summer 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 a loss of load.

- Customer service entrance voltage limits (high or low) will not be violated. These limits are described below:

  - For 230kV and above, the voltage deviation at any bus shall not exceed 8% of the pre-outage voltage for P1 events.

  - For 115kV, the voltage magnitude will not drop below the minimum established by the current edition of the ANSI standard #C84.1 for service entrance voltages as reflected on the high side of the transformer.

- System Stability – All machines in the system shall remain synchronous with the system as demonstrated by their relative rotor angles.

- System Damping – System damping will exist as demonstrated by the damping of relative rotor angle swings and the damping of voltage magnitude swings. All oscillations that do not show positive damping within 30-seconds shall be deemed unstable in accordance with WECC Criterion – TPL-001-WECC-CRT-3 (Appendix B).

- Voltage Recovery – After a fault clears, the voltage shall recover to 80% of the pre-contingency voltage within 20 seconds of the event in accordance with WECC Criterion – TPL-001-WECC-CRT-3 (Appendix B).

- Delayed Voltage Recovery – After voltage recovers above 80% following a fault, the voltage at each applicable Bulk Electric System (BES) bus serving load shall not dip below 70% of pre-contingency voltage for more than 30 cycles nor remain below 80% of pre-contingency voltage for more than two seconds in accordance with WECC Criterion – TPL-001-WECC-CRT-3 (Appendix B).

2.3 Contingencies

2.3.1 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-001-4 Criteria for Single Contingencies (Appendix C). 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 2026 case can be found in Appendix D.

2.3.2 Transient Stability

SRP developed a contingency list in accordance with Category P1 of NERC TPL-001-4 to simulate three-phase faults of all SRP transmission facilities with voltages of 115kV and above. The subsequent element at the faulted bus was taken out of service after the fault. The list of transient stability contingencies can be found in Appendix F.

3. Results

3.1 Power Flow

The power flow analysis showed one overload on SRP's system for N-1 outages of transmission lines and transformers of 115kV and above.

The Rogers 230/69kV transformer overloads above its emergency rating starting in 2025 with the loss of the other 230/69kV transformer. This is beyond SRP's six-year planning cycle (2018-23) and due to the uncertainty of the load forecasts beyond the six-year planning cycle, the overload will need to be further studied to determine options for mitigations.

There were no voltage violations observed on SRP's facilities in the analysis.

Appendix E shows results for SRP equipment loaded above 90%.

3.2 Transient Stability

The transient stability analysis revealed that the 2026 system model was stable. For simulation of faults on SRP facilities, the system was stable and damped. The voltage and frequency at valley buses were within acceptable limits. Due to the volume of plots, the graphs for the transient stability will be made available upon request, as noted in Appendix G.

4. Conclusion

The power flow analysis was performed on each of the ten years, beginning in 2017. The transient stability analysis was performed in the last year, 2026, to evaluate the ultimate configuration of the transmission system. The single contingencies simulated in the Power Flow and Transient Stability analysis were simulated on SRP's system according to the NERC TPL-001-4 standard. SRP's system performed within the thermal, voltage, and transient stability boundaries for the studied outages with the projects proposed in the Ten Year Transmission Plan, satisfying SRP's internal planning criteria and applicable WECC and NERC criteria.

5. Appendices

5.1 Appendix A – System Ratings in 2026[1]

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	PFISTER	1	1	796.7	796.7
230	ABEL	RANDOLPH	1	1	1366.4	1501.9
230	ABEL	SANTAN	1	1	822.6	904.3
230	ABEL	SCHRADER	1	1	822.6	904.3

[1] System ratings in 2026 were derived from the WECC 2025 HS1A case.

Voltage (KV)	From Bus	To Bus	Circuit	Section	Continuous Rating (MVA 1)	Emergency Rating (MVA 2)
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
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	PFISTER	SANTAN	1	1	717	796
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

Voltage (KV)	From Bus	To Bus	Circuit	Section	Continuous Rating (MVA 1)	Emergency Rating (MVA 2)
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
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

Voltage (KV)	From Bus	To Bus	Circuit	Section	Continuous Rating (MVA 1)	Emergency Rating (MVA 2)
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
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

5.2 Appendix B – WECC Criterion – TPL-001-WECC-CRT-3

B. Requirements and Measures

WR1. Each Transmission Planner and Planning Coordinator shall use the following default base planning criteria, unless otherwise specified in accordance with Requirements WR2 and WR3:

1.1. Steady-state voltages at all applicable Bulk-Electric System (BES) buses shall stay within each of the following limits:

1.1.1. 95 percent to 105 percent of nominal for P0[1] event (system normal pre-contingency event powerflow);

1.1.2. 90 percent to 110 percent of nominal for P1-P7[2] events (post-contingency event powerflow).

1.2. Post-Contingency steady-state voltage deviation at each applicable BES bus serving load shall not exceed 8% for P1 events.

1.3. Following fault clearing, the voltage shall recover to 80% of the pre-contingency voltage within 20 seconds of the initiating event for all P1 through P7 events, for each applicable BES bus serving load.

1.4. Following fault clearing and voltage recovery above 80%, voltage at each applicable BES bus serving load shall neither dip below 70% of pre-contingency voltage for more than 30 cycles nor remain below 80% of pre-contingency voltage for more than two seconds, for all P1 through P7 events.

1.5. For Contingencies without a fault (P2.1 category event), voltage dips at each applicable BES bus serving load shall neither dip below 70% of pre-contingency voltage for more than 30 cycles nor remain below 80% of pre-contingency voltage for more than two seconds.

1.6. All oscillations that do not show positive damping within 30-seconds after the start of the studied event shall be deemed unstable.

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[1] P0 through P7 refers to the categories of contingencies identified in Table 1 of NERC Standard TPL-001-4, Transmission System Planning Performance Requirements.

[2] Previously cited

WM1. Each Transmission Planner and Planning Coordinator will have evidence that it used the base criteria in its Planning Assessment specified in Requirement WR1, unless otherwise allowed in accordance with Requirements WR2 and WR3.

WR2. Each Transmission Planner and Planning Coordinator that uses a more stringent criterion than that stated in Requirement WR1 shall apply that criterion only to its own system, except where otherwise agreed upon by all other planning entities to which the more stringent criterion was applied.

WM2. Each Transmission Planner and Planning Coordinator that uses a more stringent criterion in its planning assessment than that stated in Requirement WR1 and applied that criterion to other systems will have evidence of agreement from all other planning entities to which the more stringent criteria was applied.

WR3. Each Transmission Planner and Planning Coordinator that uses a less stringent criterion than that stated in Requirement WR1 shall allow other Transmission Planners and Planner Coordinators to have the same impact on that part of the system for the same category of planning events (e.g., P1, P2).

WM3. Each Transmission Planner and Planning Coordinator that uses a less stringent criterion than that stated in Requirement WR1 will have evidenced that it allowed other Transmission Planners and Planner Coordinators to have the same impact on that part of the system for the same category of planning events (e.g., P1, P2).

WR4. Each Transmission Planner and Planning Coordinator shall use the following threshold criteria to identify the potential for Cascading or uncontrolled islanding. An entity is allowed to use these criteria to identify instability due to Cascading or uncontrolled islanding as long as it does not impose it on others:

- When a post contingency analysis results in steady-state facility loading that is either in excess of a known BES facility trip setting, or exceeds 125% of the highest seasonal facility rating for the BES facility studied. If the trip setting is known to be different than the 125% threshold, the known setting should be used.

- When transient stability voltage response occurs at any applicable BES bus outside of the criteria stated in Requirement WR1.3 of this document.

- When either unrestrained successive load loss occurs or unrestrained successive generation loss occurs.

WM4. Each Transmission Planner and Planning Coordinator will have evidence that it used the indicators of Requirement WR4 to identify the potential for Cascading or uncontrolled islanding.

WR5. Each Transmission Planner and Planning Coordinator shall use the following minimum criteria when identifying voltage stability:

5.1. For transfer paths, all P0-P1 events shall demonstrate a positive reactive power margin at a minimum of 105 percent of transfer path flow.

5.2. For transfer paths, all P2-P7 events shall demonstrate a positive reactive power margin at a minimum of 102.5 percent of transfer path flow.

5.3. For load areas, all P0-P1 events shall demonstrate a positive reactive power margin at a minimum of 105 percent of forecasted peak load.

5.4. For load areas, all P2-P7 events shall demonstrate a positive reactive power margin at a minimum of 102.5 percent of forecasted peak load.

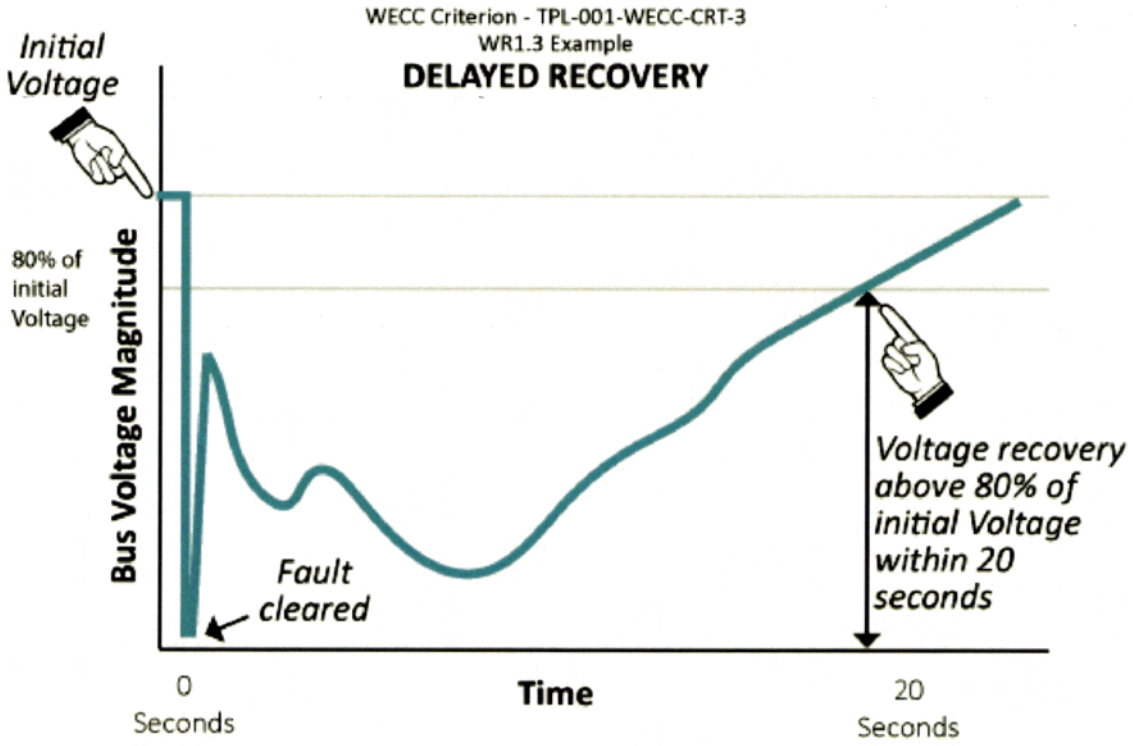
WM5. Each Transmission Planner and Planning Coordinator will have evidenced that it used the minimum criteria identified in Requirement WR5 to identify voltage stability.

WR6. Each Transmission Planner and Planning Coordinator that uses study criteria different from the base criteria in Requirement WR1 shall make its criteria available upon request within 30 days.

WM6. Each Transmission Planner and Planning Coordinator that uses study criteria different from the base criteria in Requirement WR1 will have evidence that it made its criteria available upon request, as required in Requirement WR6.

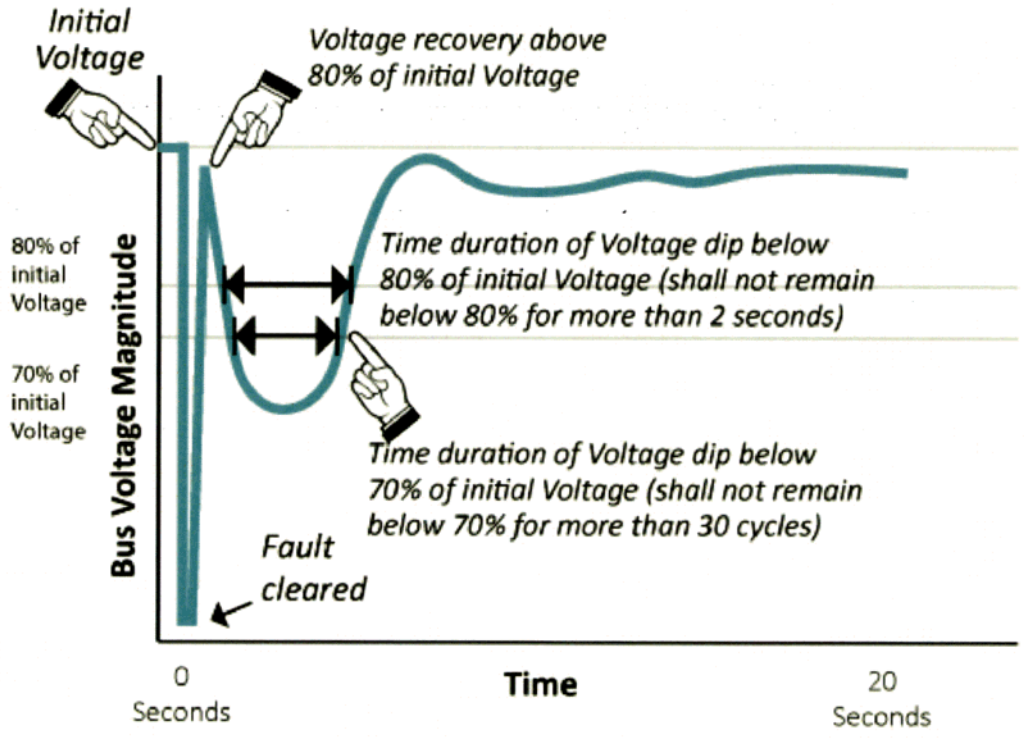
The following illustrations apply to WR1.3 and WR1.4, and not WR1.2.

The following diagrams are offered for illustrative purposes. They are not designed to depict all possible voltage trajectories.



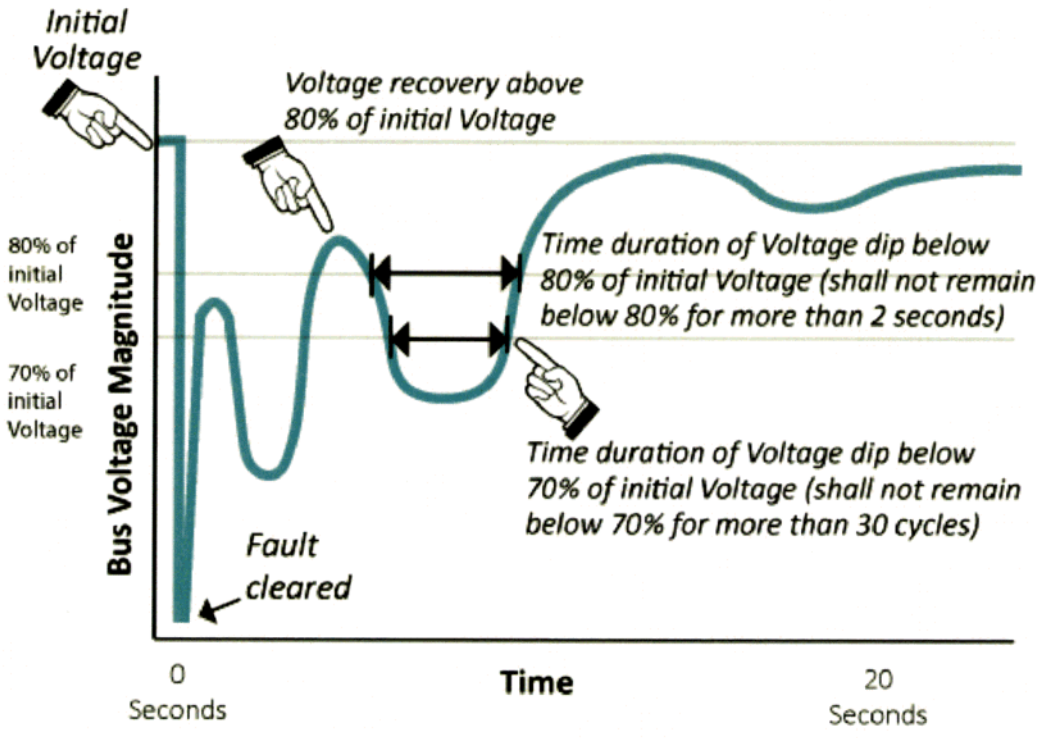
WECC Criterion - TPL-001-WECC-CRT-3
WR1.4 Example

NORMAL RECOVERY 1



WECC Criterion - TPL-001-WECC-CRT-3
WR1.4 Example

NORMAL RECOVERY 2



5.3 Appendix C – NERC TPL-001-4 Criteria for Single Contingencies

The following tables are excerpts from the NERC "Standard TPL-001-4 – Transmission System Planning Performance Requirements" document.

Table 1 – Steady State & Stability Performance Planning Events

Steady State & Stability:

a. The System shall remain stable. Cascading and uncontrolled islanding shall not occur.
b. Consequential Load Loss as well as generation loss is acceptable as a consequence of any event excluding P0.
c. Simulate the removal of all elements that Protection Systems and other controls are expected to automatically disconnect for each event.
d. Simulate Normal Clearing unless otherwise specified.
e. Planned System adjustments such as Transmission configuration changes and re-dispatch of generation are allowed if such adjustments are executable within the time duration applicable to the Facility Ratings.

Steady State Only:

f. Applicable Facility Ratings shall not be exceeded.
g. System steady state voltages and post-Contingency voltage deviations shall be within acceptable limits as established by the Planning Coordinator and the Transmission Planner.
h. Planning event P0 is applicable to steady state only.
i. The response of voltage sensitive Load that is disconnected from the System by end-user equipment associated with an event shall not be used to meet steady state performance requirements.

Stability Only:

j. Transient voltage response shall be within acceptable limits established by the Planning Coordinator and the Transmission Planner.

Category	Initial Condition	Event [1]	Fault Type [2]	BES Level [3]	Interruption of Firm Transmission Service Allowed [4]	Non-Consequential Load Loss Allowed
P0 No Contingency	Normal System	None	N/A	EHV, HV	No	No
P1 Single Contingency	Normal System	Loss of one of the following: 1. Generator 2. Transmission Circuit 3. Transformer [5] 4. Shunt Device [6]	3Ø	EHV, HV	No[9]	No[12]
		5. Single Pole of a DC line	SLG			
P2 Single Contingency	Normal System	1. Opening of a line section w/o a fault [7]	N/A	EHV, HV	No[9]	No[12]
		2. Bus Section Fault	SLG	EHV	No[9]	No
				HV	Yes	Yes
		3. Internal Breaker Fault [8] (non-Bus-tie Breaker)	SLG	EHV	No[9]	No
				HV	Yes	Yes
		4. Internal Breaker Fault (Bus-tie Breaker) [8]	SLG	EHV, HV	Yes	Yes

Table 1 – Steady State & Stability Performance Footnotes (Planning Events and Extreme Events)
1. If the event analyzed involves BES elements at multiple System voltage levels, the lowest System voltage level of the element(s) removed for the analyzed event determines the stated performance criteria regarding allowances for interruptions of Firm Transmission Service and Non-Consequential Load Loss.
2. Unless specified otherwise, simulate Normal Clearing of faults. Single line to ground (SLG) or three-phase (3Ø) are the fault types that must be evaluated in Stability simulations for the event described. A 3Ø or a double line to ground fault study indicating the criteria are being met is sufficient evidence that a SLG condition would also meet the criteria.
3. Bulk Electric System (BES) level references include extra-high voltage (EHV) Facilities defined as greater than 300kV and high voltage (HV) Facilities defined as the 300kV and lower voltage Systems. The designation of EHV and HV is used to distinguish between stated performance criteria allowances for interruption of Firm Transmission Service and Non-Consequential Load Loss.
4. Curtailment of Conditional Firm Transmission Service is allowed when the conditions and/or events being studied formed the basis for the Conditional Firm Transmission Service.
5. For non-generator step up transformer outage events, the reference voltage, as used in footnote 1, applies to the low-side winding (excluding tertiary windings). For generator and Generator Step Up transformer outage events, the reference voltage applies to the BES connected voltage (high-side of the Generator Step Up transformer). Requirements which are applicable to transformers also apply to variable frequency transformers and phase shifting transformers.
6. Requirements which are applicable to shunt devices also apply to FACTS devices that are connected to ground.
7. Opening one end of a line section without a fault on a normally networked Transmission circuit such that the line is possibly serving Load radial from a single source point.
8. An internal breaker fault means a breaker failing internally, thus creating a System fault which must be cleared by protection on both sides of the breaker.
9. An objective of the planning process should be to minimize the likelihood and magnitude of interruption of Firm Transmission Service following Contingency events. Curtailment of Firm Transmission Service is allowed both as a System adjustment (as identified in the column entitled 'Initial Condition') and a corrective action when achieved through the appropriate re-dispatch of resources obligated to re-dispatch, where it can be demonstrated that Facilities, internal and external to the Transmission Planner's planning region, remain within applicable Facility Ratings and the re-dispatch does not result in any Non-Consequential Load Loss. Where limited options for re-dispatch exist, sensitivities associated with the availability of those resources should be considered.
10. A stuck breaker means that for a gang-operated breaker, all three phases of the breaker have remained closed. For an independent pole operated (IPO) or an independent pole tripping (IPT) breaker, only one pole is assumed to remain closed. A stuck breaker results in Delayed Fault Clearing.
11. Excludes circuits that share a common structure (Planning event P7, Extreme event steady state 2a) or common Right-of-Way (Extreme event, steady state 2b) for 1 mile or less.
12. An objective of the planning process is to minimize the likelihood and magnitude of Non-Consequential Load Loss following planning events. In limited circumstances, Non-Consequential Load Loss may be needed throughout the planning horizon to ensure that BES performance requirements are met. However, when Non-Consequential Load Loss is utilized under footnote 12 within the Near-Term Transmission Planning Horizon to address BES performance requirements, such interruption is limited to circumstances where the Non-Consequential Load Loss meets the conditions shown in Attachment 1. In no case can the planned Non-Consequential Load Loss under footnote 12 exceed 75 MW for US registered entities. The amount of planned Non-Consequential Load Loss for a non-US Registered Entity should be implemented in a manner that is consistent with, or under the direction of, the applicable governmental authority or its agency in the non-US jurisdiction.
13. Applies to the following relay functions or types: pilot (#85), distance (#21), differential (#87), current (#50, 51, and 67), voltage (#27 & 59), directional (#32, & 67), and tripping (#86, & 94).

5.4 Appendix D – Contingency List

Single element contingencies evaluated in the study for year 2026 include:

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	AGUACAL1	500	HDWSH	500	1
line	ARLINTON	500	HASSYAMP	500	1
line	BROWNING	500	KYRENE	500	1
line	BROWNING	500	PINAL_C	500	1
line	BROWNING	500	SILVERKG	500	1
line	CEDARMT	500	YAVAPAI	500	1
line	CHOLLA	500	SAGUARO	500	1
line	CHOLLA	500	SGRLF	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	HARQUAHA	500	HASSYAMP	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	PINAL_W	500	2
line	JOJOBA	500	GILARIVR	500	1
line	JOJOBA	500	GILARIVR	500	2

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	1
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	PL-RCTR1	500	1
line	PALOVRDE	500	PL-RCTR2	500	2
line	PALOVRDE	500	PL-RCTR3	500	3
line	PALOVRDE	500	RUDD	500	1
line	PALOVRDE	500	WESTWING	500	1
line	PALOVRDE	500	WESTWING	500	2
line	PERKINPS	500	PERKINS	500	1
line	PERKINPS	500	WESTWING	500	1
line	PINAL_C	500	TORTOLIT	500	1
line	PL-RCTR1	500	HASSYAMP	500	1
line	PL-RCTR2	500	HASSYAMP	500	2
line	PL-RCTR3	500	HASSYAMP	500	3
line	SAGUARO	500	TORTLIT2	500	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	SAGUARO	500	TORTOLIT	500	1
line	SAGUARO	500	TORTOLIT	500	2
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	APACHHS1	345	APACHHS2	345	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	FOURCORN	345	WESTMESA	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	HIDALSL1	345	APACHHS1	345	1
line	HIDALSL2	345	APACHHS2	345	2
line	LIBERTY	345	PEACOCK	345	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	MACHO_SPRNGS	345	SPRINGR	345	1
line	MAZATZAL	345	PNPK E	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	PNPK C	345	PNPK W	345	1
line	PNPK E	345	PNPK C	345	1
line	PRECHCYN	345	PNPK W	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	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	WILLOW	345	1
line	ABEL	230	DINOSAUR	230	1
line	ABEL	230	RANDOLPH	230	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	ADMTP230	230	APACHE_SL	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	ANDERSON	230	ORME	230	1
line	ANDERSON	230	ORME	230	2
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	BRANDOW	230	KYR-EAST	230	1
line	BRANDOW	230	PAPAGOBT	230	1
line	BRANDOW	230	PINPKSRP	230	1
line	BRANDOW	230	PINPKSRP	230	2
line	BRANDOW	230	WARD	230	2
line	BRANDOW	230	WARD	230	4
line	BROWNING	230	CORBELL	230	1
line	BROWNING	230	DINOSAUR	230	1
line	BUCKEYE	230	LIBERTY	230	1
line	BUTERFLD	230	PANTANO	230	1
line	BUTERFLD	230	SAN RAF	230	1
line	BUTERFLD	230	TOMB JCT	230	1
line	CACTUS	230	OCO N	230	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	CCGS 1-6	230	ABEL	230	1
line	CCGS 1-6	230	ABEL	230	2
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	CORBELL	230	SANTAN	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	1
line	DAVIS	230	TOPOCK	230	2
line	DBG	230	PINAL_C	230	1
line	DEERVALY	230	ALEXANDR	230	1
line	DEERVALY	230	PINPKSRP	230	1
line	DEERVALY	230	WESTWNGE	230	1
line	DELBAC23	230	NOGLE230	230	1
line	DOSCONDO	230	HACKBERY	230	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	EAGLEYE	230	BUCKEYE2	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	PPKWAPA	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	GOLDFELD	230	SILVERKG	230	1
line	GOLDFELD	230	SUPERIOR	230	1
line	GOLDFELD	230	THUNDRST	230	1
line	GOLDFELD	230	THUNDRST	230	2
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	LIBERTY	230	1
line	HASSYTAP	230	SNVLY	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	JUNIPRMT	230	SELIGMAN	230	1
line	KAYENTA	230	LNGHOUSE	230	1
line	KAYENTA	230	SHIPROCK	230	1
line	KNOX	230	KYR-EAST	230	1
line	KNOX	230	SNTAROSA	230	1
line	KOMATKE	230	PANDA	230	1
line	KYR-EAST	230	SCHRADER	230	1
line	KYR-WEST	230	OCO C	230	1
line	LEUPP	230	COCONINO	230	1
line	LIBERTY	230	BUCKEYE2	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	OCO N	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	MARANA23	230	RTLSN230	230	1
line	MARANA23	230	SAGWRO.WAPA	230	2
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	MESSOLAR	230	MESQUITE	230	1
line	MESSOLAR	230	MESQUITE	230	2
line	MILLIGAN	230	CASGRAPS	230	1
line	MORENCI	230	GREEN-SW	230	1
line	MORENCI	230	PD-MORNC	230	1
line	MORGAN	230	RACEWAY	230	1
line	N.GILA	230	ORCHRD	230	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	NOGLE230	230	ADMTP230	230	1
line	OAKFLAT	230	SILVERKG	230	1
line	OAKFLAT	230	SUPERIOR	230	1
line	OCO C	230	OCO N	230	1
line	OCO C	230	OCO2	230	1
line	OCO S	230	OCO C	230	1
line	OCO S	230	OCO1	230	1
line	OCO1	230	OCO2	230	1
line	ORME	230	RUDD	230	1
line	ORME	230	RUDD	230	2
line	PAHRUMP	230	MEAD S	230	1
line	PANDA	230	GILABEND	230	1
line	PANTANO	230	APACHE_SL	230	1
line	PANTANO	230	NEWTUCSN	230	1
line	PAPAGOBT	230	KYR-WEST	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	PD-MORNC	230	FRISCO	230	1
line	PEACOCK	230	HILLTOP	230	1
line	PHXWAPA	230	LONE BUT	230	1
line	PINAL_C	230	RANDOLPH	230	1
line	PPAPS C	230	PPAPS E	230	1
line	PPAPS N	230	OCO S	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	PPAPS C	230	1
line	PPAPS W	230	PPKWAPA	230	1
line	PPKWAPA	230	PINPKSRP	230	1
line	PPKWAPA	230	PINPKSRP	230	2
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	PPKWAPA	230	1
line	ROGSWAPA	230	PPKWAPA	230	2
line	ROGSWAPA	230	SPKHILTP	230	1
line	RS-28	230	SCHRADER	230	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	RS-31	230	BROWNING	230	1
line	RS-31	230	RS-32	230	1
line	RS-32	230	BROWNING	230	1
line	RTLSN230	230	TUCSON23	230	1
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	SAN RAF	230	TOMB JCT	230	1
line	SANTAN	230	CCGS 1-6	230	1
line	SANTAN	230	ROGERS	230	1
line	SANTAN	230	RS-31	230	1
line	SANTAN	230	SCHRADER	230	1
line	SANTAN	230	THUNDRST	230	1
line	SCHRADER	230	CCGS 1-6	230	1
line	SCTWSH	230	PPAPS W	230	1
line	SIGURDPS	230	GLENCANY	230	1
line	SILVERKG	230	SUPERIOR	230	1
line	SNTAROSA	230	DBG	230	1
line	SNTAROSA	230	TATMOMLI	230	1
line	SNTAROSA	230	TESTTRAK	230	1
line	SNVLY	230	HASSY AZ	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	TOPOCK	230	BLK MESA	230	1
line	TOPOCK	230	SOPOINT	230	1
line	TOPOCK	230	SOPOINT	230	2
line	TORT230	230	TUCSON23	230	1
line	TRLBY	230	PLMVLY	230	1
line	TS4	230	KOMATKE	230	1
line	TS4	230	PLMVLY	230	1
line	TUCSON23	230	DELBAC23	230	1
line	TUCSON23	230	VAIL 230	230	1
line	VAIL 230	230	PANTANO	230	1
line	VERDE S	230	VERDE N	230	1
line	WESTWNGW	230	EL SOL	230	1
line	WESTWNGW	230	PPKWAPA	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	YAVAPAI	230	WILOWLKE	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	BLYTHE	161	NILAND	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	PARKER	161	BLYTHE	161	1
line	PARKER	161	BOUSE	161	1
line	PARKER	161	HEADGATE	161	1
line	PARKER	161	PARKERAZ	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.LP W	138	1
line	CYPRUS	138	CLEAR	138	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	NE.LP E	138	1
line	DMP	138	SN.CRUZ	138	1
line	DMP_EXP	138	TUCSON	138	1
line	DREXEL	138	IRVNGTN	138	1
line	DREXEL	138	MIDVALE	138	1
line	E.LP N	138	HARRISON	138	1
line	E.LP N	138	NE.LP E	138	1
line	E.LP N	138	ROBERTS	138	1
line	E.LP S	138	PANTANO	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	N. LOOP	138	NARANJA	138	1
line	N. LOOP	138	RANVISTO	138	1
line	N. LOOP	138	RILLITO	138	1
line	N. LOOP	138	WESTINA	138	1
line	NE.LP E	138	NELP_SVC	138	1
line	NE.LP W	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.LP N	138	1
line	SNYDER	138	NE.LP W	138	1
line	SONOITA	138	VALNCIA	138	1
line	SOUTH	138	ASARCO	138	1
line	SOUTH	138	CLEAR	138	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	KINO	138	1
line	TWNTYSEC	138	E.LP S	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	APACHE_SL	115	APACHE	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	COCHRAN	115	BONNEYTP	115	1
line	COCHRAN	115	SANDSTONE	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	SANDSTONE	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-4	115	ELOY	115	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	ED-5	115	EMPIRE	115	1
line	ELLISON	115	ELLISOTP	115	1
line	ELLISOTP	115	GASCLEAN	115	1
line	ELLISOTP	115	MIAMI 4	115	1
line	ELLISOTP	115	REFINETP	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	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	KEARNYTP	115	MORRISAZ	115	1
line	KNOLL	115	MORRISAZ	115	1
line	KNOLL	115	RAY	115	1
line	MARANA	115	AVRA	115	1
line	MARANATP	115	ED-5	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	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	BAGDTWN	115	1
line	RATTLSNK	115	TUCSON	115	1
line	RATTLSNK	115	TWINPEAK	115	1
line	RAY	115	SUPERIOR	115	1
line	RED ROCK	115	REDRCKAZ	115	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
line	RED ROCK	115	SAG.EAST	115	1
line	REFINERY	115	REFINETP	115	1
line	S.BRKRCH	115	SNMANUEL	115	1
line	SAG.EAST	115	ORACLE	115	1
line	SAG.EAST	115	SAG.WEST	115	1
line	SAG.WEST	115	ED-5	115	2
line	SAG.WEST	115	SNMANUEL	115	1
line	SAGWRO.WAPA	115	ED-5	115	1
line	SAGWRO.WAPA	115	SAG.EAST	115	1
line	SAGWRO.WAPA	115	SAG.WEST	115	1
line	SANDARIO	115	BRAWLEY	115	1
line	SANDARIO	115	SANDARAZ	115	1
line	SANDSTONE	115	SANDSTON1	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	CORONADO	500	CORONADO	345	9B
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	1A
tran	BROWNING	500	BROWNING	230	1B
tran	DUKE	500	DUKE	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
tran	MEAD	500	MEAD N	230	2
tran	MESQUIT1	500	MESQUITE	230	1
tran	MESQUIT2	500	MESQUITE	230	2
tran	MORGAN	500	MORGAN	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	1A
tran	RUDD	500	RUDD	230	1B
tran	RUDD	500	RUDD	230	3A
tran	RUDD	500	RUDD	230	3B
tran	SILVERKG	500	SILVERKG	230	1
tran	SNVLY	500	SNVLY	230	1
tran	SNVLY	500	SNVLY	230	2
tran	TORTOLIT	500	TORT230	230	1
tran	TORTOLIT	500	TORT230	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
tran	APACHHS1	345	APACHE_SL	230	1
tran	APACHHS2	345	APACHE_SL	230	2
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	PPKWAPA	230	1
tran	PINPKBRB	345	PPKWAPA	230	2
tran	PINPKBRB	345	PPKWAPA	230	3
tran	PNPK C	345	PPAPS E	230	3
tran	PNPK E	345	PPAPS C	230	1
tran	PNPK W	345	PPAPS N	230	2
tran	SHIPROCK	345	SHIPROCK	230	1
tran	VAIL	345	VAIL 230	230	1
tran	VAIL	345	VAIL 230	230	2
tran	WINCHSTR	345	WINCHSTR	230	1
tran	SOUTH	345	SOUTH	138	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
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	TUCSON23	230	DMP	138	1
tran	TUCSON23	230	DMP	138	2
tran	VAIL 230	230	VAIL	138	1
tran	VAIL 230	230	VAIL	138	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

TYPE	FROM BUS	KV	TO BUS	KV	CK
tran	PANTANO	230	PANTANO	115	1
tran	PRESCOTT	230	PRESCOTT	115	1
tran	PRESCOTT	230	PRESCOTT	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	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	ADAMSTAP	115	ADMTP230	230	1
tran	APACHE_SL	115	APACHE_SL	230	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
tran	MARANATP	115	MARANA23	230	1
tran	RATTLSNK	115	RTLSN230	230	1
tran	SAGWRO.WAPA	115	SAGWRO.WAPA	230	1
tran	SAGWRO.WAPA	115	SAGWRO.WAPA	230	2
tran	TUCSON	115	TUCSON23	230	1
tran	SNMANUEL	115	SNMANUEL	100	1
tran	PINAL	115	PINAL	69	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	1

TYPE	FROM BUS	KV	TO BUS	KV	CK
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

TYPE	FROM BUS	KV	TO BUS	KV	CK
tran	WHITETNK	69	WHITETNK	230	1
tran	WHITETNK	69	WHITETNK	230	3

5.5 Appendix E – Power Flow Results

The following table shows SRP elements loaded at 90% or higher of their emergency thermal limits. The ratings of the transmission lines are shown in amperes and the ratings of the transformers are shown in MVA.

	Element	Rating	Actual	% Loading	Outage Element
2017	None	n/a	n/a	n/a	n/a

	Element	Rating	Actual	% Loading	Outage Element
2018	White Tanks 230/69kV Transformer #3	317.9	293.6	92.4%	White Tanks 230/69kV Transformer #1

	Element	Rating	Actual	% Loading	Outage Element
2019	Rogers 230/69kV Transformer #4	327.6	295.5	90.2%	Rogers 230/69kV Transformer #2
	White Tanks 230/69kV Transformer #3	317.9	298.8	94.0%	White Tanks 230/69kV Transformer #1

	Element	Rating	Actual	% Loading	Outage Element
2020	Browning 500/230kV Transformer #1A	719.8	697.5	96.9%	Browning 500/230kV Transformer #1B
	Browning 500/230kV Transformer #1B	707.7	696.2	98.4%	Browning 500/230kV Transformer #1A
	Mesquite 500/230kV Transformer #1	1593.0	1519.0	95.4%	Mesquite 500/230kV Transformer #2
	Mesquite 500/230kV Transformer #2	1593.0	1518.4	95.3%	Mesquite 500/230kV Transformer #1
	Rogers 230/69kV Transformer #4	327.6	297.5	90.8%	Rogers 230/69kV Transformer #2
	White Tanks 230/69kV Transformer #3	317.9	304.2	95.7%	White Tanks 230/69kV Transformer #1

	Element	Rating	Actual	% Loading	Outage Element
2021	Mesquite 500/230kV Transformer #1	1593.0	1533.5	96.3%	Mesquite 500/230kV Transformer #2
	Mesquite 500/230kV Transformer #2	1593.0	1532.7	96.2%	Mesquite 500/230kV Transformer #1
	Rogers 230/69kV Transformer #4	327.6	306.8	93.6%	Rogers 230/69kV Transformer #2

	Element	Rating	Actual	% Loading	Outage Element
2022	Rogers 230/69kV Transformer #4	327.6	311.6	95.1%	Rogers 230/69kV Transformer #2

	Element	Rating	Actual	% Loading	Outage Element
2023	Rogers 230/69kV Transformer #4	327.6	315.3	96.3%	Rogers 230/69kV Transformer #2

	Element	Rating	Actual	% Loading	Outage Element
2024	Mesquite 500/230kV Transformer #1	1593.0	1499.4	94.1%	Mesquite 500/230kV Transformer #2
	Mesquite 500/230kV Transformer #2	1593.0	1498.6	94.1%	Mesquite 500/230kV Transformer #1
	Rogers 230/69kV Transformer #4	327.6	319.3	97.5%	Rogers 230/69kV Transformer #2

	Element	Rating	Actual	% Loading	Outage Element
2025	Mesquite 500/230kV Transformer #1	1593.0	1533.8	96.3%	Mesquite 500/230kV Transformer #2
	Mesquite 500/230kV Transformer #2	1593.0	1533.0	96.2%	Mesquite 500/230kV Transformer #1
	Rogers 230/69kV Transformer #4	327.6	327.6	100.0%	Rogers 230/69kV Transformer #2

	Element	Rating	Actual	% Loading	Outage Element
2026	Mesquite 500/230kV Transformer #1	1593.0	1522.5	95.6%	Mesquite 500/230kV Transformer #2
	Mesquite 500/230kV Transformer #2	1593.0	1521.9	95.5%	Mesquite 500/230kV Transformer #1
	Rogers 230/69kV Transformer #4	327.6	332.2	101.4%	Rogers 230/69kV Transformer #2

Notes:

1. The overload occurring on the Rogers 230/69kV Transformer will need to be further studied to determine the mitigation.

5.6 Appendix F – Transient Stability Lists

5.6.1 500kV Outage List

ARLINGTON - HASSAYAMPA LINE
ARLINGTON-CT1 GENERATOR
ARLINGTON-CT2 GENERATOR
ARLINGTON-ST1 GENERATOR
AVSOLAR TRANSFORMER
AVSOLAR2 GENERATOR
BROWNING - KYRENE LINE
BROWNING - PINAL CENTRAL LINE
BROWNING - SILVERKING LINE
BROWNING TRANSFORMER
BROWNING TRANSFORMER
CHOLLA - SILVERKING LINE
CHOLLA - SUGARLOAF LINE
CORONADO - SILVERKING LINE
CORONADO - SUGARLOAF LINE
CORONADO TRANSFORMER
CORONADO TRANSFORMER
CORONADO TRANSFORMER
CORONADO1 GENERATOR
CORONADO2 GENERATOR
DUKE - PINAL CENTRAL LINE
DUKE - PINAL WEST LINE
DUKE TRANSFORMER
HARQUAHA - HASSAYAMPA LINE
HARQUAHALA-CT1 GENERATOR
HARQUAHALA-CT2 GENERATOR
HARQUAHALA-CT3 GENERATOR
HARQUAHALA-ST1 GENERATOR
HARQUAHALA-ST2 GENERATOR
HARQUAHALA-ST3 GENERATOR
HASSAYAMPA - HDWSH LINE
HASSAYAMPA - JOJOBA LINE
HASSAYAMPA - JOJOBA LINE
HASSAYAMPA - NORTHGILA LINE
HASSAYAMPA - PINAL WEST LINE
JOJOBA - GILA RIVER LINE

JOJOBA - GILA RIVER LINE
JOJOBA - KYRENE LINE
JOJOBA - PINAL WEST LINE
KYRENE TRANSFORMER
KYRENE TRANSFORMER
KYRENE TRANSFORMER
MEAD - PERKINS LINE
MESQUIT1 TRANSFORMER
MESQUIT2 TRANSFORMER
MESQUITE-CT1 GENERATOR
MESQUITE-CT2 GENERATOR
MESQUITE-CT3 GENERATOR
MESQUITE-CT4 GENERATOR
MESQUITE-ST1 GENERATOR
MESQUITE-ST2 GENERATOR
NAVAJO 1 GENERATOR
NAVAJO 2 GENERATOR
NAVAJO 3 GENERATOR
PALO VERDE - COLRIVER LINE
PALO VERDE - DELANEY LINE
PALO VERDE - PL REACTOR1 LINE
PALO VERDE - PL REACTOR2 LINE
PALO VERDE - PL REACTOR3 LINE
PALO VERDE - RUDD LINE
PALO VERDE - WESTWING LINE
PALO VERDE - WESTWING LINE
PALO VERDE1 GENERATOR
PALO VERDE2 GENERATOR
PALO VERDE3 GENERATOR
PERKINPS - PERKINS LINE
PERKINPS - WESTWING LINE
PERKINS TRANSFORMER
PERKINS TRANSFORMER
PINAL CENTRAL - TORTOLIT LINE
PINAL CENTRAL TRANSFORMER
PINAL CENTRAL TRANSFORMER

PINAL WEST TRANSFORMER
PL REACTOR1 - HASSAYAMPA LINE
PL REACTOR2 - HASSAYAMPA LINE
PL REACTOR3 - HASSAYAMPA LINE
RUDD TRANSFORMER
RUDD TRANSFORMER

RUDD TRANSFORMER
RUDD TRANSFORMER
SILVERKING - SAGUARO LINE
SILVERKING TRANSFORMER
SPRINGERVILLE 4 GENERATOR

5.6.2 230kV Outage List

ABEL - DINOSAUR LINE
ABEL - RANDOLPH LINE
AGUA FRIA - ALEXANDR LINE
AGUA FRIA - WESTWING LINE
AGUA FRIA - WHITE TANK LINE
AGUA FRIA 1 GENERATOR
AGUA FRIA 2 GENERATOR
ANDERSON - KYRENE EAST LINE
ANDERSON - ORME LINE
ANDERSON - ORME LINE
BRANDOW - KYRENE EAST LINE
BRANDOW - PAPAGO BUTTES LINE
BRANDOW - PINNACLE PEAK SRP LINE
BRANDOW - PINNACLE PEAK SRP LINE
BRANDOW - WARD LINE
BRANDOW - WARD LINE
BROWNING - CORBELL LINE
BROWNING - DINOSAUR LINE
CASA GRANDE APS - DESERT BASIN LINE
COPPER CROSSINGS 1-6 - ABEL LINE
COPPER CROSSINGS 1-6 - ABEL LINE
COPPER CROSSINGS-CT1 GENERATOR
COPPER CROSSINGS-CT2 GENERATOR
COPPER CROSSINGS-CT3 GENERATOR
COPPER CROSSINGS-CT4 GENERATOR
COPPER CROSSINGS-CT5 GENERATOR
COPPER CROSSINGS-CT6 GENERATOR
COPPER CROSSINGS-CT7 GENERATOR
COPPER CROSSINGS-CT8 GENERATOR
CORBELL - KYRENE EAST LINE

CORBELL - SANTAN LINE
DEER VALLEY - ALEXANDER LINE
DEER VALLEY - PINNACLE PEAK SRP LINE
DEER VALLEY - WESTWNGE LINE
DESERT BASIN - PINAL CENTRAL LINE
DESERT BASIN-CT1 GENERATOR
DESERT BASIN-CT2 GENERATOR
DESERT BASIN-ST1 GENERATOR
EL SOL - AGUA FRIA LINE
GLENDALE - AGUA FRIA LINE
GOLDFIELD - SILVERKING LINE
GOLDFIELD - SUPERIOR LINE
GOLDFIELD - THUNDERSTONE LINE
GOLDFIELD - THUNDERSTONE LINE
GOLDFIELD TRANSFORMER
GOLDFIELD TRANSFORMER
KNOX - KYRENE EAST LINE
KNOX - SANTA ROSA LINE
KYRENE 7A GENERATOR
KYRENE 7S GENERATOR
KYRENE EAST - SCHRADER LINE
KYRENE WEST - OCOTILLO LINE
LIBERTY - ORME LINE
LIBERTY - RUDD LINE
MESSOLAR - MESQUITE LINE
MESSOLAR - MESQUITE LINE
OAKFLAT - SILVERKING LINE
OAKFLAT - SUPERIOR LINE
ORME - RUDD LINE
ORME - RUDD LINE

PAPAGO BUTTES - KYRENE WEST LINE
PAPAGO BUTTES - PINNACLE PEAK SRP LINE
PINAL CENTRAL - RANDOLPH LINE
PPAPS N - PINNACLE PEAK SRP LINE
PPAPS N - PINNACLE PEAK SRP LINE
PPKWAPA - PINNACLE PEAK SRP LINE
PPKWAPA - PINNACLE PEAK SRP LINE
ROGERS - THUNDERSTONE LINE
RS-28 - SCHRADER LINE
RS-31 - BROWNING LINE
RS-31 - RS-32 LINE
RS-32 - BROWNING LINE
RUDD - PALM VALLEY LINE
RUDD - WHITE TANK LINE
SANTA ROSA - DESERT BASIN LINE
SANTAN - COPPER CROSSINGS 1-6 LINE
SANTAN - ROGERS LINE
SANTAN - RS-31 LINE

SANTAN - SCHRADER LINE
SANTAN - THUNDERSTONE LINE
SANTAN 1 GENERATOR
SANTAN 2 GENERATOR
SANTAN 3 GENERATOR
SANTAN 4 GENERATOR
SANTAN 5A GENERATOR
SANTAN 5B GENERATOR
SANTAN 5S GENERATOR
SANTAN 6A GENERATOR
SANTAN 6S GENERATOR
SCHRADER - COPPER CROSSINGS 1-6 LINE
SILVERKING - SUPERIOR LINE
SILVERKING TRANSFORMER
SILVERKING TRANSFORMER
SUN ARIZ - PINAL CENTRAL LINE
WEST PHX APS - RUDD LINE
WHITE TANK APS - RUDD LINE

5.6.3 115kV Outage List

APACHE - HAYDENAZ LINE
ASARCOSR - ASARCOTP LINE
ASARCOTP - CRUSHER LINE
ASARCOTP - HAYDENAZ LINE
AVSOLAR - AVSOLAR2 LINE
BONNEYBROOK TAP - BONNEYBROOK LINE
BONNEYBROOK TAP - CRUSHER LINE
BONNEYBROOK TAP - SANDSTONE LINE
CARLOTA - PINTO VALLEY LINE
CARLOTA - SILVERK2 LINE
CARREL - GOLDFIELD LINE
CARREL - SPURLOCK LINE
COCHRAN - BONNEYBROOK TAP LINE
COCHRAN - SANDSTONE LINE
COOLIDGE - SANDSTONE LINE
ELLISON - ELLISON TAP LINE
ELLISON TAP - GASCLEAN LINE
ELLISON TAP - MIAMI 4 LINE

ELLISON TAP - REFINERY TAP LINE
FRAZIER - HORSE MESA LINE
FRAZIER - MOONSHIN LINE
FRAZIER - ROOSEVELT LINE
GOLDFIELD - HORSE MESA LINE
GOLDFIELD - MRMNFLAT LINE
GOLDFIELD - STEWART MTN LINE
HAYDENAZ - KEARNY TAP LINE
HORSE MESA - MRMNFLAT LINE
KEARNY TAP - MORRISAZ LINE
KNOLL - MORRISAZ LINE
KNOLL - RAY LINE
MIAMI - MIAMI 3 LINE
MIAMI - PINTO VALLEY LINE
MIAMI 3 - MIAMI 4 LINE
MIAMI 3 - PINAL LINE
MOONSHIN - PINAL LINE
MOONSHIN - REFINERY TAP LINE

OAKFLAT - SILVERT1 LINE
OAKFLAT - TRASK LINE
PINAL - SILVERT1 LINE
RAY - SUPERIOR LINE
REFINERY - REFINERY TAP LINE

SILVERKING1 - SILVERKING TAP LINE
SILVERKING2 - SUPERIOR LINE
SPURLOCK - SUPERIOR LINE
SUPERIOR - TRASK LINE

5.6.4 Reactive Resources

SVDs		
BUS NAME	KV	MAX MVAR
KYR-EAST	230	310
SCHRADER	230	150
WARD	230	150
HAYDENAZ	115	13.5
KNOLL	115	75
PINTOVLY	115	44.6

SHUNTS			
BUS NAME	KV	ID	MAX MVAR
PAPAGOBT	230	c1	150
PINPKSRP	230	c1	150
ROGERS	230	c1	150
WARD	230	c1	150
ASARCOSR	115	b	28.8
PINAL	115	b	27

5.7 Appendix G – Transient Stability Plots

Due to the large number of plots, the results for the Transient Stability will be made available upon request.

Please send request to: SRP.TransmissionPlanning@srpnet.com.