TEN-YEAR TRANSMISSION PLAN

2017 – 2026
Docket No. E00000D-15-0001

JANUARY 30, 2017
ARIZONA ELECTRIC POWER COOPERATIVE, INC.

TEN-YEAR TRANSMISSION PLAN

2017 – 2026

Prepared for the

ARIZONA CORPORATION COMMISSION

Docket No. E-00000D-15-0001
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GENERAL INFORMATION

This Ten-Year Plan is submitted to the Arizona Corporation Commission (Commission) to satisfy the requirements of § 40-360.02 of the Arizona Revised Statutes (A.R.S.), relating to power plant and transmission line siting requirements. It outlines the plans of Arizona Electric Power Cooperative, Inc. (AEPCO) to install electric facilities required to reliably meet the system load growth of its Distribution Cooperative Members (Members) and other network customers or reliability requirements applicable to AEPCO’s transmission system.

This report contains transmission projects that AEPCO anticipates may be constructed over the next ten-year period. As noted in A.R.S. § 40-360.02.F, the plans contained in this report are tentative information only and are subject to change at any time at the discretion of AEPCO. AEPCO anticipates that any changes to this plan will likely be due to changes in load forecasts, environmental constraints, economic considerations, other utilities’ plans, regulatory and legal developments, as well as future regional and federal mandates. All transmission projects are subject to a peer-review by AEPCO’s Operating Committee (OC) prior to submittal to the AEPCO Board of Directors for approval. Meetings of the OC are held quarterly, or as needed, and changes to these projects are reviewed as necessary to meet the Member needs. The OC reviews the Construction Work Plan (CWP) that is then submitted to the AEPCO Board of Directors for approval. Once the CWP is approved, the projects are considered by AEPCO as “planned” projects. Conceptual projects, or those that have not been vetted by the OC for placement into a CWP, may be included in ten-year plan filings but will be listed as conceptual projects with tentative or “to-be-determined” (TBD) in-service dates. TBD as used in this document means that in addition to the project not being yet vetted by the OC, it can also mean that the project is still in negotiations with other entities.
This specific report is divided into two sections, as outlined in the Table of Contents on page 2. Section I describes planned transmission lines and projects AEPCO may construct over the ten-year plan period, whose nominal voltage is equal to or greater than one hundred fifteen thousand volts (115 kV).

Section II contains AEPCO’s internal planning criteria and facility ratings, pursuant to Commission Decision #63876, dated July 25, 2001.

A technical study report to satisfy the requirements of paragraph C.7 of A.R.S. §40-360.02 has been prepared as a stand-alone document and will be filed jointly with this document.

REGIONAL PLANNING

AEPCO has been an active participant in regional and sub-regional transmission planning efforts within the Western Interconnection for many years. This participation has been through the Southwest Area Transmission (SWAT), membership in the Western Electricity Coordinating Council (WECC) and WestConnect. AEPCO is involved in the following subcommittees of SWAT, either through active participation or copy interest:

- Arizona Subcommittee (SWAT-AZ)
- Short-circuit Work Group (SCWG)

AEPCO is an active participant within the following committees of WECC:

- Operating Committee (OC)
- Planning Coordination Committee (PCC)
- Technical Studies Subcommittee (TSS)
- System Review Work Group (SRWG)

In addition, AEPCO continues to monitor the efforts of the WECC Transmission Expansion Planning Policy Committee (TEPPC) which has been tasked with the development of 10- and 20- year transmission plans for the Western Interconnection.
On December 6, 2016, the WECC Board of Directors approved the recommendations of the Joint PCC-TEPPC Review Task Force (JPTRTF) which will combine the PCC, TEPPC, and all their subcommittees into a new Reliability Assessment Committee (RAC). AEPCO will continue to be involved in regional planning with representation on RAC, and any other subcommittees and Task Forces created in conjunction with RAC.

AEPCO continues its involvement in the regional transmission planning activities of WestConnect as a Coordinating Transmission Owner in the Transmission Owner with Load Serving Obligations Sector. WestConnect coordinates its efforts with other regional planning entities and inter-regionally within the Western Interconnection, to comply with the provisions of the Federal Energy Regulatory Commission (FERC) Order No. 1000 “Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities” that was issued July 21, 2011.

WestConnect completed its initial abbreviated planning cycle on December 31, 2015, and began its first full two-year planning cycle beginning January 1, 2016. As part of its first full planning cycle, AEPCO and other members of WestConnect spent 2016 working with Sub-regional Planning Groups, such as Southwest Area Transmission (SWAT) on data collection and modeling processes to identify any regional needs. 2017 will be used to evaluate and identify project alternatives, allocate costs, and draft the Regional Plan. The planning cycle is scheduled to be completed with its Regional Plan in early 2018. A timeline of the full planning cycle is illustrated in the following chart.
The Planning Management Committee (PMC) under the Planning Participation Agreement (PPA) that was filed on November 17, 2014 is responsible for development of a Regional Transmission Study Plan, development of an annual budget for the Regional and Inter-regional planning processes, activities, and functions, development of planning models, identification of Regional transmission needs, submittal of projects to meet Regional transmission needs and identification of beneficiaries and cost allocation. The structure of the PMC includes three standing subcommittees: (1) the Planning Subcommittee, (2) the Cost Allocation Subcommittee and (3) the Legal Subcommittee. Within the Planning Subcommittee are two working groups, the Expansion Planning Working Group that will perform benefits analyses and such other functions as defined and directed by the PMC, and the Power Flow Working Group that will perform power flow, voltage, stability, short circuit and transient analyses and such other functions as defined and directed by the PMC.

**NINTH BIENNIAL TRANSMISSION ASSESSMENT (BTA) REQUIREMENTS**

At the Arizona Corporation Commission (ACC) Open Meeting held on October 27 and 28 2016, the Commission reviewed the 9th BTA Report with Decision #75817 that adopted Staff’s recommendations and the Commission ordered studies. The 9th BTA was docketed on
November 21, 2016. The specific recommendations and orders applying to AEPCO are listed below, along with AEPCO’s response:

**Recommendation b:**

The use of collaborative transmission planning processes such as those that currently exist in Arizona, which help to facilitate competitive wholesale markets and broad stakeholder participation in grid expansion plans.

**AEPCO Response:**

AEPCO is committed to the collaborative transmission planning processes that currently exist in Arizona by its participation in WECC Committees, WestConnect, as well as Regional and Sub-Regional transmission planning groups.

**Recommendation f:**

That any requirement established in a prior BTA will continue in force unless the Commission suspends such requirement in a succeeding BTA. Nevertheless, Staff recommends that the Commission emphasize the importance of these continuing requirements for Arizona utilities:

i. Advise each interconnection applicant at the time the applicant files for interconnection of the need to contact the Commission for appropriate ACC requirements related to the Power Plant and Transmission Line Siting Committee.

**AEPCO Response:** AEPCO has complied with this requirement since the policy was instituted by providing language to this effect in a document posted on its OASIS site and also by providing this Commission policy in writing to potential applicants filing for interconnection to the AEPCO system.

ii. Report relevant findings in future BTAs regarding compliance with transmission planning standards from North American Electric Reliability Corporation (NERC)/WECC reliability audits that have been finalized and Bled with FERC.
**AEPCO Response:** AEPCO is committed to complying with all transmission planning standards. AEPCO’s latest NERC/WECC reliability audit for the period February 10, 2012 through October 24, 2014 was completed in February 2015. As a result of this audit, AEPCO was found to be in 100% compliance with all NERC and WECC standards.

iii. Address the effects of DG and EE on future transmission needs in their Ten-Year Plan filings.

**AEPCO Response:** Given that AEPCO is a transmission only cooperative with no retail load to serve, this recommendation is not applicable to AEPCO.

iv. Ensure that the Commission-ordered Ten Year Snapshot study monitors transmission elements down to and including the 115 kV level for thermal loading and voltage violations.

**AEPCO Response:** AEPCO provided information in regards to its system to SWAT-AZ for inclusion in the Ten Year snapshot study, by sharing its Ten-Year Plan, coordination of cases with other utilities in Arizona, and AEPCO’s participation in the SWAT-AZ subcommittee.

v. Include planned transmission reconductor projects, transformer capacity upgrade projects, and reactive power compensation facility additions at 115 kV and above in future Ten-Year Plan filings.

**AEPCO Response:** AEPCO has no transmission reconductor projects to report in this ten-year plan. AEPCO is in the process of acquiring two distressed 345/230 kV 200 MVA transformers to be installed in parallel to existing transformers at Greenlee and Bicknell in 2019. There are reactive power compensation facility additions at 115 kV and above that are planned for this Ten-Year plan filing, as per the following schedule:

<table>
<thead>
<tr>
<th>Year</th>
<th>Substation</th>
<th>MVAR Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>Butterfield</td>
<td>14.4</td>
</tr>
</tbody>
</table>
2017  Bicknell  19.2
2018  Valencia  14.4
2018  Dos Condados  50.0 (Moved from Morenci)

Additional studies conducted in 2017, reflecting the recently approved 2016 Load Forecast or other circumstances that may tend to refine these values and/or suggest the need to adjust locations for reactive support to the AEPCO system. Any modifications will be reported in the next Ten-Year Plan filing.

**Recommendation g:**

The policy that the Load Serving Entitles (LSE) in Cochise and Santa Cruz Counties continue to monitor the reliability in Cochise and Santa Cruz Counties, respectively, and propose any modifications that they deem to be appropriate in future Ten-Year Plans. Staff also recommends that the Commission continue to collect applicable outage data from the respective utilities in order to monitor any changes to Cochise County and Santa Cruz County system reliability in future BTA proceedings.

**AEPCO Response:**

AEPCO continues to work with Arizona Public Service Company (APS) and Sulphur Springs Valley Electric Cooperative, Inc. (SSVEC) to develop the joint Tombstone Junction Project in Cochise County to effect reliability improvements among the utilities. AEPCO continues to target 2021 as an in-service date for this project. Applicable outage data continues to be collected to monitor any changes to system reliability.

**Recommendation h:**

The acceptance of the results of the following Commission-ordered studies provided as part of the Ninth BTA filings:

a. The SIL and MLSC are adequate to meet ten year local load forecasts.

b. The RMR studies were not required because none of the triggering factors occurred for the Ninth BTA that would require RMR study work in any of the RMR areas.
c. The Extreme Contingency Analysis for Arizona's major transmission corridors and substations and the associated risks and consequences of such overlapping contingencies.

d. Ten Year Snapshot study results documenting the performance of Arizona's statewide transmission system in 2025 for a comprehensive set of single (N-1) contingencies, each tested with the absence of different major planned transmission projects.

e. The EE/DG study results containing the Fifth-Year Contingency Analysis with and without disaggregated DG and EE loads.

**AEPCO Response:**

AEPCO accepts the results of all the Commission-ordered studies provided as part of the Ninth BTA filings.
CHANGES FROM 2016 TEN-YEAR PLAN FILING

On November 9, 2016, AEPCO’s Board of Directors approved the 2017-2020 Construction Work Plan (CWP). The CWP identified a number of projects that will be included in this year’s Ten-Year Plan as planned projects. Projects that have projected in-service dates outside of the current CWP window but still have a high likelihood of being constructed are also included as planned projects. Additional projects that have a higher degree of uncertainty and no firm in-service dates are included as “Additional Projects Under Consideration.”

PLANNED PROJECTS

APS Bagdad Interconnection Project. The project expands AEPCO’s Bagdad Interconnect substation by installing a used 115/69 kV transformer and connecting it to APS’ Bagdad substation via a new 115 kV line. This connection will provide mutual backup for APS loads in the town of Bagdad, and Mohave Electric Cooperative’s Inc. (MEC) loads west of Bagdad. AEPCO and APS are currently discussing project configuration and cost allocations for this project. The driving factor for this project is reliability for both APS and MEC.

Dos Condados Capacitor Bank Installation. Relocate one of the two 50 MVAr capacitor banks at AEPCO’s Morenci substation to AEPCO’s Dos Condados substation. The driving factor for this project is reliability.

FMI Morenci – TEP Joint Project. The project will purchase a new 345/230 kV 400 MVA transformer for Morenci Water and Electric's (MW&E) Copper Verde substation and relocate the two existing transformers at Copper Verde to the AEPCO Greenlee substation and the AEPCO Bicknell substation and place them in satisfactory operation. Previous studies have identified TEP outages that have the potential to overload of AEPCO’s Greenlee transformer during peak load periods. This project will alleviate these overloads. The driving factor for this project is reliability.
**Valencia to CAP Black Mountain 115 kV line.** This line segment was approved by the ACC Line Siting Committee on February 10, 2010 and by the Commission on April 14, 2010 (Case #152, Decision #71649) as part of the North Loop to Rattlesnake 115 kV Line Project. The project proposes a new 2.6 mile 115 kV line that will extend from the existing AEPCO Valencia Substation to tie to the turning structure of the 115 kV CAP line that heads directly north two miles to the existing Central Arizona Project (CAP) Black Mountain substation. The driving factor for this project is reliability on both AEPCO and CAP systems.

**Marana-Thornydale-Saguaro Interconnect.** The project involves the construction of a new 115 kV line from the existing Marana substation to the Thornydale substation and to acquire a single circuit of TEP’s quad-circuit line from TEP's Tortolita substation, disconnecting from Tortolita, and connecting it to Saguaro, reenergizing the quad-circuit line to 115 kV and interconnect with AEPCO’s Thornydale substation. The driving factor for this project is reliability.

**Tombstone Junction Project.** This Cochise County project involves looping the AEPCO Butterfield to San Rafael 230 kV line into a new Scheiffelin substation with a 230/69 kV transformation to the existing SSVEC Tombstone Junction substation and APS Boot Hill substation. AEPCO and APS are currently discussing project configuration and cost allocations for this project. The driving factor for this project is reliability.

**ADDITIONAL PROJECTS UNDER CONSIDERATION**

AEPCO continues to study the feasibility of additional projects for inclusion into future Ten-Year Plans that have been deferred from previous Ten-Year Plans for various reasons.

A brief description of each of these projects follows, for information purposes only. A driving factor is provided for each of these projects per BTA recommendations. These projects are under consideration, but have not advanced far enough to have a projected in-service date.
AEPCO will continue to hold discussions with potential project participants throughout 2017, and if refined project scopes have been established with agreements from project participants, and with approvals from governing boards, these projects may be reflected in next year’s Ten-Year Plan.

**Apache/Hayden to San Manuel 115 kV Line.** This project has been presented in previous AEPCO Ten-Year Plans, but has been deferred beyond the Ten-Year Plan horizon. It was approved by the ACC Line Siting Committee on May 12, 2009 and by the Commission on July 9, 2009 (Case #142, Decision #71218). The project proposes the extension of a new 4.5 mile 115 kV line from the existing AEPCO Apache to Hayden 115 kV line to the existing APS San Manuel substation. The value to AEPCO of this project depends on working out contact paths with APS connecting AEPCO to Trico Electric Cooperative, Inc. (Trico) loads from the east and north. This line project will require the agreement of APS and additional studies. The driving factor for this project is reliability.

**Thornydale to Twin Peaks 115 kV Line.** This line segment was approved by the ACC Line Siting Committee on February 10, 2010 and by the Commission on April 14, 2010 (Case #152, Decision #71649). The project proposes a new 8 mile 115 kV line between AEPCO’s Thornydale substation and the CAP Twin Peaks substation. With the addition of Valencia to CAP Black Mountain 115 kV line, and the Marana-Thornydale-Saguaro Interconnect projects described in the previous section, this project would no longer be necessary. However, the same route may still be used as part of the Marana-Thornydale-Saguaro Interconnect. The driving factor for this project has been load growth and reliability.

**CAP 115 kV Line Tap to AEPCO Sandario Substation.** This line segment was also approved by the ACC Line Siting Committee on February 10, 2010 and by the Commission on April 14, 2010 (Case #152, Decision #71649) as part of the North Loop to Rattlesnake 115 kV Line Project. The project proposes that a new 0.6 mile 115 kV line to be tapped off of the existing CAP Sandario to Brawley 115 kV line to tie to the existing AEPCO Sandario substation. This line project will require the agreement of CAP and is pending additional studies. The driving factor for this project is reliability.
Saguaro to Tucson 115 kV Line Loop-in To Marana. With the addition of Valencia to CAP Black Mountain 115 kV line, and the Marana-Thornydale-Saguaro Interconnect projects described in the previous section, this project is being studied as a sensitivity to determine additional reliability benefits that can be achieved. The driving factor for this project is reliability.

PROJECT MAPS

The following maps are included to show the location of existing and future transmission projects and as presented in the earlier Planned Projects section. The planned additions of AEPCO’s Members are not included on these maps or reflected in this filing.

The maps included in this report are:

- Figure 1 - AEPCO Northern Area
- Figure 2 - AEPCO Southern Area
- Figure 3 - AEPCO Western Area
- Figure 4 – AEPCO California and Northwest Arizona Areas
Figure 1:
Figure 2:

AEPCO SOUTHERN AREA SYSTEM

46 & 69 kV LINES
115 kV LINES
138 kV LINES
230 kV LINES
345 kV LINES
500 kV LINES
FUTURE SUBSTATION
AEPCO SUBSTATION
OTHER SUBSTATION
AEPCO GENERATION
Figure 4:

**AEPCO CALIFORNIA & NORTHWEST ARIZONA AREA SYSTEMS**

**ANZA (CALIFORNIA) AREA**

**MOHAVE (NORTHWEST ARIZONA) AREA**

[Diagram showing the connections and substations in the ANZA and Mohave areas.]

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**Arizona G&T Cooperatives**

"Touchstone Energy" Cooperatives

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Http://azgt/sites/azgt/powerpln/Managed Documents/Transmission Planning/ACC Ten Year Plan Filings/2017/ACC10YRPlan2017-2026.docx

January 30, 2017
SECTION I - PLANNED TRANSMISSION PROJECTS

Reactive Power Compensation

Description:
There are reactive power compensation facility additions at 115 kV and above that are planned for this ten-year plan filing, as per the following schedule:

<table>
<thead>
<tr>
<th>Year</th>
<th>Substation</th>
<th>MVAR Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>Bicknell</td>
<td>19.2</td>
</tr>
<tr>
<td>2018</td>
<td>Valencia</td>
<td>14.4</td>
</tr>
<tr>
<td>2018</td>
<td>Dos Condados</td>
<td>50.0 (Moved from Morenci)</td>
</tr>
</tbody>
</table>

Project Type: Capacitor Installations

Project Location: Pima and Graham Counties

Justification: Reliability

AEPCO Estimated Cost: $1,450,000

In Service Date: 2017 - 2018
APS Bagdad Interconnection Project

Description:
The project expands AEPCO’s Bagdad Interconnect substation by installing a used 115/69 kV transformer and connecting it to APS’ Bagdad substation via a new 115 kV line. This connection will provide mutual backup for APS loads in the town of Bagdad, and MEC’s loads west of Bagdad. AEPCO and APS are currently discussing project configuration and cost allocations for this project. The driving factor for this project is reliability for both APS and MEC.

Project Type: Transformer Relocation and Transmission Line

Project Location: Yavapai County

Justification: Reliability

AEPCO Estimated Cost: $2,350,000

In Service Date: 2018
FMI Morenci – TEP Joint Project

Description:
The project will purchase a new 345/230 kV 400 MVA transformer for MW & E Copper Verde substation and relocate the two existing transformers at Copper Verde to the AEPCO Greenlee substation and the AEPCO Bicknell substation and place them in satisfactory operation. The driving factor for this project is reliability.

Project Type: Transformer Replacement and Relocation

Project Location: Graham and Pima Counties

Justification: Load Serving and Reliability

AEPCO Estimated Cost: $1,957,400

In Service Date: 2018
Valencia to CAP Black Mountain 115 kV line

Description:
The project proposes a new 2.6 mile 115 kV line that will extend from the existing AEPCO Valencia substation to tie to the turning structure of the 115 kV CAP line that heads directly north two miles to the existing CAP Black Mountain substation. The driving factor for this project is reliability on both AEPCO and CAP systems.

Project Type: Transmission Line

Project Location: Pima County

Justification: Reliability

AEPCO Estimated Cost: $2,537,500

In Service Date: 2019
Marana-Thornydale-Saguaro Interconnect

Description:
The project involves the construction of a new 115 kV line from the existing Marana substation to the Thornydale substation and to acquire a single circuit of TEP’s quad-circuit line from TEP's Tortolita substation, disconnecting from Tortolita, and connecting it to Saguaro, reenergizing the quad circuit line to 115 kV and interconnect with (AEPCO Thornydale substation. The driving factor for this project is reliability.

Project Type: Transmission Line

Project Location: Pima and Pinal Counties

Justification: Reliability and Load Serving

AEPCO Estimated Cost: $16,200,000

In Service Date: 2020
Tombstone Junction Project.

Description:
This Cochise County project involves looping the AEPCO Butterfield to San Rafael 230 kV line into a new Scheiffelin substation with a 230/69 kV transformation to the existing SSVEC Tombstone Junction substation and APS Boot Hill substation. AEPCO and APS are currently discussing project configuration and cost allocations for this project. The driving factor for this project is reliability.

Project Type: Multiple Transmission Elements

Project Location: Cochise County

Justification: Reliability

AEPCO Estimated Cost: $13,800,000

In Service Date: 2021
SECTION II - INTERNAL PLANNING CRITERIA AND
FACILITY RATINGS

AEPCO’s current internal planning criteria and facility ratings have been documented in its Facility Ratings Methodology and Establish and Communicate Facility Ratings (FAC-008-3) last revised in July 2016, to meet requirements of the NERC Planning Standards. Portions of the document are reprinted below, which identify the assumptions and methodologies used by AEPCO to determine electrical facility ratings and also describe the electrical load limits for AEPCO on the various power system transmission lines, power transformers, and other facility equipment under normal and emergency operating conditions.

1.0 Introduction

In accordance with NERC and Western Electricity Coordinating Council (WECC) standards, this document sets forth the methodology to cover facilities solely owned by AEPCO. This document’s purpose is to ensure that Facility Ratings used in the reliable planning and operation of the Bulk Electric System (BES) are determined based on technically sound principles. As industry standards change over the years, AEPCO will modify its rating methodology to comport with accepted industry practice. In particular, this document covers the methodologies used to establish the electrical ratings of transmission facilities owned by AEPCO, which are currently in commercial service. This document is intended to comply with the requirements of NERC Reliability Standard FAC-008-3.

2.0 Statement of Limitations

This document is limited to addressing operating conditions under normal and emergency situations and is not intended to address electrical faults, abnormal operations, failures of covered equipment or establish settings for protective devices. Additionally, the document does not make any assumptions as to the design criteria of legacy equipment and facilities.

2.1 The facilities addressed in this document include transmission conductors, transformers, relay protective devices, terminal equipment and compensation devices.

2.2 This methodology addresses Normal and Emergency ratings for the facilities that comprise AEPCO’s BES.

2.3 This Facility Ratings Methodology considers the ratings provided by equipment manufacturers, The Institute of Electrical and Electronics Engineers, Inc., (IEEE) and American National Standards Institute (ANSI) standards, ambient conditions for solar input, temperature and wind speed, design criteria, operating limitations, and other assumptions, as applicable.
2.4 The ratings for all of AEPCO BES facilities, including but not limited to lines, transformers, and shunt compensation devices shall respect the most limiting applicable Equipment Rating of the individual equipment that comprises that facility.

2.5 In cases where a facility is jointly owned, the operator of the facility determines the rating and shares the rating with the other joint owners. AEPCO is a joint owner in two transmission lines: The Vail to Westwing 345 kV line, which it co-owns with Tucson Electric Power (TEP) (project operator), and the Hassayampa to Pinal West 500 kV line, which it co-owns with Electrical District 2 (ED2), Electrical District 3 (ED3), Electrical District 4 (ED4), Salt River Project (SRP) (project operator) and TEP. AEPCO is also a co-owner with TEP (project operator) in the Pinal West 500/345 kV transformer. Information on co-owned facilities is included in Appendices A and B.

2.6 In cases where a facility is owned in segments (such as a transmission line owned by one party with the breaker being owned by a different party), each owner will determine the rating for their segment and coordinate with the others to determine the most limiting segment. The rating for the most limiting segment will be used for the entire facility.

3.0 Facility Rating Methodologies for Generation and Transmission Facilities

The following sections describe the rating methodology for AEPCO facilities.

3.1 Generation Facilities

AEPCO has five generating facilities interconnected at voltages higher than 100 kV. These are Apache Station ST1, ST2, ST3, GT3, and GT4. These facilities comprise AEPCO’s BES.

The following sections describe the rating method for the various facilities that comprise AEPCO’s BES. The Facility Rating shall not exceed the most limiting applicable Equipment Rating of the individual equipment that comprises that Facility. AEPCO’s Facility Ratings are expressed in megawatts. Equipment Ratings are expressed in megawatts based on the equipment’s associated generator nameplate kilovolt-amperes and power factor. For equipment located on the secondary side of current transformer circuits, the Equipment Rating will be based on the primary side current, associated generator nameplate kV, and generator nameplate power factor.

The Normal Rating of any one generator is based on the generator manufacturer’s nameplate rating and is equal to the maximum generator nameplate rating as reported on Form EIA-860 “Annual Electric Generator Report” and EIA 767. From
EIA 767, “…report the maximum generator nameplate rating in megawatts. If the nameplate rating is expressed in kilovolt-amperes, convert to kilowatts by multiplying the power factor by the kilovolt-amperes, then convert kilowatts to megawatts by dividing by 1,000. If more than one rating appears on the nameplate, select the highest rating. Do not indicate the nameplate rating of the turbine.”

The Emergency Rating of each of AEPCO’s generating facilities is equal to the Facility’s Normal Rating.
## Generator Facility Rating Summary

<table>
<thead>
<tr>
<th>Facility</th>
<th>Owner’s Normal Rating (MW)</th>
<th>Owner’s Emergency Rating (MW)</th>
<th>Most Limiting Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST1</td>
<td>81.6</td>
<td>81.6</td>
<td>Generator @ p.f.=0.85</td>
</tr>
<tr>
<td>ST2</td>
<td>204.0</td>
<td>204.0</td>
<td>Generator @ p.f.=0.85</td>
</tr>
<tr>
<td>ST3</td>
<td>204.0</td>
<td>204.0</td>
<td>Generator @ p.f.=0.85</td>
</tr>
<tr>
<td>GT3</td>
<td>78.8</td>
<td>78.8</td>
<td>Generator @ p.f.=0.9</td>
</tr>
<tr>
<td>GT4</td>
<td>60.5</td>
<td>60.5</td>
<td>Generator @ p.f.=0.85</td>
</tr>
</tbody>
</table>

Generator ratings are determined in accordance with Energy Information Administration (EIA) methods based on nameplate MVA and power factor.

These ratings are for the purposes of FAC-008 and are only indicative of the generator and equipment manufacturer's stated electrical capability. They do not reflect the megawatt producing capability of the plant.

### 3.2 Overhead Conductors

In 2014, AEPCO updated its overhead conductor rating methodology based upon the parameters outlined in Table 2 below. The calculations for normal operating conditions use the design criteria of 75°C, and the emergency operating conditions use a conductor design temperature rating of 100°C. AEPCO incorporates the calculations used in the IEEE Standard 738 “IEEE Standard for Calculating the Current-Temperature of Bare Overhead Conductors,” in its analysis of determining the current-temperature relationship of its conductors, given the parameters noted in Table 2.\(^1\)

The ratings can be found in Table 1 below. The conductor ratings apply to the entire line, including the last span of the line entering a substation. The limiting factors of each transmission line are discussed in the next Section and a spreadsheet of AEPCO’s transmission line ratings can be found in Appendix A “AEPCO Transmission Line Ratings.” Appendix F “GE PSLF Power Flow Model” also shows the transmission line ratings based on their limiting factors as noted in Appendix A.

The updated conductor ratings have also been done to calculate year-round 15-minute, 30-minute and 4-hour emergency ratings, using an Excel based program to produce a loading guide for each conductor, based on the IEEE Standard 738. The same parameters noted in Table 2 below were used to calculate these emergency ratings.

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\(^1\) Information on AEPCO Conductor Ratings also found in the following reference documents:
- System Operating Limits Methodology for the Operations Horizon, Version 6.1
- Establish and Communicate System Operating Limits, Version 3.0

Http://azgt/sites/azgt/powerpln/Managed Documents/Transmission Planning/ACC Ten Year Plan Filings/2017/ACC10YRPlan2017-2026.docx

January 30, 2017
The 15-minute and 30-minute emergency ratings will be utilized by System Operations in their Dispatch Center where contingency overloads can be mitigated within 15 to 30 minutes.

The values for the four-hour emergency ratings for all conductors below are based on 130% of the normal ratings. It should be noted that the 15- and 30-minute emergency ratings for the smaller conductors, #2 CU to 636 ACSR, are the same as the 4-hour emergency ratings. For conductor sizes 795 AAC and up, all four values of ratings are shown: normal, 15-minute, 30-minute and 4-hour. The 15-minute ratings are 140% or normal and the 30 minute ratings are 135% of normal.

TABLE 1: Conductor Thermal Ratings

<table>
<thead>
<tr>
<th>SIZE</th>
<th>AMPS (Normal/Emergency)</th>
<th>SIZE</th>
<th>AMPS (Normal/Emergency)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/0 – 105.7 ACSR</td>
<td>239/311</td>
<td>#2 – 3 Strand</td>
<td>235/306</td>
</tr>
<tr>
<td>2/0 – 133.0 ACSR</td>
<td>274/356</td>
<td>#2 – 7 Strand</td>
<td>228/296</td>
</tr>
<tr>
<td>3/0 – 167.7 ACSR</td>
<td>314/408</td>
<td>4/0 – 211.6 MCM</td>
<td>476/619</td>
</tr>
<tr>
<td>4/0 – 211.6 ACSR</td>
<td>361/469</td>
<td>350 MCM</td>
<td>653/849</td>
</tr>
<tr>
<td>266.8 ACSR</td>
<td>451/586</td>
<td></td>
<td></td>
</tr>
<tr>
<td>336.4 ACSR</td>
<td>522/679</td>
<td></td>
<td></td>
</tr>
<tr>
<td>397.5 ACSR</td>
<td>580/754</td>
<td></td>
<td></td>
</tr>
<tr>
<td>477 AAC</td>
<td>631/820</td>
<td></td>
<td></td>
</tr>
<tr>
<td>477.0 ACSR</td>
<td>652/848</td>
<td></td>
<td></td>
</tr>
<tr>
<td>556.0 ACSR</td>
<td>718/933</td>
<td></td>
<td></td>
</tr>
<tr>
<td>636.0 ACSR</td>
<td>781/1015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>795.0 AAC</td>
<td>870/1218/1175/1131</td>
<td></td>
<td></td>
</tr>
<tr>
<td>795.0 ACSR</td>
<td>899/1259/1214/1169</td>
<td></td>
<td></td>
</tr>
<tr>
<td>954.0 AAC</td>
<td>974/1364/1315/1266</td>
<td></td>
<td></td>
</tr>
<tr>
<td>954.0 ACSR</td>
<td>989/1385/1335/1286</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 – 954 ACSR</td>
<td>1978/2769/2670/2571</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1033.5 ACSR</td>
<td>1040/1456/1404/1352</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1192.5 ACSR</td>
<td>1135/1589/1532/1476</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1272.0 AAC</td>
<td>1164/1630/1571/1513</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1272.0 ACSR</td>
<td>1182/1655/1596/1537</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1351.5 ACSR</td>
<td>1228/1719/1658/1596</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1590.0 ACSR</td>
<td>1359/1903/1835/1767</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2167.0 ACSR</td>
<td>1624/2274/2192/2111</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The parameters upon which the conductor ratings are based are found in Table 2 below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Continuous Rating</th>
<th>Emergency Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind Direction</td>
<td>70° to Line</td>
<td>70° to Line</td>
</tr>
<tr>
<td>Emissivity</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Absorptivity</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>Date</td>
<td>July 1</td>
<td>July 1</td>
</tr>
<tr>
<td>Time</td>
<td>4 PM</td>
<td>4 PM</td>
</tr>
<tr>
<td>Latitude and Longitude</td>
<td>32.5° North</td>
<td>32.5° North</td>
</tr>
<tr>
<td>Elevation</td>
<td>2500 Ft</td>
<td>2500 Ft</td>
</tr>
<tr>
<td>Solar Input</td>
<td>Clear</td>
<td>Clear</td>
</tr>
<tr>
<td>Allowable Cond. Temp (ACSR)</td>
<td>75°C</td>
<td>100°C or sag limit</td>
</tr>
<tr>
<td>Wind Speed</td>
<td>4 ft/s</td>
<td>4 ft/s</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>40°C</td>
<td>40°C</td>
</tr>
</tbody>
</table>

The following items are pertinent with regard to the current conductor rating method:

a. The thermal ratings from Table 1, used by AEPCO to rate its transmission lines, are considered to be conservative. The emergency ratings are set at 130% of the normal rating based on ratings developed for each transmission line according to IEEE Standard 738. If through internal studies it is determined that a line will become stability limited, (at a value lower than the thermal limit) its rating will be based on its particular stability limit.

b. The weather parameters for development of the existing conductor thermal ratings are based on the values for wind direction, absorptivity, and wind speed as noted in Table 2 above. The conductor ratings are based on a 75°C operating temperature with a 4 ft. per second wind speed and a 40°C air temperature. Emergency ratings, as shown in Appendix A, are based on a 100°C operating temperature with a 4 ft. per second wind speed and a 40°C air temperature. AEPCO can exceed its normal ratings for up to 30 minutes. Where a transmission line, or line section, is constructed or upgraded with more than one size conductor, the overall line rating is determined by the rating of the most limiting sized conductor. If other equipment (switches, series capacitors, etc) in series with the transmission conductor is more limiting, the lowest limitation defines the transmission line rating.

c. Rigid Bus and Strain Bus design are determined by the Rural Utilities Service (RUS) Design Guide for Rural Substations Bulletin 1724E-300 (Bulletin) and NESC as a minimum. The design involves many factors, which are spelled out in the Bulletin. For new 115 kV substations, AEPCO uses a standard schedule 40 aluminum pipe conductor size of 3” and for new 230 kV substations, AEPCO uses an aluminum pipe conductor size of 4”.
There is currently no case on the AEPCO system where the rigid bus or strain bus is a limiting factor for any of AEPCO’s transmission line ratings. The ratings of the aluminum rigid bus or pipe conductor are based on IEEE Standard 605-1998 “IEEE Guide for Design of Substation Rigid-Bus Structures, using an emissivity of 0.5, with Sun, at a 40°C temperature rise above 40°C ambient for normal operating conditions, and a 60°C temperature rise above 40°C ambient for emergency operating conditions.

3.2.1 Transmission Line Ratings

Appendix A contains a summary table for the transmission line ratings followed by tables that show the individual rating of components that make up each transmission line. Currently, there are not operating limitations in effect as of the date of this revision. Any such limitations will be posted on the AEPCO OASIS. Specific items that are marked “N/A” mean that the facility in question is a legacy facility for which no specific data exists or the facility belongs to another entity that has not provided the requested information. The summary table allows for the finding of the most limiting factor of a transmission line, as well as the next most limiting factor.

AEPCO ensures that its transmission line ratings are aligned with current design tolerances based on the National Electric Safety Code (NESC) and likewise ensures that actual field conditions do not create conditions that will cause the facilities to be non-compliant with the NESC clearance requirements.

Based on historical, conservative design practices, AEPCO has incorporated additional design margin to compensate for minor variations between design conditions and actual field conditions. In addition, AEPCO verifies its “as-built” conditions by scheduled field visits. Each line segment part of the BES is monitored on an annual basis. AEPCO’s current maintenance practices include an annual inspection on concrete and steel structures and a semi-annual inspection on wood structures. Inspections are performed by a journeyman hot stick lineman inspector who has been trained and provided the information to identify problems of a structural nature as well as phase to ground clearance issues. The inspector will note changes in field conditions such as new structures, tree growth, etc. In addition, the inspector has been trained in the use of measuring devices to determine pole integrity and phase to ground clearances. The inspection is a visual inspection designed to monitor the integrity, reliability, and compliance with NESC standards checking minimum conductor sag distances at key points throughout the system. Findings are documented, reported, and addressed as issues arise. In addition to on-ground line inspections, AEPCO also performs regular aerial bucket or climbing inspections in high risk areas outlined in AEPCO’s Transmission Vegetation Management Plan (TVMP).
3.3 **Transformers**

AEPCO owns the following types of power transformers:

a. Load serving transformers with LTC
   - Conventional
   - Auto
b. Tie Autotransformers

The Normal and Emergency Ratings for terminal equipment are determined as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Normal Rating</th>
<th>Emergency Rating ½ Hour Maximum Overload</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEPCO Transformers</td>
<td>100% Manufacturer’s highest Nameplate Rating @ 55°C or 65°C rise</td>
<td>125% of Manufacturer’s Nameplate Rating @ 55°C or 65°C rise</td>
</tr>
</tbody>
</table>

During All Lines In Service (ALIS) operation the loading of the transformer should not exceed the normal rating. During system contingencies the loading of the transformer should not exceed its Emergency Rating, which is set at 125% of the normal rating based on ratings developed for each transformer according to IEEE Std. C57.91-1995 “Guide for Loading Mineral-Oil-Immersed Transformers.” AEPCO can exceed its normal ratings for up to 30 minutes. In addition, AEPCO follows the recommendations of PRC-023 which limits the ability of automatic protection equipment to de-energize transformers. This allows time to permit operator intervention and helps avoid potential system cascading. Under special circumstances, AEPCO may wish to evaluate other sources in regard to manufacturer’s specifications, such as the latest applicable versions of IEEE Standard C57.15.12.00-2010 “IEEE Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers,” and IEEE Std. C57.119-2001 “IEEE Recommended Practice for Performing Temperature Rise Tests on Oil-Immersed Power Transformers at Loads Beyond Nameplate Ratings.” Appendix B contains a summary table of AEPCO transformer data including the ratings as discussed in this Section.

Some transformers on the AEPCO system are owned by other entities or co-owned by AEPCO and other entities. Appendix B lists these specific transformers and notes the operating agent responsible for the transformer ratings.

3.4 **Relay Protective Devices**

None of AEPCO BES facilities have ratings that are limited by protection or monitoring devices. AEPCO’s relays will not trip (trip on Zone 3) due to normal or emergency load current (See PRC-023-1 Transmission Relay Loadability). New facilities and protection schemes are reviewed by AEPCO to ensure that loadability requirements are met.
3.5 **Terminal Equipment (switches, breakers, etc)**

Power Circuit Breakers will be rated according to the manufacturer’s nameplate ampacity at the nominal applied voltage. Normal and Emergency Ratings will be identical. This is in accordance with IEEE C37.010-1999 (R2005) “IEEE Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis,” and IEEE C37.06 “IEEE Standard for Switchgear – AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis – Preferred Ratings and Related Required Capabilities.”

Power Circuit Switchers will be rated according to the manufacturer’s nameplate ampacity at the nominal applied voltage. Normal and Emergency Ratings will be identical.

Air Disconnect Switches will be rated according to the manufacturer’s nameplate ampacity at the nominal applied voltage. Normal and Emergency Ratings will be identical. This is in accordance with IEEE C37.30 “IEEE Standard Requirements for High-Voltage Switches” and IEEE C37.37a-1996 “IEEE Standard Loading Guide for AC High-Voltage Air Switches Under Emergency Conditions.”

Current Transformers as installed on the AEPCO system are primarily Bushing Current Transformers that are supplied with power transformers and circuit breakers. These will be rated according to the corresponding unit’s nameplate in accordance with IEEE C57.13-2008 “IEEE Standard Requirements for Instrument Transformers.” A thermal rating factor will be applied to the normal and emergency ratings as provided by the manufacturer or developed based on industry practice. Normal and Emergency Ratings will be identical. Under certain circumstances, AEPCO may wish to evaluate other sources in regard to manufacturer’s specifications, such as increasing a thermal rating factor for a legacy bushing current transformer.

For example, AEPCO uses a Westinghouse “Memorandum on Thermal Current Characteristics of Current Transformers used with Power Circuit Breakers and Power Transformers,” dated June 26, 1969, to develop ratings for legacy bushing current transformers at the Pantano and Marana Substations.

There are very few free-standing current transformers on the AEPCO system, but there are also rated according to the corresponding unit’s nameplate in accordance with IEEE C57.13-2008.

The Normal and Emergency Ratings for terminal equipment are determined as follows:
### Equipment Normal Rating | Emergency Rating
---|---
Power Circuit breakers | 100% of Manufacturer’s Nameplate Rating | 100% of Manufacturer’s Nameplate Rating
Power Circuit switchers | 100% of Manufacturer’s Nameplate Rating | 100% of Manufacturer’s Nameplate Rating
Air Disconnect switches | 100% of Manufacturer’s Nameplate Rating | 100% of Manufacturer’s Nameplate Rating
Current transformers | 100% of Manufacturer’s Nameplate Rating | 100% of Manufacturer’s Nameplate Rating

Additional applicable IEEE standards will be consulted as deemed necessary regarding the rating of its terminal equipment. Appendix C “AEPCO Power Circuit Breaker & Circuit Switcher Ratings,” and Appendix D “Substation Switch Ratings,” contains the summary table for AEPCO terminal equipment ratings.

### 3.6 Compensation Devices

#### a. Shunt Compensations
Shunt capacitors will be rated according to the manufacturer’s nameplate ampacity and in accordance with IEEE 18-2012 “IEEE Standard for Shunt Power Capacitors.” Appendix E “Shunt Capacitor Ratings” contains a summary table for AEPCO shunt capacitor ratings. The normal and emergency ratings for shunt compensation devices will be identical as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Normal Rating</th>
<th>Emergency Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shunt Capacitors</td>
<td>100% of Manufacturer’s Nameplate Rating</td>
<td>100% of Manufacturer’s Nameplate Rating</td>
</tr>
</tbody>
</table>

#### b. Series Compensation
AEPCO has no series compensation devices on its system.

### 4.0 Internal Planning Criteria for Facility Ratings

The factors used to determine equipment ratings were outlined above. They represent criteria that is accepted within the utility industry, NERC, WECC, and the Federal Energy Regulatory Commission (FERC).

The following is AEPCO’s internal transmission reliability planning criteria as published in its FERC FORM #715 filing:

1) Nominal Operating Limit
   - Transmission lines should not be loaded greater than 100% of the thermal rating of the conductors.
   - Transformers, circuit breakers, current transformers, and other equipment should not be loaded above their continuous nameplate rating.
Transmission system voltages should not fall below 0.95 per unit (p.u.) of nominal rating nor rise above 1.05 p.u. of nominal rating.

For long range planning system studies, an appropriate power factor for the planning period will be used.

For operating system studies, an appropriate power factor for the operating planning period will be used.

2) Emergency Operating Limit

- Transmission lines should not be loaded greater than the specified emergency rating of the conductors. (See Appendix A)
- Transformers should not be loaded greater than the specified emergency rating of the transformers. (See Appendix B)
- Circuit breakers, current transformers, and other equipment should not be loaded above their continuous nameplate rating, except as permitted under applicable standards. (See Appendices C, D, and E)
- Transmission system voltages should not fall below 0.90 p.u. of nominal rating nor rise above 1.10 p.u. of nominal rating.
- For long range planning system studies, an appropriate power factor for the planning period will be used.
- For operating system studies, an appropriate power factor for the operating planning period will be used.

5.0 Establishment and Communication of Facility Ratings

AEPCO establishes the facility ratings for its BES in accordance with the facility rating methodologies described above. AEPCO submits its most up-to-date ratings as part of the WECC base case preparation process on a periodic basis as required by WECC. Appendix E “GE PSLF Powerflow Model” contains a table for typical AEPCO power flow modeling data.

AEPCO shall communicate its Facility Ratings Methodology for its solely and jointly owned Facilities that are existing Facilities, new Facilities, modifications to existing Facilities and re-ratings of existing Facilities to Peak RC, its Reliability Coordinator, its Planning Coordinator, and to other Transmission Owners, Operators, or Planners within 21 calendar days of a receipt of a request. If any of the aforementioned entities provides documented comments on its technical review of the AEPCO Facility Ratings Methodology, AEPCO shall provide a response to the commenting entity within 45 calendar days of a receipt of those comments, indicating whether a change will be made to the Facility Ratings Methodology and, if no change will be made, the reason why.

Within 30 calendar days (or a later date if specified by a requestor) for any requested Facility with a Thermal Rating that limits the use of Facilities under a requestor’s authority by causing any of the following: 1) An Interconnection Reliability Operating Limit, 2) A limitation of Total Transfer Capability, 3) An impediment to generator deliverability, or 4) An impediment to service to a major load center, AEPCO shall identify the existing next
most limiting equipment of the Facility and the Thermal Rating for that most limiting equipment.

When AEPCO has determined that updated ratings are applicable, it will communicate those ratings as part of the WECC base case preparation process, by email or by telephone, as appropriate. AEPCO shall keep all superseded portions of its Facility Ratings Methodology for 12 months beyond the date of the change in that methodology and shall keep all documented comments on the Facility Ratings Methodology and associated responses for three calendar years, in accordance with NERC Standard FAC-008-3.

The following table of AEPCO Transmission Line Ratings is found in Appendix A of AEPCO’s Facility Ratings Methodology:
## AEPCO Transmission Line Rating Limits

<table>
<thead>
<tr>
<th>Station A From</th>
<th>Station B To</th>
<th>Voltage KV</th>
<th>Normal Limit</th>
<th>Emergency Limit</th>
<th>Normal Limit</th>
<th>Emergency Limit</th>
<th>Limiting Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>HASSAYAMPA</td>
<td>PINAL WEST</td>
<td>500</td>
<td>3000</td>
<td>3000</td>
<td>2598</td>
<td>2598</td>
<td>Breaker Out for Maintenance</td>
</tr>
<tr>
<td>PINAL WEST</td>
<td>HASSAYAMPA</td>
<td>500</td>
<td>3000</td>
<td>3000</td>
<td>2598</td>
<td>2598</td>
<td>Conductor</td>
</tr>
<tr>
<td>GREEN-SW</td>
<td>GREENLEE</td>
<td>345</td>
<td>1978</td>
<td>2571</td>
<td>1182</td>
<td>1537</td>
<td>Conductor</td>
</tr>
<tr>
<td>GREENLEE</td>
<td>GREEN-SW</td>
<td>345</td>
<td>1978</td>
<td>2571</td>
<td>1182</td>
<td>1537</td>
<td>Conductor</td>
</tr>
<tr>
<td>BICKNELL</td>
<td>VAIL</td>
<td>345</td>
<td>1600</td>
<td>1600</td>
<td>956</td>
<td>956</td>
<td>Station Motor-Operated Switch</td>
</tr>
<tr>
<td>VAIL</td>
<td>BICKNELL</td>
<td>345</td>
<td>1600</td>
<td>1600</td>
<td>956</td>
<td>956</td>
<td>Equipment</td>
</tr>
<tr>
<td>PINAL WEST</td>
<td>VAIL</td>
<td>345</td>
<td>1548</td>
<td>1858</td>
<td>925</td>
<td>1110</td>
<td>Station Terminal</td>
</tr>
<tr>
<td>VAIL</td>
<td>PINAL WEST</td>
<td>345</td>
<td>1548</td>
<td>1858</td>
<td>925</td>
<td>1110</td>
<td>Equipment</td>
</tr>
<tr>
<td>PINAL WEST</td>
<td>WESTWING</td>
<td>345</td>
<td>1548</td>
<td>1858</td>
<td>925</td>
<td>1110</td>
<td>Station Terminal</td>
</tr>
<tr>
<td>WESTWING</td>
<td>PINAL WEST</td>
<td>345</td>
<td>1548</td>
<td>1858</td>
<td>925</td>
<td>1110</td>
<td>Equipment</td>
</tr>
<tr>
<td>DOSCONDO</td>
<td>HACKBERRY</td>
<td>230</td>
<td>1164</td>
<td>1513</td>
<td>464</td>
<td>603</td>
<td>Conductor</td>
</tr>
<tr>
<td>HACKBERRY</td>
<td>DOSCONDO</td>
<td>230</td>
<td>1164</td>
<td>1513</td>
<td>464</td>
<td>603</td>
<td>Conductor</td>
</tr>
<tr>
<td>MORENCI</td>
<td>HACKBERRY</td>
<td>230</td>
<td>1164</td>
<td>1513</td>
<td>464</td>
<td>603</td>
<td>Conductor</td>
</tr>
<tr>
<td>HACKBERRY</td>
<td>MORENCI</td>
<td>230</td>
<td>1164</td>
<td>1513</td>
<td>464</td>
<td>603</td>
<td>Conductor</td>
</tr>
<tr>
<td>GREEN-SW</td>
<td>GREENLEE</td>
<td>230</td>
<td>1182</td>
<td>1537</td>
<td>471</td>
<td>612</td>
<td>Conductor</td>
</tr>
<tr>
<td>GREENLEE</td>
<td>GREEN-SW</td>
<td>230</td>
<td>1182</td>
<td>1537</td>
<td>471</td>
<td>612</td>
<td>Conductor</td>
</tr>
<tr>
<td>MORENCI</td>
<td>PD-MORNCI</td>
<td>230</td>
<td>989</td>
<td>1286</td>
<td>394</td>
<td>512</td>
<td>Conductor</td>
</tr>
<tr>
<td>PD-MORNCI</td>
<td>MORENCI</td>
<td>230</td>
<td>989</td>
<td>1286</td>
<td>394</td>
<td>512</td>
<td>Conductor</td>
</tr>
<tr>
<td>APACHE</td>
<td>BUTERFLD</td>
<td>230</td>
<td>899</td>
<td>1169</td>
<td>358</td>
<td>466</td>
<td>Conductor</td>
</tr>
<tr>
<td>BUTERFLD</td>
<td>APACHE</td>
<td>230</td>
<td>899</td>
<td>1169</td>
<td>358</td>
<td>466</td>
<td>Conductor</td>
</tr>
<tr>
<td>APACHE</td>
<td>RED TAIL</td>
<td>230</td>
<td>1182</td>
<td>1537</td>
<td>471</td>
<td>612</td>
<td>Conductor</td>
</tr>
<tr>
<td>RED TAIL</td>
<td>APACHE</td>
<td>230</td>
<td>1182</td>
<td>1537</td>
<td>471</td>
<td>612</td>
<td>Conductor</td>
</tr>
<tr>
<td>APACHE</td>
<td>WINCHESTER</td>
<td>230</td>
<td>1182</td>
<td>1537</td>
<td>471</td>
<td>612</td>
<td>Conductor</td>
</tr>
<tr>
<td>WINCHESTER</td>
<td>APACHE</td>
<td>230</td>
<td>1182</td>
<td>1537</td>
<td>471</td>
<td>612</td>
<td>Conductor</td>
</tr>
<tr>
<td>BUTERFLD</td>
<td>PANTANO</td>
<td>230</td>
<td>899</td>
<td>1169</td>
<td>358</td>
<td>466</td>
<td>Conductor</td>
</tr>
<tr>
<td>PANTANO</td>
<td>BUTERFLD</td>
<td>230</td>
<td>899</td>
<td>1169</td>
<td>358</td>
<td>466</td>
<td>Conductor</td>
</tr>
<tr>
<td>BUTERFLD</td>
<td>SAN RAFL</td>
<td>230</td>
<td>989</td>
<td>1286</td>
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Notes:

1) SRP is the operating agent for the Hassayampa to Pinal West 500 kV line and has determined its line ratings. SWTC owns 7.305% of this line.
2) TEP is the operating agent for Pinal West to Vail and Pinal West to Westwing 345 kV lines and have determined their line ratings. SWTC owns 24% of these lines.
3) Dos Condados to Hackberry and Hackberry to Morenci 230 kV Lines limited by 1272 AAC conductor.
4) Davis to Riviera 230 kV Line limited by 1272 ASCR conductor Normal Conditions and limited by 1200A disconnect switch Emergency Conditions.
5) Apache to Hayden 115 kV Line limited by 477 AAC conductor at Apache (SWTC Rating) and Hayden (SRP Rating).
6) Marana to Avra and Avra to Sandario 115 kV line limited by 396 AAC conductor at Avra.

[Link](http://argb/sites/azgt/powerpln/Managed/Documents/TransmissionPlanning/ACCTenYearPlanFittings2017/ACC10YRPlan2017-2026.docx)