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**Southwest  
Transmission**  
COOPERATIVE, INC

**TEN-YEAR PLAN**

**2011 – 2020**

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**JANUARY 28, 2011**

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**TEN-YEAR PLAN**

**2011 – 2020**

Prepared for the

**ARIZONA CORPORATION COMMISSION**

**Docket No. E-00000D-11-0017**

**TRANSMISSION PLANNING**

**JANUARY 28, 2011**

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# **SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

## **TEN-YEAR PLAN**

### GENERAL INFORMATION

This Ten-Year Plan is submitted to the Arizona Corporation Commission (“Commission”) to satisfy the requirements of section 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 Southwest Transmission Cooperative, Inc. (“SWTC”) to install electric facilities required to meet anticipated system load growth of its Distribution Cooperative Members (“Members”) and other network and point to point customers.

This report contains transmission projects that SWTC anticipates may be constructed over the next ten-year period. As noted in A.R.S. section 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 SWTC. SWTC anticipates that any changes to this plan will likely be due to changes in load forecasts, environmental constraints, economic considerations and/or regulatory and legal developments. All projects are subject to a peer-review by SWTC’s Class A Operating Committee (“CAOC”) prior to submittal to the SWTC Board for approval. Meetings of the CAOC are held quarterly and changes to these projects are reviewed as necessary to meet the Member needs. This process concludes with the preparation of a Construction Work Plan (“CWP”) that is then submitted to the SWTC Board for approval. Once the CWP is approved, the projects are considered by SWTC as “planned” projects that have a high likelihood of being constructed. Projects that have been studied for this ten-year plan horizon that have not been approved and placed into a CWP for approval by the SWTC Board are considered as “conceptual,” meaning that they are still undergoing review by the CAOC and do not yet have a high likelihood for being constructed. Changes of any significance that occur prior to the next Ten-Year Plan filing will be discussed with the Commission Staff.

This specific report is divided into two sections, as outlined in the Table of Contents on page 1. Section I describes planned and conceptual transmission lines SWTC may construct over the ten-

year plan period, whose nominal rating is equal to or greater than one hundred fifteen thousand volts ("115 kV"). (Included in this section are a few line loop-in projects for load-serving substations for SWTC Members that are planned for service off of the SWTC transmission system. Some of these potential line loop-in projects will not require line siting, but have been listed in case the preferred substation location changes during the land acquisition process, necessitating transmission line extensions to provide service.) Section II contains SWTC's internal planning criteria and facility ratings, pursuant to Commission Decision #63876, dated July 25, 2001.

In the past, SWTC has included a Section III to this report, which is a technical study report of the planned transmission projects contained in Section I, to satisfy the requirements of paragraph C.7 of A.R.S. Section 40-360.02. With this filing, SWTC has prepared the Technical Study Report as a stand-alone document.

The planned and conceptual transmission lines that are listed in Section I are needed to maintain system reliability and to serve load of SWTC Members and other customers. Due to the proximity of the new lines to the Member load being served, studies conducted show little impact to the overall interconnected system.

### REGIONAL PLANNING

SWTC participates in Regional Planning efforts through its involvement in the Southwest Area Transmission ("SWAT") Planning Group. SWTC is involved in the following subcommittees of SWAT, either through active participation or copy interest:

- Arizona-New Mexico Regional Transmission Subcommittee ("AZNM")
- Central Arizona Transmission Subcommittee ("CATS")
- Colorado River Transmission Subcommittee ("CRT")
- Renewable Transmission Task Force ("RTTF")
- Southeast Arizona Transmission Study ("SATS")
- Short-circuit Working Group ("SCWG")

In addition, SWTC continues to monitor the efforts of the Transmission Expansion Planning Policy Committee (“TEPPC”) of the Western Electricity Coordination Council (“WECC”) and is active within the following subcommittees of WECC: the Operating Committee (“OC”), the Planning Coordination Committee (“PCC”) and the Technical Studies Subcommittee (“TSS”).

SWTC is also an active participant in WestConnect and was one of the original twelve signatories to the WestConnect Project Agreement for Subregional Transmission Planning (“STP Agreement”). A Planning Management Committee (“PMC”), made up of one representative from each of the signatories to the STP Agreement, is tasked with implementation of the subregional planning process. SWTC participates regularly in the PMC meetings or conference calls.

At the WestConnect Annual Planning Workshop, held November 17, 2010, SWTC presented its 2011-2020 Ten-Year Transmission Plan for inclusion into the 2010 WestConnect Transmission Plan. The WestConnect plan is scheduled for approval at the February 17, 2011 WestConnect Annual Planning Meeting. The projects that are included in this ten year plan filing to the Commission are similar to those presented at the WestConnect Annual Planning Workshop with the exception of the Apache to Bicknell 230 kV line upgrade projects that have been deleted as explained in the section “Changes from 2010 Ten-Year Plan Filing.” All of the conceptual projects are subject to change, pending further discussions with the SWTC Members, through ongoing meetings of the CAOC. Notations to this effect are included in the write-up of each of the transmission line project summaries in Section 1.

#### 2010 6<sup>th</sup> BTA REQUIREMENTS

In December 2010, the ACC approved the Sixth Biennial Transmission Assessment (“BTA”) report with Decision #72031 that adopted staff’s recommendations and proposed orders, along with two new requirements. The specific orders that apply directly to SWTC are noted here, along with those that apply to all jurisdictional utilities:

- 1) SWTC, APS, Tucson Electric Power Company (“TEP”) and Sulphur Springs Valley Electric Cooperative (“SSVEC”) shall jointly complete additional actions and file specified information related to the Cochise County Study Group plan of service with the Commission as follows:
  - a. By June 30, 2011, identify the components of the plan in a facilities report that provide the most benefit to customer reliability and can be implemented in the shortest timeframe, and file a progress report with the Commission that includes planning in-service dates for all relevant elements of the plan reflecting these priorities.
  - b. By September 30, 2011, submit a progress report including in-service dates for the components of the plan of service identified in the June 30, 2011, facility study. This schedule shall reflect the most recent load forecast.
  - c. By December 31, 2011, substantially complete contractual negotiations with affected parties over cost responsibility, wheeling arrangements, Engineering, Procurement and Construction (“EPC”), operations and maintenance, etc. (described as pending items in the CCSG 2009 report), and file a draft memorandum of understanding among affected parties addressing these items with the Commission.
- 2) The jurisdictional utilities shall report relevant findings in future BTAs regarding compliance with transmission planning standards (e.g., TPL-001 through TPL-004) from NERC/WECC reliability audits that have been finalized and filed with FERC.
- 3) SWTC shall determine if an engineering “re-rating” of the Apache-Butterfield 230 kV line as proposed in the Sixth BTA filings would be an acceptable measure until the line is upgraded in 2016, and to file the results of this assessment by January 31, 2011.
- 4) APS, SWTC, and TEP shall conduct additional analysis of potential 230 kV and 138 kV voltage deviations in Southeastern Arizona as noted in the 2009 SATS report and file an update based on the 2010 SATS [Report] by February 20, 2011, and shall finalize

mitigation plans if needed for this voltage concern in ten-year plan filing(s) for the 7<sup>th</sup> BTA by January 31, 2012.

- 5) Jurisdictional utilities shall include planned transmission conductor projects, transformer capacity upgrade projects and reactive power compensation facility additions at 115 kV and above in future BTA ten-year plan filings.
- 6) Jurisdictional utilities shall jointly conduct or procure a study, as well as conduct a stakeholder workshop process in conjunction with the study, which identifies the barriers to solutions for enhancing Arizona's ability to export renewable energy, including identifying specific transmission corridors that should be built out in order to accomplish this objective. The study and results of the workshop shall be filed at the Commission no later than November 1, 2011 and shall be included as part of the 2012 BTA.
- 7) Jurisdictional utilities shall include the effects of distributed renewable generation and energy efficiency programs on future transmission needs in future ten-year plan filings, beginning in January 2011, and a discussion of these effects will take place in future BTAs.

The following represent SWTC's responses to these requirements:

**Requirement #1:**

SWTC is committed to working with APS, TEP, and SSVEC to complete the actions of this requirement and assist in whatever is needed to file the specified information related to the Cochise County Study Group plan of service.

**Requirement #2:**

SWTC will report relevant findings from NERC/WECC audits after they have been finalized and filed with FERC.

**Requirement #3:**

With this filing, SWTC submits to the Commission, an engineering “re-rate” study of the Apache to Butterfield 230 kV line.

This engineering study report represents a significant effort in 2010, on the part of SWTC, to determine increases for its transmission back-bone system line-ratings that are currently very conservative. Detailed studies using weather analysis and LiDAR flown topographies that have gone into the study to re-rate the transmission lines, and specifically the re-rate of the Apache to Butterfield 230 kV line, comport with established NESC and NERC Standards criteria. The study should also allay concerns that have been expressed in previous BTA’s of issues associated with the overload of the Apache to Butterfield 230 kV line from EHV outages that potentially could occur. The mitigation measures to alleviate any overload of the Apache to Butterfield 230 kV line prior to implementation of an engineering re-rate or an upgrade of the line are to implement generation re-dispatch. Additional information regarding these mitigation efforts can also be found in the 2010 SATS Study Report.

**Requirement #4:**

The Technical Study Report filed with this 2011-2020 ten year plan addresses in part this requirement, along with the 2010 SATS Report. Any future mitigation measures needed on the SWTC system to alleviate the delta-voltage violations, beyond what is noted in the Technical Study Report filed with this ten-year plan, will be provided in the ten-year plan filing for the 7<sup>th</sup> BTA.

**Requirement #5:**

SWTC has provided, in previous ten-year plan filings, and in this ten-year plan filing, planned transmission reconductor projects and transformer capacity upgrade projects as noted in this requirement.

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

<u>Year</u>	<u>Substation</u>	<u>MVAR Quantity</u>
2013	Avra Valley	18.9
2013	Hackberry	17.2
2013	New Tucson	21.6
2020	Redtail	9.45
2020	San Rafael	19.2

Additional studies conducted during 2011 that tend to refine these values and/or suggest additional locations for reactive support to the SWTC system, will be reported in the next ten-year plan filing.

SWTC is involved with SRP and other project participants that are evaluating the need and timing of phase shifting transformers (“PSTs”) for the Southeast Valley and Desert Basin-Pinal Central projects. At this time there are no definitive plans for the PSTs to provide more specific information in this ten-year plan filing.

**Requirement #6:**

SWTC intends to participate in the study and workshops to identify solutions for enhancing Arizona’s ability to export renewable energy.

**Requirement #7:**

SWTC is a wholesale transmission only cooperative and therefore, does not develop energy efficiency or distributed renewable generation programs. These programs are put in place by SWTC’s Members. In addition, each Member files with the ACC an individual Renewable Energy Standard and Tariff which include plans for such programs. The effect of each respective plan is included in SWTC’s annual Member approved load forecast. Transmission projects developed in response to load forecasts are net of any energy efficiency or distributed renewable generation programs.

## 2010 SATS STUDY REPORT

Each year, SATS updates its current Study Report which is a culmination of study efforts throughout the year to actively evaluate strategies to increase local load serving capability and evaluate impacts of potential EHV transmission to bring in remote resources into the area to serve the growing loads of Southeast Arizona. Study participants continue to acknowledge the importance of renewable resources in the resource study mix.

The 2010 Study Report was developed using selected power flow base cases for the years 2011 through 2015 and 2020. The cases were developed from the WECC approved heavy summer cases; however, not every year is available or current from WECC. The 2011-2014 cases were developed from the 2013 heavy summer case that was developed for the Cochise County study effort which was initially developed from the WECC 2012 heavy summer (12HS2S) case. The 2020 case was developed from the WECC 2019 heavy summer (19HS1A) case, the WestConnect data for areas 10-14, and the SWAT 2020HS seed case.

The final draft of 2010 SATS Study Report is to be reviewed and approved by SATS participants in February, either by conference call or a sit-down meeting. It will be posted on the WestConnect website ([www.westconnect.com](http://www.westconnect.com)) for all interested stakeholders within SWAT and WestConnect. It is anticipated that the final Report will be approved at the SWAT Oversight Committee Meeting on February 16, 2011. TEP is responsible for filing the 2010 SATS Report on behalf of SATS participants.

For easy reference, the Conclusion section of the Report will contain a listing of the proposed projects for the 2011 to 2020 time frame that document projects under consideration by SWTC and TEP for the near and long-term planning horizons. Hence, the SATS Study Report is an important part of the overall Regional Study Process within SWAT and WestConnect and forms the basis for the projects that are provided in this ten year plan filing.

The following is a brief description of the EHV projects that SWTC either is a participant in, or is evaluating interest in, through the Regional Planning Process, that are contemplated for

completion during this Ten-Year Plan Filing (“2011-2020”) timeframe:

**Pinal West to Pinal Central (Formerly Pinal West to Southeast Valley/Browning 500 kV Line)**

A CEC (“Case No. 126”) for this project was issued in August 2005, with an amendment to the CEC approved in November 2005, for construction of a 500 kV line from Pinal West to Browning, with the segment from Santa Rosa to the proposed Pinal Central Substation being proposed as a double-circuit 500/230 kV line, as is a segment of the Pinal Central to the Southeast Valley Substation line. SRP is the project manager for this project, which has an anticipated in-service date of 2014. While SWTC is no longer a participant in the 500 kV line segment from Pinal West to Pinal Central, it is, as noted earlier, evaluating the need and timing of and participation in PSTs at Pinal Central.

**Pinal Central to Tortolita 500 kV Line**

This project contemplates construction of a 500 kV line from the proposed Pinal Central Substation to the TEP Tortolita Substation. SWTC is a participant in Phase 1 of this project. TEP is the project manager for this project, which has an anticipated in-service date of 2014.

**Winchester to Vail Double-circuit 345 kV Line**

This conceptual project contemplates construction of a double-circuit 345 kV line from Winchester Substation to Vail Substation, following the route of the existing Winchester to Vail 345 kV line. SWTC had been evaluating possible participation in this project as an alternative to the rebuild of the Apache to Butterfield and Butterfield to Bicknell 230 kV lines, in 2016 and 2017, respectively. However, with the Engineering Rerating Study of the Apache to Butterfield 230 kV line recommending a re-rate of the Apache to Butterfield 230 kV line, SWTC is no longer considering this option at this time. TEP is the project manager for this project, which does not have an anticipated in-service date. It has not been included in the listing of Planned and Conceptual Transmission Lines of this ten-year plan report.

As a participant in SATS, SWTC will, from time to time, evaluate potential joint participation in EHV projects whose in-service dates have not yet been established and may potentially lie outside of this ten year planning horizon. If, through its involvement in the SATS 2011 Study Plan effort, an EHV project is brought forward that will meet SWTC and its Member's future needs, SWTC will report on it in the next Ten Year Plan filing.

### **CHANGES FROM 2010 TEN-YEAR PLAN FILING**

There are several changes to the projects considered by SWTC for inclusion in this Ten-Year Plan filing over last year's ("2010-2019") Ten-Year Plan filing. These are noted below. Some changes are due to minor changes to in-service dates in this filing, over last year's filing, which is a result of the economic downturn that SWTC and its Members are currently experiencing. Other projects have been deleted as they are no longer viable or their in-service dates are beyond this ten-year plan horizon. All conceptual projects in this filing are under review as a result of the economic downturn and, may again, change with next year's 10 year plan filing. The changes are noted below:

**CAP 115 kV Line Loop-in to San Joaquin.** Through SWTC's discussions with Trico Electric Cooperative, Inc., this project has been deleted.

**CAP 115 kV Line Loop-in to SWTC Sandario.** This project has been re-evaluated by SWTC and CAP and both parties have mutually agreed that it should be deferred indefinitely. As such, the project now lies outside of the 10-year planning horizon of this report and has therefore been deleted.

**Marana To Avra Valley 115 kV Line Upgrade.** The in-service date for this planned project has changed from 2011 to 2012.

**North Loop to Rattlesnake 115 kV Line.** This project has been re-evaluated by SWTC and CAP and both parties have mutually agreed that it should be deferred indefinitely. As such, the project now lies outside of the 10-year planning horizon of this report and has therefore been

deleted.

**Saguaro to North Loop 115 kV Line.** This project has been re-evaluated by SWTC and CAP and both parties have mutually agreed that it should be deferred indefinitely. As such, the project now lies outside of the 10-year planning horizon of this report and has therefore been deleted.

**Valencia to CAP Black Mountain 115 kV Line.** This project has been re-evaluated by SWTC and CAP and both parties have mutually agreed that it should be deferred indefinitely. As such, the project now lies outside of the 10-year planning horizon of this report and has therefore been deleted.

**Avra Valley to Sandario Tap 115 kV Line Upgrade.** The in-service date for this planned project has been changed from 2011 to 2012.

**San Rafael 2<sup>nd</sup> 230/69 kV Transformer.** The in-service date for this conceptual project has been changed from 2011 to “to be determined” (“TBD”). On-going study efforts of the Cochise County Study Group in 2011 may change this to occur within the current ten year plan timeframe.

**Sandario Tap to Three Points 115 kV Line Upgrade.** The in-service date for this conceptual project has changed from 2014 to 2015.

**Bicknell 345/230 kV Transformer Replacement.** The in-service date for this conceptual project has changed from 2012 to 2015.

**Greenlee 2<sup>nd</sup> 345/230 kV Transformer.** The in-service date for this conceptual project has changed from 2013 to 2015.

**Pinal Central 230/115 kV Transformer.** This project has been deleted. The Southwest Public Power Resources Group (“SPPR”) was the project sponsor and SWTC was a participant in the

project; however, SPPR has decided not to move forward with this project at this time and it has been deleted from this report.

**Pinal West to Pinal Central.** As noted earlier, due to the economic downturn, SWTC is no longer a participant in this 500 kV line project and it has been deleted from this report.

**Three Terminal Plan Circuit 1.** This project has undergone slight changes since last year's ten year plan filing. The Southwest Public Power Resources Group ("SPPR") is the project sponsor. However, SWTC is no longer a participant in the project, and it has been deleted from this report.

**Three Terminal Plan Circuit 2.** The in-service date for this project is still TBD. The Southwest Public Power Resources Group ("SPPR") is the project sponsor. However, SWTC is no longer a participant in the project, and it has been deleted from this report.

**Three Terminal Plan Circuit 3.** The in-service date for this project is still TBD. The Southwest Public Power Resources Group ("SPPR") is the project sponsor. However, SWTC is no longer a participant in the project, and it has been deleted from this report.

**Saguaro to Adonis 115 kV Line Loop-in to Naviska.** Through SWTC's discussions with Trico Electric Cooperative, Inc., this conceptual project has been deferred and is under study through the SATS-NW Study Group. As such, it has been deleted from this report. However, upon completion of the SATS-NW Study, SWTC anticipates a replacement for this project to be included in the 2012-2121 10-year plan filing.

**CAP 115 kV Line Loop-in to Picture Rocks.** Through SWTC's discussions with Trico Electric Cooperative, Inc., this conceptual project has been deleted from this report.

**CS2 Substation.** As this project now lies outside of the 10-year planning horizon of this report it has been deleted.

**Kartchner to CS2 230 kV Line.** As this project now lies outside of the 10-year planning horizon of this report it has been deleted.

**Pantano to Kartchner 115 kV Line Upgrade.** As this project now lies outside of the 10-year planning horizon of this report it has been deleted.

**San Rafael to CS2 230 kV Line.** As this project now lies outside of the 10-year planning horizon of this report it has been deleted.

**Apache to Butterfield 230 kV Line Upgrade.** As a result of the “Engineering Re-rate Study of the Apache to Butterfield 230 kV line,” which was filed with the Commission in conjunction with this ten-year plan filing, this project now lies outside of the 10-year planning horizon of this report and has been deleted.

**Butterfield to Bicknell 230 kV Line Upgrade.** As a result of the “Engineering Re-rate Study of the Apache to Butterfield 230 kV line,” which was filed with the Commission in conjunction with this ten-year plan filing, this project now lies outside of the 10-year planning horizon of this report and has been deleted.

**SECTION I**

**SWTC PLANNED AND CONCEPTUAL TRANSMISSION LINES**

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

**Line Designation:** Marana Tap to Marana 115 kV Line Upgrade

**Size:**

- a) Voltage 115 kV
- b) Capacity 219 MVA
- c) Point of Origin Marana Tap  
Sec. 26 T11S R10E
- d) Point of Termination Marana Substation  
Sec. 26 T11S R10E
- e) Length Approximately 0.2 miles

**Routing:** Western's Marana Tap, west to the SWTC Marana Substation.

**Purpose:** To provide system reliability, increased transfer capability and voltage support for the SWTC system and to provide for anticipated Member load growth.

**Dates:**

- a) Construction Start 2011
- b) In-Service Date 2011/2012

**Notes:** This is an approved, planned project and a certificate will be needed to site this project.

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

Line Designation: Pantano to Sahuarita 230 kV Line Loop-in to New Tucson

Size:

- a) Voltage 230 kV
- b) Capacity 50 MVA
- c) Point of Origin Pantano to Sahuarita 230 kV Line near the proposed New Tucson Substation Sec. 34 T16S R16E
- d) Point of Termination New Tucson Substation Sec. 34 T16S R16E
- e) Length 0 miles

Routing: Pantano to Sahuarita 230 kV line ROW, approximately 8.5 miles west of Pantano Substation.

Purpose: To provide an additional delivery point for Trico and provide for anticipated load growth in the area.

Dates:

- a) Construction Start 2011
- b) In-Service Date 2011

Notes: This is an approved, planned project. It is included in this plan in case the preferred substation location changes, necessitating the filing of a CEC application for a transmission extension to serve the substation.

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

Line Designation: Marana to Avra Valley 115 kV Line Upgrade

Size:

- a) Voltage 115 kV
- b) Capacity 219 MVA
- c) Point of Origin Marana Substation  
Sec. 26 T11S R10E
- d) Point of Termination Avra Valley Substation  
Sec. 11 T13S R10E
- e) Length Approximately 8.75 miles

Routing: Marana Substation, south to Avra Valley Substation, following the existing Marana to Avra Valley ROW.

Purpose: To provide system reliability, increased transfer capability and voltage support for the SWTC system and to provide for anticipated Member load growth.

Dates:

- a) Construction Start 2011
- b) In-Service Date 2012

Notes: This is an approved, planned project and a certificate will be needed to site this project.

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

Line Designation: Avra Valley to Sandario Tap 115 kV Line Upgrade

Size:

- a) Voltage 115 kV
- b) Capacity 219 MVA
- c) Point of Origin Avra Valley Substation  
Sec. 11 T13S R10E
- d) Point of Termination Sandario Tap  
Sec. 23 T13S R10E
- e) Length Approximately 2.8 miles

Routing: Avra Valley Substation, south to the Sandario Tap turning structure, following the existing Avra Valley to Sandario Tap ROW.

Purpose: To provide system reliability, increased transfer capability and voltage support for the SWTC system and to provide for anticipated Member load growth.

Dates:

- a) Construction Start 2012
- b) In-Service Date 2012

Notes: This is an approved, planned project and a certificate will be needed to site this project.

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

Line Designation: San Rafael 2<sup>nd</sup> 230/69 kV Transformer

Size:

- a) Voltage 230 kV
- b) Capacity TBD
- c) Point of Origin San Rafael Substation  
Sec. 17 T22S R21E
- d) Point of Termination San Rafael Substation  
Sec. 17 T22S R21E
- e) Length 0 miles

Routing: None

Purpose: Provide continuous reliable service to SSVEC under certain N-1 outage conditions in the Sierra Vista area. Note: This project is part of the ongoing Cochise County Study efforts.

Dates:

- a) Construction Start TBD
- b) In-Service Date TBD

Notes: On-going efforts of the Cochise County Study Group in 2011 may change this conceptual project to occur within the current ten year plan timeframe. No certificate is necessary for the project.

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

Line Designation: Apache/Hayden to San Manuel 115 kV line

Size:

- a) Voltage 115 kV
- b) Capacity 123 MVA
- c) Point of Origin Apache/Hayden 115 kV line near San Manuel  
Sec. 19 T9S R18E
- d) Point of Termination APS San Manuel Substation  
Sec. 29 T9S R17E
- e) Length Approximately 4.5 miles

Routing: Apache/Hayden 115 kV line, heading generally west then southwest to San Manuel Substation.

Purpose: To provide system reliability, increased transfer capability and voltage support for the SWTC system and to provide for anticipated Member load growth.

Dates:

- a) Construction Start 2013
- b) In-Service Date 2014

Notes: This project was approved by the ACC Line Siting Committee on May 12, 2009 and by the Commission (Case #142, Decision #71218) on July 9, 2009. However, due to the economic downturn, SWTC may defer this project.

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

Line Designation: Pinal Central to Tortolita 500 kV Line

Size:

- a) Voltage 500 kV
- b) Capacity 1732 MVA
- c) Point of Origin Pinal Central Substation  
Sec. 25 T6S R7E
- e) Point of Termination New Tortolita 500 kV Yard  
Sec. 23 T10S R10E
- f) Length Approximately 38.0 miles

Routing: From Pinal Central Substation to Tortolita Substation following the CAP facilities.

Purpose: Identified by TEP as necessary to increase TEP System Load Serving Capability from remove resources. The project would provide for increased transfer capability to SWTC loads in Southeast AZ.

Dates:

- a) Construction Start 2013
- b) In-Service Date 2014

Notes: SWTC is a participant in Phase I of the project; TEP is the project manager

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

Line Designation: Bicknell 345/230 kV Transformer Replacement

Size:

- a) Voltage 345 kV
- b) Capacity 420 MVA
- c) Point of Origin Bicknell Substation  
Sec. 30 T17S R13E
- d) Point of Termination Bicknell Substation  
Sec. 30 T17S R13E
- e) Length 0 miles

Routing: None

Purpose: Provide increased import capability into the SWTC transmission system.

Dates:

- a) Construction Start 2015
- b) In-Service Date 2015

Notes: The in-service date for this conceptual project has changed from 2012 to 2015 and is subject to change. No certificate is necessary for this project.

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

Line Designation: Greenlee 2<sup>nd</sup> 345/230 kV Transformer

Size:

- a) Voltage 345 kV
- b) Capacity 193 MVA
- c) Point of Origin SWTC Greenlee Substation  
Sec. 29 T5S R31E
- d) Point of Termination SWTC Greenlee Substation  
Sec. 29 T5S R31E
- e) Length 0 miles

Routing: None

Purpose: Provide increased import capability into the SWTC transmission system.

Dates:

- a) Construction Start 2015
- b) In-Service Date 2015

Notes: The in-service date for this conceptual project has changed from 2013 to 2015 and is subject to change. No certificate is necessary for this project.

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**10 YEAR PLAN**

**PLANNED TRANSMISSION FACILITIES**

Line Designation: Sandario Tap to Three Points 115 kV Line Upgrade

Size:

- a) Voltage 115 kV
- b) Capacity 219 MVA
- c) Point of Origin Sandario Tap  
Sec. 23 T13S R10E
- d) Point of Termination Three Points Substation  
Sec. 25 T15S R10E
- e) Length Approximately 13.71 miles

Routing: Sandario Tap turning structure, south to the existing Three Points Substation, following the existing Sandario Tap to Three Points ROW.

Purpose: To provide system reliability, increased transfer capability and voltage support for the SWTC system and to provide for anticipated Member load growth.

Dates:

- a) Construction Start 2014
- b) In-Service Date 2015

Notes: This is a conceptual project and a certificate will be needed to site this project. The in-service date for this project has changed from 2014 to 2015 and is subject to change.

**SECTION II**

**SOUTHWEST TRANSMISSION COOPERATIVE, INC.**

**INTERNAL PLANNING CRITERIA AND FACILITY RATINGS**

SWTC's current internal planning criteria and facility ratings have been documented in its "Facility Ratings Methodology and Establish and Communicate Facility Ratings (FAC-008-1 and FAC-009-1)," dated February 11, 2009, and revised November 15, 2010, to meet requirements of the North American Reliability Corporation ("NERC") Planning Standards. Portions of the document are reprinted below, which identify the assumptions and methodologies used by SWTC to determine electrical facility ratings and also describe the electrical load limits for SWTC 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 used by SWTC to rate its facilities. It is the method by which the Rating of SWTC major Bulk Electric System ("BES") equipment is determined.

- 1.1 The facilities addressed in this document include transmission conductors, transformers, relay protective devices, terminal equipment, and series and shunt compensation devices.
- 1.2 This methodology addresses Normal and Emergency ratings for the facilities that comprise SWTC's BES.
- 1.3 This Facility Ratings Methodology considers the ratings provided by equipment manufacturers, IEEE and ANSI standards, ambient conditions for solar input, temperature and wind speed, design criteria, operating limitations, and other assumptions, as applicable.
- 1.4 The ratings for all of SWTC BES facilities, including but not limited to lines, transformers, and shunt compensation devices, shall be equal to the most limiting applicable equipment rating of the individual equipment that comprises the facility.
- 1.5 This methodology will be made available for inspection and technical review within 15 business days of receipt of a request from SWTC's Loveland Reliability Coordination Center ("LLRC"), Transmission Planners, Planning Authorities, and any other FERC jurisdictional entity that has responsibility for the area in which the facilities are located. Requests and responses for the methodology will be tracked by the Manager of System Operations at SWTC.
- 1.6 A written response to any comments regarding this Facility Ratings Methodology will be sent to the commenting entity within 45 calendar days of the comment receipt. The response shall indicate whether a change will be made to the Facility Ratings Methodology and, if no change will be made to that Facility Ratings Methodology, the reason why. Comments and responses regarding the methodology will be tracked by the Manager of System Operations at SWTC.
- 1.7 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.

In cases where a facility is owned in segments (such as a transmission line being 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 other owners to determine the most limiting segment. The rating for the most limiting segment would be used for the entire facility.

## 2.0 Facility Rating Methodologies for Transmission Facilities

The following sections describe the rating method for SWTC facilities.

### 2.1 Generation Facilities

SWTC does not own generation facilities.

### 2.2 Transmission Lines

SWTC owns transmission facilities. The rating of transmission lines involves comparison of the ratings of all elements which make up the line between the two identified busses, including the terminal equipment. The overall line rating is limited by the rating of the component with the lowest rating element or the stability limit of the line, whichever is lower. The bulk of SWTC's transmission lines are thermally limited and are currently based on the Western Area Power Administration ("Western") Power System Bulletin 510, dated July 13, 1989 and updated on January 14, 1992.

In 2009 SWTC undertook studies to re-rate its transmission facilities to more fully comply with the NERC Standards. On October 14, 2009, SWTC contracted with LIDAR to fly its southeast transmission system for the gathering of parameters to use in developing new transmission line ratings. The assembly of this data is not complete, but when it is, it will be provided in a revision to this standard.

#### 2.2.1 Transmission Line Conductors

The transmission line conductor ratings from the Western PDS Bulletin 50 dated January 14, 1992 are found below in the following tables:

TABLE 1: Conductor Thermal Ratings			
At 75 Deg. Celsius Operating Temperature			
Based on 2 ft. per second Wind Velocity			
and 40 deg. Celsius Air Temperature			
ACSR Conductor		Copper Conductor	
SIZE	AMPS	SIZE	AMPS
1/0 – 105.5 MCM	240	6 – 26.3 MCM	120
2/0 – 133.1 MCM	270	4 – 41.7 MCM	170
3/0 – 167.8 MCM	310	2 – 66.4 MCM	240
4/0 – 221.6 MCM	360	1/0 – 105.5 MCM	310

266.8 MCM	380	2/0 – 133.1 MCM	360
336.4 MCM	500	3/0 – 167.8 MCM	415
397.5 MCM	550	4/0 – 221.6 MCM	485
477.0 MCM	620	250.0 MCM	540
636.0 MCM	760	300.0 MCM	605
795.0 MCM	840	350.0 MCM	680
954.0 MCM	920	500.0 MCM	840
984.9 MCM	940	605.0 MCM	950
1033.5 MCM	980	750.0 MCM	1090
1192.5 MCM	1074		
1272.0 MCM	1100		
1351.5 MCM	1150		
1590.0 MCM	1250		
2167.0 MCM	1500		

<b>TABLE 2: Conductor Rating Parameters</b>		
<b>Parameters Common to All Locations/Conductors</b>		
<b>Parameter</b>	<b>Continuous Rating</b>	<b>Emergency Rating</b>
Wind Direction	Perpendicular to Line	Perpendicular to Line
Emissivity	0.5	0.5
Absorptivity	0.5	0.5
Date	July 1	July 1
Time	12 PM	12 PM
Latitude and Longitude	32.5° North	32.5° North
Elevation	2500 Ft	2500 Ft
Solar Input	Clear	Clear
Allowable Cond. Temp (ACSR)	75°C	110% of Continuous
Wind Speed	2 ft/s	2 ft/s
Ambient Temperature	40°C	40°C

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

- a. The thermal ratings from Table 1, used by SWTC to rate its transmission lines, are considered to be very conservative. 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 shown in Table 1 for development of the existing conductor thermal ratings are based on the Western PSD bulletin. The conductor ratings are based on a 75 degree Celsius operating temperature that is based on a 2 ft. per second wind speed and a 40 degree Celsius air temperature. Emergency ratings are based on a conservative increase of 10% above the values in Table 1. SWTC allows operation at the emergency ratings for no more than a 30 minute time period. 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. The transmission line rating program is based on the classical House and Tuttle method of line rating which uses a heat balance equation to determine the allowable line current for a specified conductor temperature. This is also the basis for IEEE Standard 738.
- d. Rigid Bus and Strain Bus design are determined by the RUS Design Guide for Rural Substations Bulletin 1724E-300 (Bulletin) and National Electric Safety Code as a minimum. The design involves many factors, which are spelled out in the Bulletin. There is currently no case on the SWTC system where the rigid bus or strain bus is a limiting factor for any of SWTC's transmission line ratings.

### 2.3 Transformers

SWTC 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:

Equipment	Normal Rating	Emergency Rating
SWTC Transformers	100% Manufacturer's Nameplate Rating @45°C or 55°C rise	100% Manufacturer's Nameplate Rating @55°C or 65°C rise

Transformers in the SWTC system have a continuous rating which is based on the manufacturer's nameplate data. SWTC operates and monitors its transformers according to PRC-023 which mandates the ability to sustain short-term overloads. In an emergency event, the transformer emergency rating may be exceeded, thus allowing for operator intervention within 30 minutes. Under special circumstances, SWTC may wish to evaluate other sources in regard to manufacturer's specifications, such as the latest applicable versions of IEEE Standard C57.13-2209, IEEE Std. 57.91-1995 or IEEE Std. C57.119-2001.

### 2.4 Relay Protective Devices

None of SWTC BES facilities have ratings that are limited by protection or monitoring devices. SWTC'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 SWTC to ensure that loadability requirements are met.

## 2.5 Terminal Equipment (switches, breakers, etc)

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

SWTC shall consult the most current and applicable IEEE standards as deemed necessary regarding the rating of its terminal equipment: IEEE Std. C37.010-1999 (R2005), IEEE Std C37.37-1996, IEEE Std. C57.13-2008, IEEE Std. C93.3-1995, or RUS Bulletin 1724E-300.

## 2.6 Shunt Compensation Devices

The normal and emergency ratings for shunt compensation devices are determined as follows:

Equipment	Normal Rating	Emergency Rating
Shunt Capacitors	100% of Manufacturer's Test Report Rating	100% of Manufacturer's Test Report Rating

## 3.0 Internal Planning Criteria for Facility Ratings

The factors used to determine equipment ratings were outlined above. They represent criteria that SWTC has used for a number of years, to meet requirements of the NERC, WECC, and the Federal Energy Regulatory Commission (FERC).

The following is SWTC's internal transmission reliability planning criteria as published in the 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, a power factor of 0.95 lagging 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 110% of the thermal rating of the conductors.
- Transmission system voltages should not fall below 0.90 per unit (p.u.) of nominal rating nor rise above 1.10 p.u. of nominal rating.
- For long range planning system studies, a power factor of 0.95 lagging will be used.
- For operating system studies, an appropriate power factor for the operating planning period will be used.

## **4.0 Establishment and Communication of Facility Ratings**

SWTC establishes the facility ratings for its BES in accordance with the facility rating methodologies described above. SWTC submits its most up-to-date ratings as part of the WECC base case preparation process on a periodic basis as required by WECC.

SWTC shall communicate its ratings for its solely and jointly owned Facilities that are existing Facilities, new Facilities, modifications to existing Facilities and re-ratings of existing Facilities to WECC, its LLRC, its Planning Authority, and to other Transmission Owners, Operators, or Planners as scheduled by such requesting entities.

When SWTC 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. SWTC 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 years, in accordance with NERC Standard FAC-008-1.

The following table of SWTC Transmission Line Rating Limits is found in Appendix A of SWTC's Facility Rating Methodology:

SWTC Transmission Line Rating Limits							
Station A From	Station B To	Voltage KV	Normal Limit Amps	Emergency Limit Amps	Normal Limit MVA	Emergency Limit MVA	Limiting Equipment
GREEN-SW	GREENLEE	345	1370	1507	819	901	Conductor
GREENLEE	GREEN-SW	345	1370	1507	819	901	Conductor
BICKNELL	VAIL	345	1370	1507	819	901	Conductor
VAIL	BICKNELL	345	1370	1507	819	901	Conductor
DOSCONDO	HACKBERRY	230	1100	1210	438	482	Conductor
HACKBERRY	DOSCONDO	230	1100	1210	438	482	Conductor
HACKBERRY	MORENCI	230	1100	1210	438	482	Conductor
MORENCI	HACKBERRY	230	1100	1210	438	482	Conductor
GREEN-SW	MORENCI	230	1100	1210	438	482	Conductor
MORENCI	GREEN-SW	230	1100	1210	438	482	Conductor
MORENCI	PD-MORNC	230	920	1012	367	403	Conductor
PD-MORNC	MORENCI	230	920	1012	367	403	Conductor
APACHE	BUTERFLD	230	840	924	335	368	Conductor
BUTERFLD	APACHE	230	840	924	335	368	Conductor
APACHE	RED TAIL	230	1100	1210	438	482	Conductor
RED TAIL	APACHE	230	1100	1210	438	482	Conductor
APACHE	WINCHESTER	230	1100	1210	438	482	Conductor
WINCHESTER	APACHE	230	1100	1210	438	482	Conductor
BUTERFLD	PANTANO	230	840	924	335	368	Conductor
PANTANO	BUTERFLD	230	840	924	335	368	Conductor
BUTERFLD	SAN RAF	230	920	1012	367	403	Conductor
PANTANO	SAHUARITA	230	840	924	335	368	Conductor
SAHUARITA	PANTANO	230	840	924	335	368	Conductor
SAHUARITA	BICKNELL	230	840	924	335	368	Conductor
BICKNELL	SAHUARITA	230	840	924	335	368	Conductor
RED TAIL	DOSCONDO	230	1100	1210	438	482	Conductor
DOSCONDO	RED TAIL	230	1100	1210	438	482	Conductor
DAVIS	RIVIERA	230	600	660	239	263	WAPA Relays wound CT
APACHE	HAYDENA Z	115	600	660	120	132	SRP disconnect switch
HAYDENA Z	APACHE	115	600	660	120	132	
MARANA	MARANATP	115	500	550	100	109	Jumpers
MARANATP	MARANA	115	500	550	100	109	Jumpers
MARANA	AVRA	115	360	396	72	79	Conductor
AVRA	MARANA	115	360	396	72	79	Conductor
AVRA	SANDARIO	115	360	396	72	79	Conductor
SANDARIO	AVRA	115	360	396	72	79	Conductor
SANDARIO	THREEPNT	115	360	396	72	79	Conductor
THREEPNT	SANDARIO	115	360	396	72	79	Conductor
BICKNELL	THREEPNT	115	620	682	124	136	Conductor
THREEPNT	BICKNELL	115	620	682	124	136	Conductor
THREEPNT	VALENCIA	115	620	682	124	136	Conductor
PANTANO	KARTCHNR	115	620	682	124	136	Conductor