SOUTHWESTERN
Power Group II, LLC
An Energy Company - Alliance Builder



E-00000D-03-0047

Ms. Colleen Ryan, Supervisor
Document Control Center
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

Re: Annual Ten-Year Plan For Toltec Power Station, L.L.C.

Dear Ms. Ryan:

Pursuant to A.R.S. 40-360.02, Toltec Power Station L.L.C. ("Toltec") hereby submits its Ten-Year Plan for the proposed 1800 MW natural gas-fired combined cycle power plant and its associated 500 kV and 345 kV transmission lines. This letter follows the same organization specified in A.R.S. 40-360.02, which is provided in Attachment A. The Requirements within the revised statutes are formatted in italics, and are followed by Toltec's response in normal (non-italicized) type.

1. ***The size and proposed route of any transmission lines or location of each plant proposed to be constructed.***

On March 2, 2001, Toltec Power Station, L.L.C. ("Toltec") filed an application for a Certificate of Environmental Compatibility ("CEC") for a proposed 2,000 MW (nominal) natural gas-fired combined cycle power plant at a location approximately 9 miles south of Toltec. On April 16, 2001 Toltec filed a second application for a CEC for a proposed 500kV and two proposed 345 kV transmission lines which would interconnect the Toltec Power Station to the Western States Coordinating Council transmission grid through interconnections with existing high voltage transmission lines owned by Arizona Public Services Company ("APS") and Tucson Electric Power Company ("TEP"). These applications were assigned Case Nos. 112 and 113, respectively, for purposes of hearing and decision by the Arizona Power Plant and Transmission Line Siting Committee ("Siting Committee") and the Arizona Corporation Commission ("ACC").

During the course of the hearings, Toltec amended its proposed power plant design to an 1800 MW (nominal) plant with a peaking capability. On November 27, 2001, following deliberations, the Siting Committee voted 11-0 to grant a CEC for the proposed power plant, and 9-0 to grant a CEC for the proposed transmission lines. On January 30, 2002 the ACC deliberated and voted 3-0 to deny the CEC's, which had been recommended by the Siting Committee for the Toltec Project. Later the ACC did not act on the request of Toltec to rehear and reconsider their decision denial.

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Thus, on April 16, 2002, Toltec filed a lawsuit in Maricopa County Superior Court to invalidate the ACC's action in Decision Nos. 64446 and 64445. It is currently anticipated that briefing in the case on certain jurisdictional issues will be completed on February 7, 2003. The court is yet to enter an order as to when the balance of the briefing will occur, or when the matter will be orally argued.

To address Requirement "1" above, Toltec is attaching a copy of pages 2 and 3 of the CEC from case No. 112 (Power Plant) and pages 3 and 4 from case No. 113 (transmission lines) which describe the proposed generating station and the proposed 500 kV and two proposed 345 kV transmission lines. These descriptions are incorporated herein by reference and are found at the end of this letter in Attachment B and Attachment C, respectively.

***2. The purpose to be served by each proposed line or plant.***

The proposed Toltec Facilities will interconnect with the regional Western Electricity Coordinating Council System ("WECC"), formerly known as the Western Systems Coordinating Council, in such a manner as to maximize service options to targeted wholesale power markets. Toltec's target markets include the East Valley of Phoenix, the northern Phoenix area, metropolitan Tucson, the Palo Verde Hub (California), and the Mead Hub (California and Nevada).

The proposed interconnections are:

(1) Toltec-to-Saguaro Power Plant Switchyard, owned by APS, via a single circuit 500 kV transmission line constructed on single circuit steel monopoles over a linear distance of approximately 19.6 miles. This interconnection scheme has the support of APS. The interconnection will allow service into the East Valley and Tucson, via the proposed loop-in of the Saguaro-Cholla 500 kV line, owned by APS, at the Silver King Switchyard. This loop-in has long been the subject of study and recommendation by the participants in the Central Arizona Transmission Study. The loop-in can be easily constructed utilizing a single span and two 500 kV circuit breakers. The loop-in is planned to be a joint effort by Salt River Project and APS. This interconnection is planned for Toltec Phase I (nominal 1,200 MW).

(2) Toltec-to-Westwing South 345 kV line, owned by TEP and Arizona Electric Power Cooperative, via a double circuit 345 kV line constructed on steel monopoles over a linear distance of approximately 13.2 miles. This interconnection will actually accomplish a loop-in of the Westwing South line in-and-out of Toltec's Switchyard. Such interconnection will allow service to Tucson, the Palo Verde Hub, the Mead Hub, and north Phoenix. This interconnection is planned for Toltec Phase II (nominal 600 MW additional generation).

Toltec is preparing a transmission study as requested for the entire plant led by TEP and coordinated with APS. For the Phase I interconnection above, APS will be the only transmission provider used. Interconnection agreements with both APS and TEP will likely be negotiated in 2004.

### *3. The estimated date by which each transmission line or plant will be in operation.*

Both the Aquifer Protection Permit and Air Quality Permit for Toltec are expected from the Arizona Department of Environmental Quality and Pinal Air Quality Control district in 2003.

After final approval of all applicable permits, and subject to reinstatement of the aforementioned CEC's, construction will commence on the first 1200 MW block phase in the 2nd quarter of 2004 and the second 600 MW phase in the 2nd quarter of 2005. Following construction of each phase and synchronization of the turbines, Toltec anticipates commencing in-service commercial operation for the power station in the following time sequence:

| | |
|---|---|
| Phase 1 (1200 MW) | 2nd quarter 2006 |
| Phase 2 (600 MW) | 2nd quarter 2007 |

The anticipated commercial in-service operation for the 500 kV and 345 kV transmission facilities associated with the power station will be no later than 2nd quarter 2006 and 2007 respectively.

### *4. The average and maximum power output measured in megawatts of each plant installed.*

Toltec proposes to construct and operate a nominal 1,800-megawatt (MW) combined-cycle combustion turbine facility. Generally, the Toltec Facility will be operated to provide its maximum electrical output during the summer and winter peak periods when the demand for the electricity is highest. The combustion turbines may be shut down or operated at partial loads when the market demand for electricity will not support the full production of the generating facility.

### *5. The expected capacity factor for each proposed plant.*

Toltec will be designed for base–load combined cycle operations with supplemental fired peaking capability and can be operated at any given time 24 hours per day, 7days per week, 52 weeks per year. The facility is expected to have a capacity factor of 85% that will be determined by market factors, such a growth in energy demands and daily wholesale energy prices.

*6. The type of fuel to be used for each proposed plant.*

The source of natural gas supply will be the El Paso Natural Gas (EPNG) system and will likely be from Line No. 1103 (30 inch mainline) that is located on the Project site. This tap is expected to be located 200 yards from the facility metering point. The lateral tap will be constructed totally within lands owned by Toltec.

***7. The plans' for any new facilities shall include a power flow and stability analysis report showing the effect on the current Arizona electric transmission system. Transmission owners shall provide the technical reports, analysis or basis for projects that are included for serving customer load growth in their service territories.***

In connection with the proposed transmission lines, we are attaching (Attachment D) Toltec Power Station, LLC Interconnection Power Flow Update completed August 28, 2001 in coordination with our engineering consultant R.W. Beck.

In the event you have any questions regarding the above and the attached report or would like additional information, please feel free to contact Dr. Gary Crane or myself at (602) 808-2004.

Sincerely,

Gary Crane for Tom Wray

Tom Wray
General Manager

Cc:

File
Ernest Johnson w attachments (Utility Director)
Jerry Smith w attachments (Utility Engineer)
Gary Crane w/o attachments (SWPG)
Laurie Woodall w/o attachments (Chairman, Siting Committee)
Larry Robertson w/o attachments (Munger Chadwick, PLC )

# ATTACHMENTS

# Attachment "A"

40-360.02. Plans; filing; failure to comply; classification

A. Every person contemplating construction of any transmission line within the state during any ten year period shall file a ten year plan with the commission on or before January 31 of each year.

B. Every person contemplating construction of any plant within the state shall file a plan with the commission ninety days before filing an application for a certificate of environmental compatibility as provided in section 40-360.03.

C. Each plan filed pursuant to subsection A or B of this section shall set forth the following information with respect to the proposed facilities to the extent such information is available:

1. The size and proposed route of any transmission lines or location of each plant proposed to be constructed.

2. The purpose to be served by each proposed transmission line or plant.

3. The estimated date by which each transmission line or plant will be in operation.

4. The average and maximum power output measured in megawatts of each plant to be installed.

5. The expected capacity factor for each proposed plant.

6. The type of fuel to be used for each proposed plant.

7. The plans for any new facilities shall include a power flow and stability analysis report showing the effect on the current Arizona electric transmission system. Transmission owners shall provide the technical reports, analysis or basis for projects that are included for serving customer load growth in their service territories.

D. The information in the plan reported to the commission in subsection B of this section is not open to public inspection and shall not be made public if disclosure of the information in the plan could give a material advantage to competitors. The information in the plan protected as confidential under subsection B of this section is any information that is similar to the information that would be confidential under section 40-204. An officer or employee of the commission who knowingly divulges information in the plan in violation of this subsection is guilty of a class 2 misdemeanor.

E. Failure of any person to comply with the requirements of subsection A, B or C of this section may, in the commission's discretion in the absence of a showing of good cause, constitute a ground for refusing to consider an application of such person.

F. The plans shall be recognized and utilized as tentative information only and are subject to change at any time at the discretion of the person filing the plans.

G. The plans shall be reviewed biennially by the commission and the commission shall issue a written decision regarding the adequacy of the existing and planned transmission facilities in this state to meet the present and future energy needs of this state in a reliable manner.

# Attachment "B"

| | |
|---|---|
| Mark McWhirter | Designee for Director of the Energy Office of Arizona Department of Commerce |
| Richard Tobin | Designee for Director of the Arizona Department of Environmental Quality |
| Dennis Sundie | Designee for Director of the Arizona Department of Water Resources[1] |
| Patrick Schiffer | Designee for Director of the Arizona Department of Water Resources[1] |
| Jeff McGuire | Appointed Member |
| Mike Palmer | Appointed Member |
| A. Wayne Smith | Appointed Member |
| Sandie Smith | Appointed Member |
| Margaret Trujillo | Appointed Member |
| Mike Whalen | Appointed Member |

The Applicant was represented by Lawrence V. Robertson, Jr. The Arizona Corporation Commission ("Commission") staff was represented by Teena Wolfe, DeVinti Williams and David Ronald. Mary-Louise Pasutti, Jon Shumaker and Myra Smith appeared as individual intervenors. Robert S. Lynch appeared on behalf of the Central Arizona Irrigation and Drainage District, Electrical District No. 4, Pinal County, and Electrical District No. 5, Pinal County. Timothy M. Hogan appeared on behalf of the Arizona Center for Law in the Public Interest.

At the conclusion of the public hearings, after consideration of (i) the amended Application and the evidence presented during the public hearings, (ii) the closing arguments of the parties, and (iii) the legal requirements of Arizona Revised Statutes §§ 40-360 through 40-360.13 and A.A.C. R14-3-213, on November 27, 2001, upon motion duly made and seconded, by an 11-0 vote the Committee voted to grant the Applicant the following Certificate.

Applicant is hereby granted a Certificate to site and construct the following facilities ("Project"):

> "A natural gas fired, combined cycle electric generating plant with an operating capability not to exceed a nominal site rating of 1800 megawatts (MW). The facilities shall consist of up to three (3) power

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[1] Mr. Sundie served as the indicated designee until September, 2001. Thereafter, Mr. Schiffer succeeded Mr. Sundie in that capacity.

blocks, each rated up to 600 MW nominal. Each power block shall consist of (i) two combustion turbine generators (CTG), (ii) two heat recovery steam generators (HRSG) and (iii) one steam turbine electric generator. The plant design may also incorporate (i) supplementary or duct-firing of the HRSG and (ii) injecting steam into the CTG for a given power block. The duct-firing design would be incorporated in the HRSG's and the steam injection design would be incorporated in the CTG's. The power plant and supporting infrastructure shall be located in Section 26, Township 9 South, Range 7 East, G&SRB&M.

The supporting power plant infrastructure shall include (i) an air pollution control system, (ii) water handling and treatment facilities, (iii) fuel system, (iv) instrumentation and control system, (v) switchyard and electrical interconnection(s), (vi) chemical and petroleum product storage facilities, (vii) vehicular access facilities, (viii) evaporation ponds, and (ix) other site improvements. Each of these infrastructure components is described in some detail in the amended Application. "

In connection with the design and construction of Project facilities, Applicant shall use low profile structures, moderate stacks, neutral colors, compatible landscaping and low intensity directed lighting for the power plant. The transmission facilities shall include the use of non-reflective conductors and towers. In addition, Applicant shall use a zero discharge system for cooling water, subject to existing regulatory requirements. Further, Applicant shall operate the evaporation ponds so that any salt residue(s) contained therein shall not cause damage to crops grown on fields adjacent to the Project site.

This Certificate is further granted upon the following conditions.

1. Applicant shall comply with all existing applicable air and water pollution control standards and regulations, and with all existing applicable ordinances, master plans and regulations of the State of Arizona, Pinal County, the United States of America, and any other governmental entities having jurisdiction, including but not limited to the following:

   A. all applicable zoning stipulations and conditions, including but not limited to landscaping and dust control requirements and/or approvals;

   B. all applicable air quality control standards, approvals, permit conditions and requirements of the Pinal County Air Quality Control District and/or other State of Arizona or Federal agencies having jurisdiction, and Applicant shall

Tucson Electric Power Company. The Arizona Center for Law in the Public Interest also intervened through Timothy M. Hogan.

At the conclusion of the public hearings, after consideration of (i) the Application and the evidence presented during the public hearings, (ii) the closing arguments of the parties, and (iii) the legal requirements of Arizona Revised Statutes §§ 40-360 through 40-360.13 and A.A.C. R14-3-213, on November 27, 2001, upon motion duly made and seconded, by a 9-0 vote the Committee voted to grant the Applicant the following Certificate.[2]

" Applicant is hereby granted a Certificate to site and construct the following facilities, as requested in the Application: (i) a 500 kV transmission line which shall interconnect Applicant's Toltec Power Station facilities [Sec.26, T9S, R7E, G&SRB&M] with the Western Systems Coordinating Council ("WSCC") transmission grid at Arizona Public Service Company's ("APS") Saguaro Switchyard [Sec.15, T20S, R10E, G&SRB&M]; and (ii) two (2) 345 kV transmission lines, which shall interconnect the Toltec Power Station facilities with the WSCC transmission grid by means of a "loop in" interconnection with Tucson Electric Power Company's ("TEP") Westwing-South 345 kV transmission lines [Sec.22, T10S, R6E, G&SRB&M]. As testified to by the Applicant during the public hearings, electric power and energy produced at the Toltec Power Station are intended primarily to serve Central and Southern Arizona markets.

The 500 kV transmission line hereby authorized shall originate at Applicant's Toltec Power Station and follow the route proposed by Applicant in its Application for a distance of approximately 19.6 miles to the point of interconnection with APS's Saguaro Swichyard. In that regard, Applicant is further authorized to use a 2000' wide corridor within which it will ultimately acquire up to a 250' wide right-of-way for purposes of siting and construction of the line. Exhibit "A" to this Decision and Certificate sets forth a generalized narrative legal description of the routing hereby approved for the 500 kV transmission line.

The two (2) 345 kV transmission lines hereby authorized shall originate at Applicant's Toltec Power Station and follow the route proposed by Applicant in its Application for a distance of

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[2]Committee members McWhirter and Schiffer were not present at the time of the vote in Case No. 113.

approximately 13.2 miles to the point of "loop-in" interconnection with TEP's Westwing-South 345 kV transmission line. Applicant in that regard is similarly authorized to use a 2000 ' wide corridor within which it shall ultimately acquire up to a 250' wide right-of-way for purposes of siting and construction of the lines, with the exception of the Link 3 portion of the proposed route in which Applicant is authorized to use a one-mile wide corridor [consisting of Secs. 1, 2, 11, 12, 13, 14, 23, and 24 in T10S, R7E, G&SRB&M] in order to provide flexibility for avoiding or mitigating possible archaeological sites. Exhibit "B" to this Decision and Certificate sets forth a generalized narrative legal description of the routing hereby approved for the 345 kV transmission lines. Exhibit "C", as attached hereto, consists of a map depicting the aforementioned 500 kV and 345 kV transmission line corridors.

The authorized single circuit 500 kV transmission line shall be designed and constructed on single-pole or monopole structures, with the exception of lattice towers to span Interstate 10 and the Union Pacific Railroad at the Saguaro switchyard interconnection, if necessary. The authorized double circuit 345 kV transmission lines also shall be designed and constructed on single-pole or monopole structures, with the exception of a lattice structure to complete the interconnection with TEP's Westwing-South 345 kV line. The monopole and lattice tower structures shall consist of dulled galvanized steel, and may range in height from 120' to 165' above grade for the 500 kV transmission line and 140' to 175' above grade for the 345 kV transmission lines, respectively. The conductors shall be non-specular. The spans between the transmission poles shall vary in distance from 600' to 1500' depending upon conductor size, terrain and environmental mitigation conditions at a given location.

The details of the aforementioned interconnections shall be the subject of contractual arrangements to be entered into between the Applicant and APS, and the Applicant and TEP, respectively.

This Certificate is further granted upon the following conditions.

1. Applicant shall comply with all existing applicable air and water pollution control standards and regulations, and with all existing applicable ordinances, master plans

Attachment "D"

# Toltec Power Station, LLC
# Interconnection Power Flow Update

## Toltec Power Station, LLC

August 28, 2001

R·W·BECK

2201 E. Camelback Road, Suite 115B Phoenix, AZ 85016-3433 Phone (602) 957-2888

# TOLTEC
# GENERATION INTERCONNECTION
# POWER FLOW STUDY UPDATE

## Table of Contents

# Introduction

This report summarizes the results of the study to examine the potential impacts on the transmission system of interconnecting the proposed Toltec Power Station ("Client") plant ("Project") to the Arizona transmission grid. The Project is planned as three "two on one" gas combined cycle generating units with duct-firing and steam injection. The Project is to be integrated in two phases with the first phase representing two units or 1200 MW nominal and the second phase adding an additional 600 MW unit for a total of 1800 MW output.

The interconnection examined within this report consists of the output of the GE7FA/Steam turbine combined cycle generating units each stepped-up from the generation voltage to 500 kV, a minimum of two 500/345 kV transformers at the Toltec Power Station breaker-and-a-half switchyard, an approximate twenty mile 500 kV line from the Project switchyard to APS's Saguaro substation, and an approximate thirteen and a half mile in-and-out interconnection to TEP/AEPCO's Westwing – South 345 kV line.

The Base Case is represented by the system which is expected to be in place when the Project comes on-line later in 2003 or first quarter 2004. This includes the Palo Verde – Southwest Valley 500 kV line addition and associated regional system modifications as modeled in the WSCC 2001 series power flow case model. Additionally, generating plants that are currently under construction are included in the Base Case for the 1200 MW output level and SRP's Santan plant expansion is added to the Base Case for the 1800 MW Project output level.

As a sensitivity, the loop in of the Cholla to Saguaro 500 kV line at Silverking is also examined. This network upgrade has been discussed under the Central Area Transmission Study group ("CATS") as a possible, potentially low cost, means of increasing power delivery to the East Valley. While a second sensitivity was considered, an evaluation of the system with the "announced" SRP new transmission line project that would connect Palo Verde to somewhere in the East Valley, there were not enough details available to model this alternative. In regards to the tentative route the following was excepted from the August 15 Arizona Republic under the title "SRP plans major line for Valley." "While the precise path of the line has yet to be determined, it would generally run from western Maricopa County to a point southeast in Pinal County. From there a smaller 130-kV line would run 15 to 20 miles to a substation on Signal Butte between Elliot and Guadalupe roads." Although the February 28, 2001 Toltec Power Station Transmission Interconnection Study Executive Summary as filed with the Toltec Power Station CEC application provided a sensitivity regarding the certificated Palo Verde to Saguaro 500 kV line, the most recent information available provides no indication that this proposed line will

actually interconnection with Saguaro 500 kV Substation. Given these significant unknowns, this sensitivity was not re-examined as part of this update.

The results of this study are not intended to project how the Project "will" interconnect, but instead present how the Project "may" interconnect to the existing system while providing coordination, where possible, with future transmission plans that are often subject to change. The actual interconnection will be based on coordinated efforts between Toltec Power Station, LLC and the host utility(ies) as well as other interested parties.

# Project Description

The following lists the Project assumptions used in the analyses.

| | |
|---|---|
| Project Name: | Toltec Power Station |
| Maximum Summer Capability (MW): | 1200 & 1800 |
| Interconnection Voltage: | 500 and 345 kV |
| Interconnection Location: | Approximately 20 miles from the Saguaro 500 kV substation<br>13.5 miles from Westwing – South 345 kV line |
| Host Transmission Utility: | APS and TEP |
| Reliability Council/RTO: | WSCC/Desert Star |
| Plant Configuration: | Up to three 2 on 1 GE7FA/Steram turbine gas-fired combined cycle units with duct firing |

# Local Market Assessment Summary

In addition to evaluating the impact of integration of the Project on power flows in the region, it is also important, when siting new generation, to evaluate how a proposed resource may meet the projected resource needs of the region. Although the load and resource balance of the entire Arizona region is a consideration, the ability to serve regional load pockets, e.g., the East Valley and Tucson markets, is a significant consideration applicable to the Project site. This consideration applies both to the interconnection and the resource capacity in the region.

The Toltec Project site is located on the southern edge of the AZ-EV zone. Details pertaining to this zone are provided below.

## AZ-EV Zone

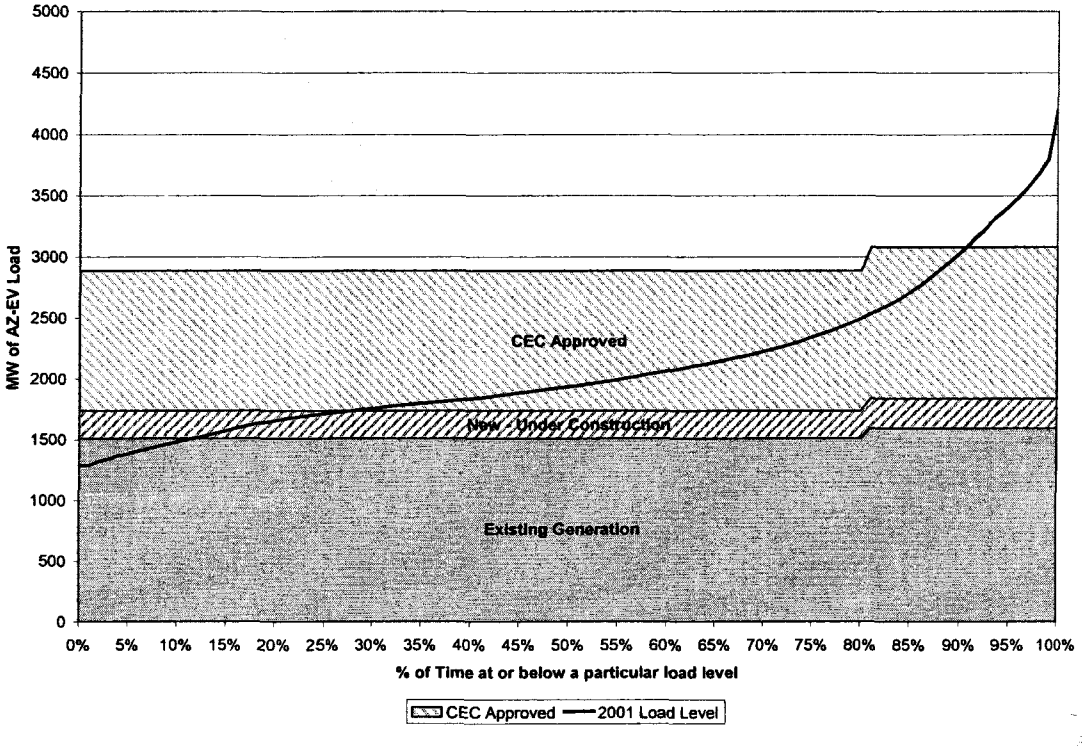
The East Valley zone includes the fast growing East Valley region (e.g., Tempe, Mesa, Chandler) of the Phoenix metropolitan area as well as Coolidge and down to Saguaro generating station. Utilities within the zone primarily include SRP, APS, WAPA, Mesa Electric Utility, San Carlos Irrigation Project and several Electrical/Irrigation Districts.

The zone has an existing deficiency in generation. This deficiency would turn to a surplus if all planned generation were constructed.

The following figure shows the level of existing, under construction and CEC approved generation plotted against the 2001 load duration curve (inclusive of reserve margin) for the zone. It is noted that much of this generation is not even yet under

construction, let alone operating. With the exception of the applied forced and maintenance outage rate, the generation level shown assumes no retirements and that the full output level of the units (as shown above in the generation summary table) is available on-peak.

**AZ-EV ZONE RESOURCE CAPACITY**




Even with the operating Desert Basin plant (included with the existing generation) and the under construction Kyrene expansion (shown marked as New – Under Construction), the zone will have to import power to serve zone load over 70% of the time, and at peak, close to its import limit of approximately 2500 MW.

The following tables provide a summary of the projected load and resource balance for the zone from 2001 to 2008. New generation plants that are under construction are included in the Base while in addition new generation plants with CEC approval or a CEC application filed are included in the Stress.

## AZ-EV BASE

| AZ-EV | New Gen Capacity (MW) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| **WSCC Growth - 2.5%** | | | | | | | | | |
| **Peak Demand - MW** | | 3747 | 3841 | 3937 | 4035 | 4136 | 4239 | 4345 | 4454 |
| **Historical Growth - 5.2%** | | | | | | | | | |
| **Peak Demand - MW** | | 3747 | 3942 | 4147 | 4362 | 4589 | 4828 | 5079 | 5343 |
| Resources: | | | | | | | | | |
| Hydro | | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 |
| ST Coal/Gas | | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 |
| CC (New) | | 540 | 540 | 540 | 540 | 540 | 540 | 540 | 540 |
| CC (Old) | | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 |
| CT Gas/Oil (Old) | | 267 | 267 | 267 | 267 | 267 | 267 | 267 | 267 |
| New Generation: | | | | | | | | | |
| SRP Kyrene (AZ11) | 250 | 0 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| SRP Santan (AZ12) | 726 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PP&L Sundance (AZ16) | 540 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SPG Toltec Phase I (AZ13) | 160 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SPG Toltec Phase II (AZ13) | 580 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **New Resources Added** | | 0 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| **Total Resources** | | 1652 | 1902 | 1902 | 1902 | 1902 | 1902 | 1902 | 1902 |
| ***2.5% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | 450 | 461 | 472 | 484 | 496 | 509 | 521 | 534 |
| ***Surplus(Deficit) - MW*** | | *(2545)* | *(2400)* | *(2507)* | *(2617)* | *(2730)* | *(2846)* | *(2965)* | *(3086)* |
| ***% of Peak Demand*** | | *-68%* | *-62%* | *-64%* | *-65%* | *-66%* | *-67%* | *-68%* | *-69%* |
| ***5.2% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | *450* | *473* | *498* | *523* | *551* | *579* | *609* | *641* |
| ***Surplus(Deficit) - MW*** | | *(2545)* | *(2513)* | *(2742)* | *(2984)* | *(3238)* | *(3505)* | *(3786)* | *(4082)* |
| ***% of Peak Demand*** | | *-68%* | *-64%* | *-66%* | *-68%* | *-71%* | *-73%* | *-75%* | *-76%* |

Projecting the load levels from the current levels demonstrates how the Toltec Project, in conjunction with the already approved Santan plant, scheduled to come on-line by 2005 summer peak, and the Sundance peaking project, shows there would still be a deficiency assuming the historical growth rate. Additionally, the graph does not factor in the use restrictions of the older Kyrene units or those that may apply to Santan. Even thought the total capacity increase added for these two units is 976 MW (250 for Kyrene plus 726 MW for Santan), operating restriction may in reality only result in a net increase in the order of 400 MW. This would result in lowering the level of existing generation by over 500 MW. This reduction is not shown in the following table nor is the fact that almost 900 MW of the gas/oil generation in the zone (including the Kyrene and Santan units that may be operationally limited per CEC) will be 30 years or older by 2003 and 315 MW of this same generation will be over 40 years old by 2005.

**AZ-EV STRESS**

| AZ-EV | New Gen Capacity (MW) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| **WSCC Growth - 2.5%** | | | | | | | | | |
| **Peak Demand - MW** | | 3747 | 3841 | 3937 | 4035 | 4136 | 4239 | 4345 | 4454 |
| **Historical Growth - 5.2%** | | | | | | | | | |
| **Peak Demand - MW** | | 3747 | 3942 | 4147 | 4362 | 4589 | 4828 | 5079 | 5343 |
| Resources: | | | | | | | | | |
| Hydro | | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 |
| ST Coal/Gas | | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 |
| CC (New) | | 540 | 540 | 540 | 540 | 540 | 540 | 540 | 540 |
| CC (Old) | | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 |
| CT Gas/Oil (Old) | | 267 | 267 | 267 | 267 | 267 | 267 | 267 | 267 |
| New Generation: | | | | | | | | | |
| SRP Kyrene (AZ11) | 250 | 0 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| SRP Santan (AZ12) | 726 | 0 | 0 | 0 | 0 | 726 | 726 | 726 | 726 |
| PP&L Sundance (AZ16) | 540 | 0 | 0 | 540 | 540 | 540 | 540 | 540 | 540 |
| SPG Toltec Phase I (AZ13) | 1160 | 0 | 0 | 0 | 1200 | 1200 | 1200 | 1200 | 1200 |
| SPG Toltec Phase II (AZ13) | 580 | 0 | 0 | 0 | 0 | 600 | 600 | 600 | 600 |
| **New Resources Added** | | 0 | 250 | 790 | 1990 | 3316 | 3316 | 3316 | 3316 |
| **Total Resources** | | 1652 | 1902 | 2442 | 3642 | 4968 | 4968 | 4968 | 4968 |
| ***2.5% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | 450 | 461 | 472 | 484 | 496 | 509 | 521 | 534 |
| ***Surplus(Deficit) - MW*** | | *(2545)* | *(2400)* | *(1967)* | *(877)* | *336* | *220* | *101* | *(20)* |
| ***% of Peak Demand*** | | *-68%* | *-62%* | *-50%* | *-22%* | *8%* | *5%* | *2%* | *0%* |
| ***5.2% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | *450* | *473* | *498* | *523* | *551* | *579* | *609* | *641* |
| ***Surplus(Deficit) - MW*** | | *(2545)* | *(2513)* | *(2202)* | *(1244)* | *(172)* | *(439)* | *(720)* | *(1016)* |
| ***% of Peak Demand*** | | *-68%* | *-64%* | *-53%* | *-29%* | *-4%* | *-9%* | *-14%* | *-19%* |

# Case Development

The Base Case was created from the FERC-715 Filing 2001 Series WSCC Summer Peak Case. The selected case included the Palo Verde to Southwest Valley 500 kV line and associated 230 kV modifications. The WSCC case also included WAPA's announced system modification of the Phoenix WAPA – Lone Butte – Santa Rosa from its current operating level of 115 kV to its designed operating level of 230 kV. However, based on new information from WAPA, this operational modification was removed from the Base Case, resulting in a return to how the facility currently operates at the 115 kV level.

## New Generation Projects in Base Case

The Base Case includes all generation project in Arizona currently under construction. Additionally, SRP's Santan plant expansion was assumed in-service for the full output of the Project planned by summer peak of 2005.

## Transaction Scenarios

Toltec has identified it primary target market as Arizona. As such, the transaction schedules shown in Table 2 were simulated in the load flow case models. For each

Alternative, the transactions were simulated in two separate ways, first by proportionately scaling Arizona load and second by proportionally reducing Arizona generation. While neither of these will be completely reflective of actual transactions, the combination of the two helps to identify which overloads are caused or partially caused by load growth and which may attributable to integration of the Project. This methodology also provides a representative evaluation of impacts on the system prior to specific transmission service receipt and delivery points being specified.

**Table 2**
**Transaction Schedules in MW**

| Region | "Alt 1&2 A" Load Scale | "Alt 1&2 B" Gen Scale | "Alt 3&4 A" Load Scale | "Alt 3&4 B" Gen Scale |
|---|---|---|---|---|
| Arizona | 1200 | 1200 | 1800 | 1800 |

# Results

The study indicates that under normal condition, integration of the Project results in no new loading violations (not attributable to load growth) for either a 1200 or an 1800 MW Project output with or without the Silverking connection.

Additionally, the post contingency results without the Silverking interconnection indicate that the Project can deliver approximately 1200 MW to the grid. To integrate the 1800 MW Project without the Silverking connection, regional 115 kV upgrades, system modification or implementation of operating schemes could be necessary. While the loading on the Cholla transformer is well within 125% of normal rating, loading on the Westwing 500/345 kV transformer may require a remedial action scheme or other system modification. A loading violation also occurs on the Westwing to Toltec to South lines. However, the emergency rating of this line appears limited by path rating as opposed to thermal capability of a double bundled 954 ACSR constructed line. As such, the rating may possibly be increased with a demonstration of increased flow. Additionally, the "announced" second Westwing – South 345 kV line included in TEP's 10-year plan would presumably alleviate these two violation.

The addition of the Silverking connection to the model alleviates all but the Westwing 500/345 kV transformer and the Westwing – South 345 kV line overloads as discussed in the previous paragraph.

In addition to the impacts identified previously, integration of the Project has several positive impact on system flows. For example, integration of the Project reduces flow on the Kyrene transformers. Additionally, integration of the Project appears to better balance delivery of power to the Tucson system. It increases the flow into Tucson at both Tortolita and South potentially providing more flexibility in regards to future system modifications.

# Section 1

# INTRODUCTION AND METHODOLOGY

## Introduction

This report summarizes the results of the study to examine the potential impacts on the transmission system of interconnecting the proposed Toltec Power Station ("Client") plant ("Project") to the Arizona transmission grid. The Project is planned as three "two on one" gas combined cycle generating units with duct-firing and steam injection. The Project is to be integrated in two phases with the first phase representing two units or 1200 MW nominal and the second phase adding an additional 600 MW unit for a total of 1800 MW output.

## Purpose of Study

Previous to this report, Beck examined several various interconnection alternatives. The purpose of these initial simulations was to (1) perform a preliminary assessment of the performance of various interconnection scenarios and (2) narrow the selection of interconnection alternatives to those which may be feasible, based primarily on the need for potential system upgrades to interconnect the Project at specific output levels of 1000, 1500 and 2000 MW which represented up to four "two on one" 500 MW combined cycle generating units.

The interconnection examined within this report consists of the output of the GE7FA/Steam turbine combined cycle generating units each stepped-up from the generation voltage to 500 kV, a minimum of two 500/345 kV transformers at the Toltec Power Station breaker-and-a-half switchyard, an approximate twenty mile 500 kV line from the Project switchyard to APS's Saguaro substation, and an approximate thirteen and a half mile in-and-out interconnection to TEP/AEPCO's Westwing – South 345 kV line.

The Base Case is represented by the system which is expected to be in place when the Project comes on-line later in 2003 or first quarter 2004. This includes the Palo Verde – Southwest Valley 500 kV line addition and associated regional system modifications as modeled in the WSCC 2001 series power flow case model. Additionally, generating plants that are currently under construction are included in the Base Case for the 1200 MW output level and SRP's Santan plant expansion is added to the Base Case for the 1800 MW Project output level.

As a sensitivity, the loop in of the Cholla to Saguaro 500 kV line at Silverking is also examined. This network upgrade has been discussed under the Central Area Transmission Study group ("CATS") as a possible, potentially low cost, means of increasing power delivery to the East Valley. While a second sensitivity was

considered, an evaluation of the system with the "announced" SRP new transmission line project that would connect Palo Verde to somewhere in the East Valley, there were not enough details available to model this alternative. In regards to the tentative route the following was excepted from the August 15 Arizona Republic under the title "SRP plans major line for Valley." "While the precise path of the line has yet to be determined, it would generally run from western Maricopa County to a point southeast in Pinal County. From there a smaller 130-kV line would run 15 to 20 miles to a substation on Signal Butte between Elliot and Guadalupe roads." Although the February 28, 2001 Toltec Power Station Transmission Interconnection Study Executive Summary as filed with the Toltec Power Station CEC application provided a sensitivity regarding the certificated Palo Verde to Saguaro 500 kV line, the most recent information available provides no indication that this proposed line will actually interconnection with Saguaro 500 kV Substation. Given these significant unknowns, this sensitivity was not re-examined as part of this update.

The results of this study are not intended to project how the Project "will" interconnect, but instead present how the Project "may" interconnect to the existing system while providing coordination, where possible, with future transmission plans that are often subject to change. The actual interconnection will be based on coordinated efforts between Toltec Power Station, LLC and the host utility(ies) as well as other interested parties.

The study uses "N-1" contingency load flow analyses in examining the potential impact of integration of the Project on the transmission system. To examine the effects (i.e., power flow changes) of adding generation, it is common practice to use power flow analyses to compare power flows on the transmission system with and without the added generation. It is important, however, when performing power flow comparisons, to recognize the difference between "typical" effects and "detrimental" effects on an AC transmission grid.

Where the power flow analysis may identify facilities that are loaded beyond the applicable facility ratings defined in the load flow case model, whether or not the facility requires upgrade to interconnect the Project to the system and/or acquire transmission service from the Project will be dependent on specific utility criteria.

Additionally, the results are based on the assumptions used in creating the power flow case model(s). Therefore, it is necessary to not only document the assumptions used but to evaluate a series of cases based on reasonable assumptions. The assumptions used for the analyses, discussed herein, are in line with common utility practices. However, the study is not intended to reflect detailed design of generation and system modification assumed for the purpose of the study, nor does it assess operational issues associated with the day to day operation of the power grid.

# Characteristics of AC Transmission Grid

Recognizing the difference between typical and detrimental effects requires an understanding of certain characteristics of an AC transmission system. In particular, there are two important characteristics of AC transmission that are relevant to this

understanding. The first is that, for any given configuration of generators, power is delivered from generation to load in precisely the most efficient manner possible. Sometimes, this inherent and beneficial feature is referred to as "taking the path of least resistance." A second characteristic of AC transmission is that, when a circuit goes off-line unexpectedly (i.e., trips), power transfers automatically and instantaneously to parallel circuits on the grid. This capability greatly enhances the reliability of interconnected transmission grids.

These beneficial characteristics come with a consequence, namely that power flowing over AC transmission systems obeys the laws of physics and, therefore, follow the "paths of least resistance" without regard for ownership or corporate boundaries. Thus, on an integrated transmission, all generators will have an effect on the entire transmission grid and not just the transmission system to which they are interconnected. Moreover, the effects of generators on adjacent systems is dynamic, in that actual power flows on the transmission system are continually changing as generation is dispatched to serve load that changes hour-by-hour throughout each day and throughout the year.

When using a power flow program to evaluate the transmission system, it must be remembered that each power flow case represents only a single snapshot in time; i.e., an assumed load level, VAr schedule, system configuration and generation dispatch to serve the load at one instant in time. Evaluating potential impacts of the Project means adding new generation to an original configuration or "base case" and requires that a corresponding amount of existing generation be removed or reduced (or alternately, load increased) in order to maintain the necessary load and resource balance. The potential impacts of the changed case or "change case" are evaluated by comparing it to the "base case". When the "change case" is compared to the "base case", power flows on the system will be observed to change. Such changes are neither positive nor negative in and of themselves and, instead, may simply be indicative of normal operating changes which the transmission grid was designed to accommodate.

# Project Description

The following lists the Project assumptions used in the analyses.

| | |
|---|---|
| Project Name: | Toltec Power Station |
| Maximum Summer Capability (MW): | 1200 & 1800 |
| Interconnection Voltage: | 500 and 345 kV |
| Interconnection Location: | Approximately 20 miles from the Saguaro 500 kV substation<br>13.5 miles from Westwing – South 345 kV line |
| Host Transmission Utility: | APS and TEP |
| Reliability Council/RTO: | WSCC/Desert Star |
| Plant Configuration: | Up to three 2 on 1 GE7FA/Steram turbine gas-fired combined cycle units with duct firing |

The interconnection consists of the output of the GE7FA/Steam turbine combined cycle generating units each stepped-up from the generation voltage to 500 kV, a minimum of two 500/345 kV transformers at the Toltec Power Station breaker-and-a-half switchyard, an approximate twenty mile 500 kV line from the Project switchyard

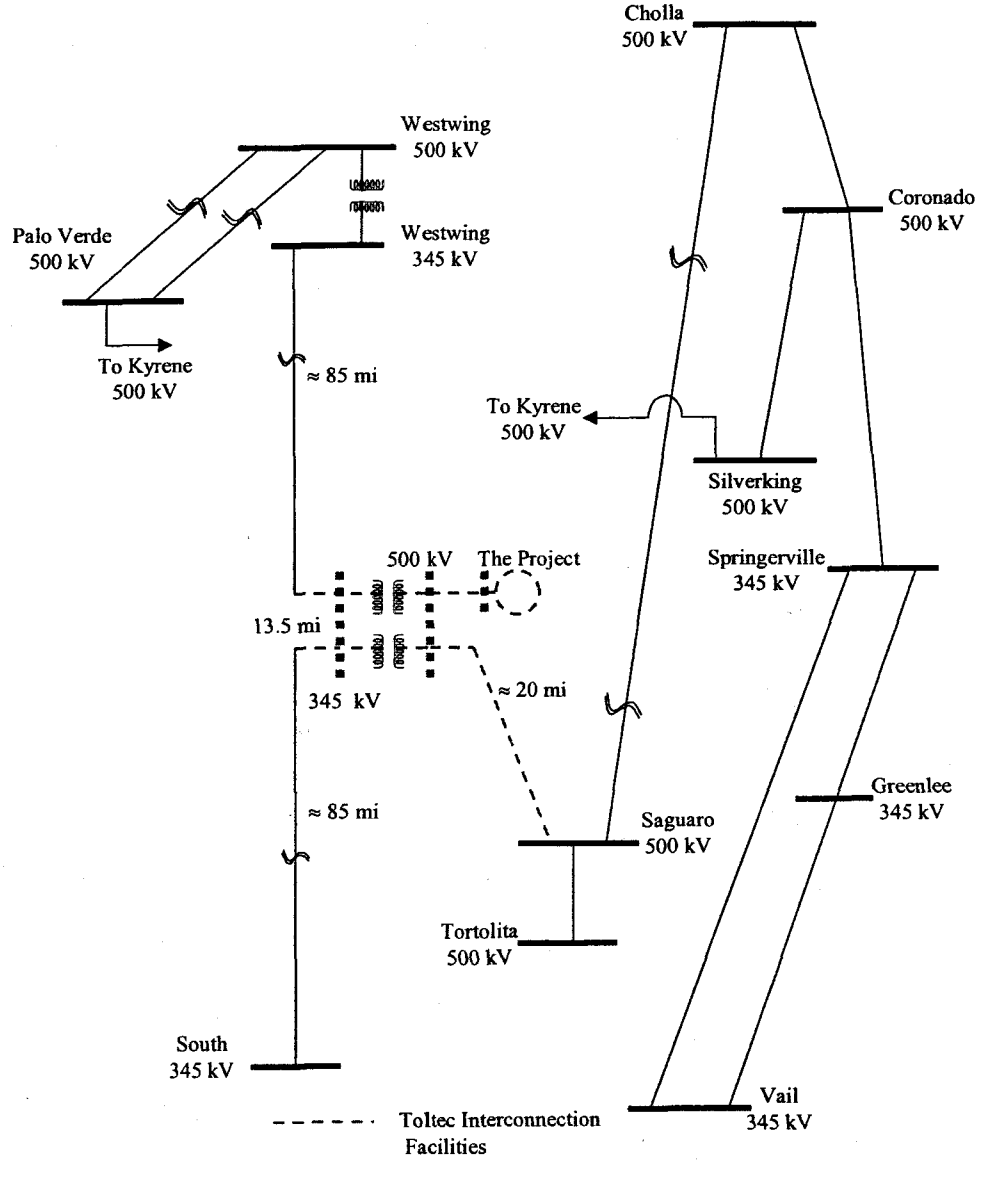
to Saguaro substation, and an approximate thirteen and a half mile in-and-out interconnection to the Westwing – South 345 kV line.

The Project is planned as three "two on one" gas combined cycle generating units with duct-firing and steam injection. The Project is to be integrated in two phases with the first phase representing two units or 1200 MW output and the second phase adding an additional 600 MW unit for a total of 1800 MW output.

- Alternatives 1 and 3 – The interconnection as described with no additional system modifications.

**FIGURE 1A**

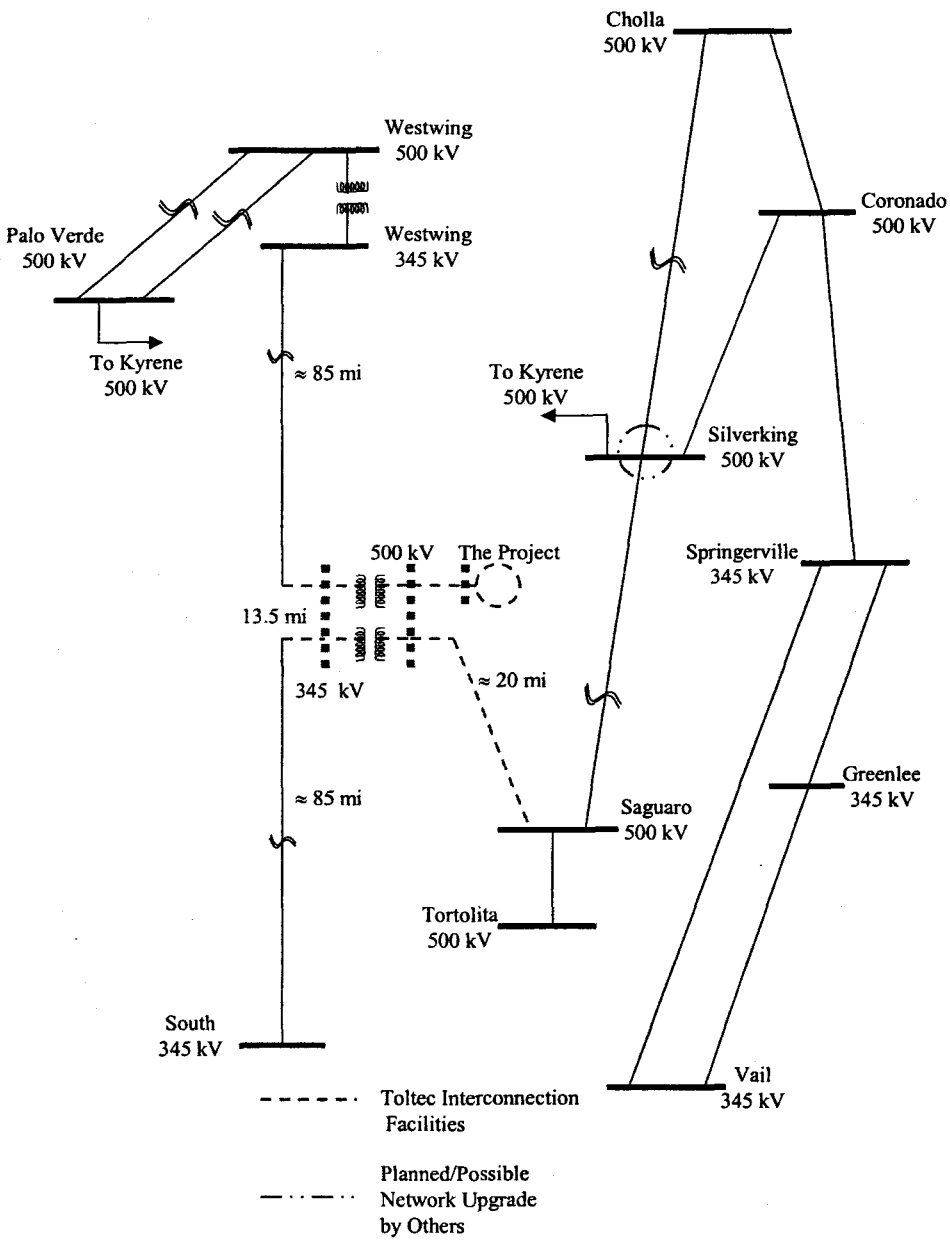
**ALTS 1 AND 3 – TOLTEC INTERCONNECTION CONFIGURATION**



- Alternatives 2 and 4 – The interconnection as described plus a bulk transmission system configuration change where the existing Cholla – Saguaro 500 kV line is rerouted a short distance to connect via an in-and-out tap to the existing Silverking 500 kV substation prior to terminating at Saguaro. The configuration change will permit deliveries of power from the Saguaro area directly into the eastern side of the East Valley without having to contractually deliver either over the 230 kV network or first to Cholla and then back to Silverking via Coronado.

**FIGURE 1B**

**ALTS 2 AND 4 – TOLTEC INTERCONNECTION CONFIGURATION**



# "N-1" Analysis Goals and Methodology

The goal of the Load Flow "N-1" Contingency Analysis is to perform an evaluation of the incremental impact of the Project on the loading of the regional transmission system. To achieve this goal, Beck uses the following process:

1. Examine level and location of existing and planned generation in the vicinity of the Project.
2. A Base Case is developed to establish a baseline performance of the system before the Project. The Base Case may include other proposed generating project or transmission system additions/modifications in the region.
3. "Change" Case(s) are then developed which include the Project.
4. Single contingency ("N-1") analysis is then performed on each scenario.
5. Results from the change case(s) are compared to the results from the Base Case to evaluate the incremental impact of the Project on the loading of the transmission system.
6. The results are analyzed and presented.

Beck uses General Electric's PSLF program to run the load flow cases.

The results of the analyses may not reflect (i) operating limitations and (ii) loading violations that result from different assumptions used to create the cases. Additionally, the analysis "forces" the plant to be dispatched and therefore does not reflect the competitive aspects of the Project. The purpose of the analyses is to identify transmission facilities that have the potential to limit the dispatch of the Project and/or other generators in the local region under heavy load conditions (when power is most needed to serve load). Whether or not upgrade of the facilities is required for integration of the Project will depend on many factors such as the local utilities Generation Interconnection procedures.

The interconnection/deliverability studies are typically performed using summer peak load cases. A peak load "N-1" analysis adheres to what has traditionally been considered good utility practice. The analyses are used to demonstrate the ability to serve load under heavy load conditions when flexibility of generation resource dispatch is reduced. For a more rigorous system impact or integration study, light load (approx. 40-50%) and "shoulder" load (approx. 60-70%) load flow cases may also be evaluated.

In addition, studies other than the load flow analysis (e.g., stability and/or short circuit analysis) will frequently be performed as part of a System Impact or Facilities Study, to fully measure the impact of the Project on the interconnected power system.

# Section 2

# MARKET BACKGROUND

## Market Structure

The structure of the market will play a major role in many factors that will affect the operation, expansion and liquidity of the market (e.g., how congestion is managed, how transmission expansion costs are allocated).

With the exception of California, the west has not yet transitioned to Regional Transmission Organizations ("RTO's") or even tightly operated pools. Although filings have been made in that regard (specifically Desert Star and RTO-West), progress has been slow. As with other regions of the country, the Arizona system is composed of many different utility systems that have integrated transmission facilities. The Project is located southeast of Phoenix and will interconnect with the Arizona Public Service ("APS") and Tucson Electric Power ("TEP") systems, which in turn connects to many of the surrounding systems. In an integrated AC transmission network changes on one system will affect power flows on another. In that regard, coordinated planning is performed across regions as opposed to only examination of a single company in isolation.

While planning for regions has generally been coordinated by the NERC Regional Reliability Councils (e.g., WSCC, SERC, MAPP, MAIN), the council regions divisions are blurring with the FERC directed establishment of RTOs, given that participants of several established reliability councils are splitting between different RTOs.

Organizations applicable to this region in particular are:

- The Federal Energy Regulatory Commission ("FERC").
- The Western Systems Coordinating Council (WSCC)
- Desert Star
- RTO West

## Organizational Entities

The WSCC territory covers all the western states including western Canada.

All public utilities (except those participating in an approved regional transmission entity that conforms to the Commission's RTO principles) that own, operate or control interstate transmission facilities were required to file with the Commission by October 15, 2000 a proposal for an RTO with the minimum characteristics and

functions adopted in the Final Rule, or, alternatively, a description of efforts to participate in an RTO, any existing obstacles to RTO participation, and any plans to work toward RTO participation.

## FERC RTO's

FERC has taken several steps in re-emphasizing its position on the development of large, independent, transmission organizations in order to fulfill the goals outlined in Order No. 888. Steps include the May 1999 notice of proposed rulemaking (NOPR), the subsequent FERC Order 2000, and several precedent setting orders to individual utility or RTO/ISO filings.

The Commission identifies the following minimum characteristics and functions that must be met in order to qualify as an RTO.

- Independence from market participants;
- Appropriate scope and regional configuration;
- Possession of operational authority for all transmission facilities under the RTO's control; and
- Exclusive authority to maintain short-term reliability.

Seven Minimum Functions an RTO must perform:

1. Administer its own tariff and employ a transmission pricing system that will promote efficient use and expansion of transmission and generation facilities;
2. Create market mechanisms to manage transmission congestion;
3. Develop and implement procedures to address parallel path flow issues;
4. Serve as a supplier of last resort for all ancillary services required in Order No. 888 and subsequent orders;
5. Operate a single OASIS site for all transmission facilities under its control with responsibility for independently calculating TTC and ATC;
6. Monitor markets to identify design flaws and market power; and
7. Plan and coordinate necessary transmission additions and upgrades.

## Desert STAR

The following is the December 28, 2000 FERC Compliance filing (Docket No. RTO1-44-000) filed reporting on the status of Desert Star:

*"On October 16, in Arizona Public Service Co. Docket No. RO1-44-000, Desert STAR, Inc., ("Desert STAR") together with six utilities subject to the Commission's jurisdiction –Arizona Public Company, El Paso Electric Company, Public Service Company of Colorado, Public Service Company of New Mexico, Texas-New Mexico Power Company and Tucson Electric Power Company (the "Jurisdictional Utilities") – filed a detailed report on their efforts to establish a Regional Transmission Organization ("RTO") ("October 16 Filing"). The RTO is expected to encompass all or portions of Arizona, New Mexico, Colorado, Eastern Wyoming and West Texas.*

*Numerous issues have been resolved. Others remain, not the least of which is the development of a suitable transmission rate design. The task is especially difficult in*

*light of the fact that approximately one-half of the transmission facilities in the region are owned by entities, such as Federal power marketing administrations, tax-exempt utilities and cooperatives, that are not subject to the Commission's jurisdiction. Moreover, the current transmission rates differ markedly among the various entities. The jurisdictional Utilities and Salt River Project Agricultural Improvement & Power District ("Salt River Project") made a transmission rate design proposal and are working with non-jurisdictional transmission owners (such as Western Area Power Administration, Tri-State Generation and Transmission Association, Southwest Transmission Cooperative, Inc. and Colorado Springs Utilities) to further develop and refine the proposal for presentation to the stakeholders and Board of Directors. Other issues remain to be resolved.*

*The stakeholders are continuing to develop the documentation that will be necessary for a more complete and better developed filing. The utilization of a collaborative process involving substantial stakeholders input should produce a better end product, with fewer issues to be resolved by the Commission, but such process is necessarily time-consuming."*

### RTO West

On October 16, 2000, Nevada Power, along with eight other utilities and market participants, filed with FERC to form a regional transmission organization named RTO West. The nine members of RTO West are Avista, BPA, Idaho Power, Montana Power, Nevada Power, PacificCorp, Portland General; Electric, Puget Sound Energy and Sierra Pacific.

As proposed, RTO West will operate the transmission systems for all participating transmission owners located in Washington, Oregon, Idaho, Nevada, Utah, and parts of Montana, Wyoming and California.

In addition to the RTO West FERC Filing, six of the utilities have taken an additional step toward formation of an independent for profit transmission company, TransConnect. The new transmission company would own or lease the high voltage transmission facilities currently held by Avista Corp., Montana Power Company, Portland General Electric, Puget Sound Energy, Nevada Power Company, and Sierra Pacific Power Company.

## Transmission Interconnection Requirements

Transmission Interconnection requirements can vary from utility to utility. FERC Order 888 outlined equal access to transmission service but did not address the ability to interconnect to a utility's transmission system without requesting firm transmission service. As such, many utilities required that a firm transmission request be submitted under their OASIS rules in order to interconnect new generation. FERC precedence, however, has provided for two distinct types of service, i.) Interconnection Service and ii.) Transmission Service. This is an important consideration and distinction - Interconnection Service allows the facility addition to interconnect to the power system, but does not grant the right to transmit power to the

ultimate consumers (deliverability). In order to obtain the right to transfer power to the ultimate consumer, Transmission Service needs to be procured. Most transmission providers limit non-Load Serving Entities (LSE's) to Point to Point Transmission Service, and therefore, a merchant generation developer must also specify a Point of Delivery, or "sink" when requesting Transmission Service.

The initial step of the response by the host to both the transmission service and/or interconnection request is a study, if required, completed at the expense of the requestor. In regards to the Project, Interconnection requests have been filed with both TEP and APS.

In addition to electrical interconnection requirements, merchant power providers will require significant interface with local regulatory bodies.

# Regional Background

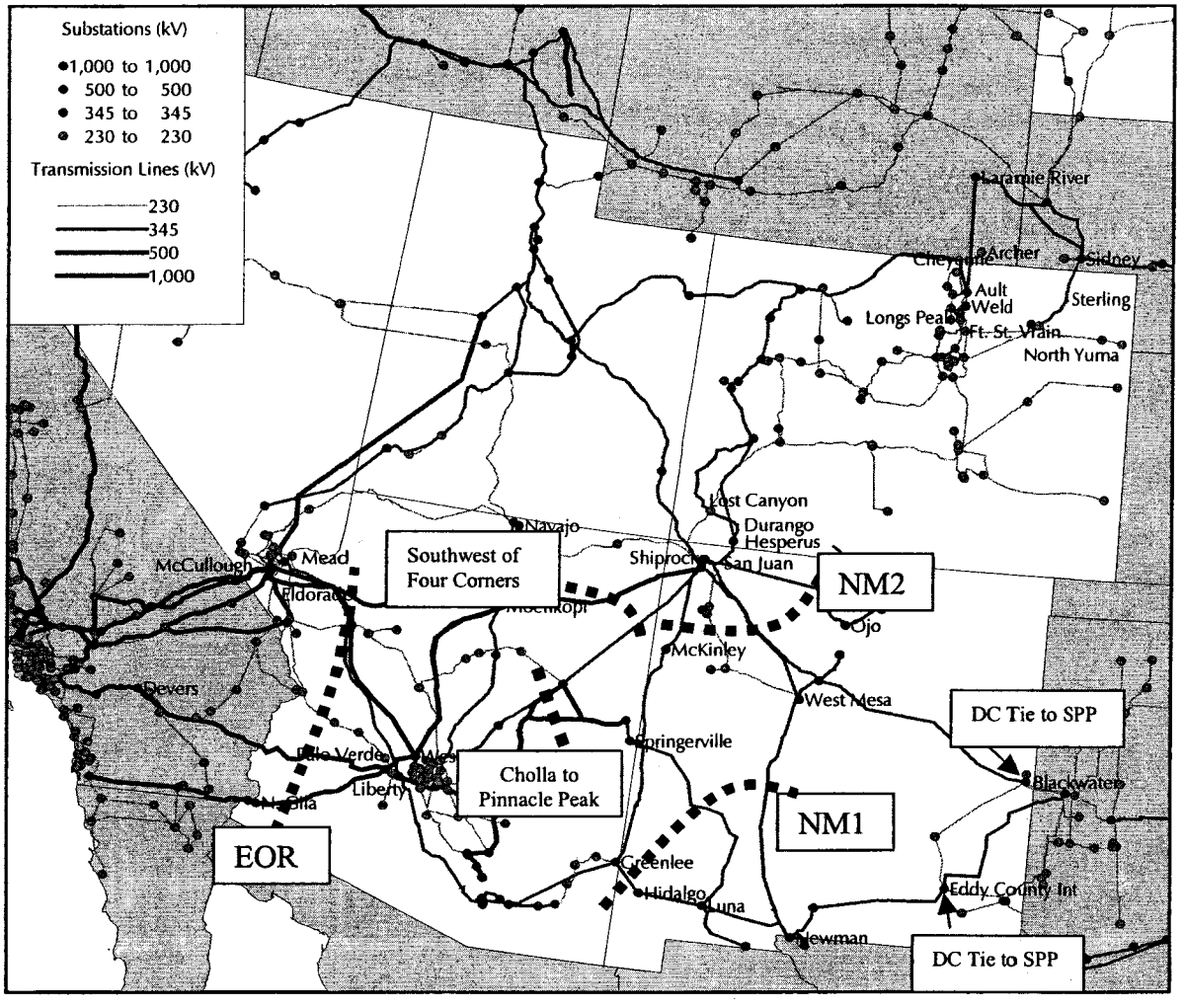
The Project is located within the southwestern WSCC region, southeast of Phoenix, Arizona. The Extra High Voltage ("EHV") transmission system in the region includes 500 kV, 345 kV, and 230 kV.

## Infrastructure and Constraints

The predominant flow of power in Arizona is across the East of the River path ("EOR") to the west into California and from the north and northeast in Arizona into the Phoenix and Tucson load zones. As such flow to the Arizona markets is constrained from the Four Corners region, the Navajo plant and the Cholla plant into Phoenix. Additionally, as new plants are constructed around Palo Verde, studies have shown (as described in the July 2001 Revised Biennial Transmission Assessment) that delivery from this hub will become more congested in regards to delivery into the Arizona markets.

Several potentially limited transmission paths affecting Arizona are included in the WSCC Path Rating Catalog and are shown on the Figure below.

## WSCC RATED TRANSMISSION "PATHS"




Several Paths identified on the figure above are described below.

| Path # | Path Description | Rating (MW) |
|---|---|---|
| 22 | Southwest of Four Corners | 2325 (East – West) |
| 47 | Southern New Mexico (NM1) | 925 (S)[1] 1048 (NS)[2] |
| 48 | Northern New Mexico (NM2) | 1450 - 1692 |
| 49 | East of the River (EOR) | 7550 (East – West) Not rated (West – East) |
| 50 | Cholla to Pinnacle Peak | 1200 (East – West) |

# Regional Generation

Dispatch of generation in the region of the Project affects the results of the analyses. The following table shows existing Arizona Utilities' generation presented in an approximated economic dispatch order based on filed FERC Form 1 data.

**Table 1**
**Summary of Existing Regional Generation**

| Ownership | Plant Name | Prime Mover | Prime Fuel | Year(s) Built | Cap Factor (%) | # of Units | Net Generation (MWh) | Total Production $/MWh | Maximum Capability (MW) |
|---|---|---|---|---|---|---|---|---|---|
| Jointly | Palo Verde | NU | Nuclear | 1986-88 | 92.0 | 3 | 13970770 | 18.21 | 3810 |
| TEP | Springerville | ST | Coal | 1985/90 | 87.6 | 2 | 5829792 | 32.56 | 760 |
| Jointly | Four Corners | ST | Coal | 1970 | 82.1 | 5 | 3478408 | 12.56 | 2060 |
| Jointly | San Juan | ST | Coal | 1973/82 | 81.1 | 2 | 5329445 | 23.26 | 1798 |
| Jointly | Navajo | ST | Coal | 1974/76 | 65.8 | 3 | 10581100 | 16.38 | 2415 |
| SRP | Stewart Mt. | HY | Hydro | 1929 | 61.4 | 1 | 33565 | 27.81 | 13 |
| AEPCO | Apache | ST | Coal/Gas | 1964/79 | 54.0 | 3 | UNK | UNK | 425 |
| APS | Cholla | ST | Coal | 1962/81 | 51.7 | 4 | 3845135 | 20.11 | 995 |
| WAPA | Parker – Davis | HY | Hydro | 1951 | 48.8 | 5 | UNK | UNK | 366 |
| SRP | Coronado | ST | Coal | 1979/80 | 46.4 | 2 | 5039392 | 25.24 | 736 |
| WAPA | Glen Canyon | HY | Hydro | 1964/66 | 39.1 | 8 | UNK | UNK | 1304 |
| SRP | Roosevelt | HY | Hydro | 1972 | 31.5 | 1 | 70299 | 26 | 34 |
| TEP | Irvington | ST | Coal/Gas | 1967 | 29.9 | 4 | 1104485 | 45.7 | 425 |
| SRP | Mormon Flat | HY | Hydro | 1920/71 | 27.3 | 2 | 109749 | 15.18 | 51 |
| APS | West Phoenix CC | CC | Gas (Old) | 1976 | 27.0 | 3 | 602590 | 36.09 | 285 |
| SRP | Agua Fria | ST | Gas/Oil (Old) | 1961 | 24.6 | 3 | 888092 | 32.86 | 386 |
| SRP | Horse Mesa | HY | Hydro | 1927/72 | 24.4 | 4 | 207372 | 16.75 | 125 |
| APS | Ocotillo | ST | Gas | 1960 | 15.9 | | 319380 | 45.43 | 230 |
| APS | Saguaro | ST | Gas/Oil | 1955 | 9.7 | 2 | 178262 | 46.47 | 209 |
| SRP | Santan | CC | Gas (Old) | 1974-5 | 9.7 | 4 | 714062 | 35.11 | 307 |
| SRP | Kyrene | ST | Gas/Oil | 1954 | 5.4 | 2 | 50072 | 76.48 | 106 |
| APS | West Phoenix | GT | Gas | 1973 | 5.2 | 3 | 50903 | 53.92 | 284 |
| APS | Ocotillo | GT | Gas | 1972-3 | 3.4 | | 33501 | 62.81 | 187 |
| APS | Saguaro GT | GT | Gas/Oil (Old) | 1973 | 2.7 | 2 | 26142 | 65.35 | 109 |
| SRP | Agua Fria GT | GT | Gas | 1975 | 2.2 | 3 | 42223 | 196.66 | 226 |
| APS | Yucca | GT | Gas/Oil (Old) | 1971-4 | 2.0 | 5 | 25551 | 63.14 | 223 |
| AEPCO | Apache CT | GT | Gas/Oil (Old) | 1975 | 1.2 | 2 | UNK | UNK | 130 |
| SRP | Kyrene GT | GT | Gas/Oil (Old) | 1973 | 1.2 | 3 | 18990 | 75.2 | 158 |
| TEP | Irvington GT | GT | Gas/Oil (Old) | 1973 | 0.8 | 2 | 5161 | 72.68 | 60 |
| TEP | North Loop | GT | Gas/Oil (Old) | 1973 | 0.7 | 5 | 5631 | 70.64 | 310 |
| TEP | DeMoss Petrie | GT | Gas/Oil (Old) | 1973/2001 | 0.1 | 1 | 569 | 441.7 | 130 |
| District Owned | New Waddell | HY | Hydro | 1993 | UNK | 4 | UNK | UNK | 46 |
| Non-utility | Yuma | CC | Gas (Old) | 1994 | UNK | 1 | UNK | UNK | 56 |
| AEPCO | Apache CC | CC | Gas (Old) | 1963 | NA | 2 | UNK | UNK | 30 |
| UNK | Vail CT | UNK | Gas/Oil (Old) | UNK | NA | 1 | UNK | UNK | 130 |

# Proposed Regional Generation

Since dispatch of other generating resources affects power flows in the region, it may be necessary to add some level of "new" generation to the Base Case. As such, the following table lists proposed generation in the region and that which has been selected to include in the Base Case model.

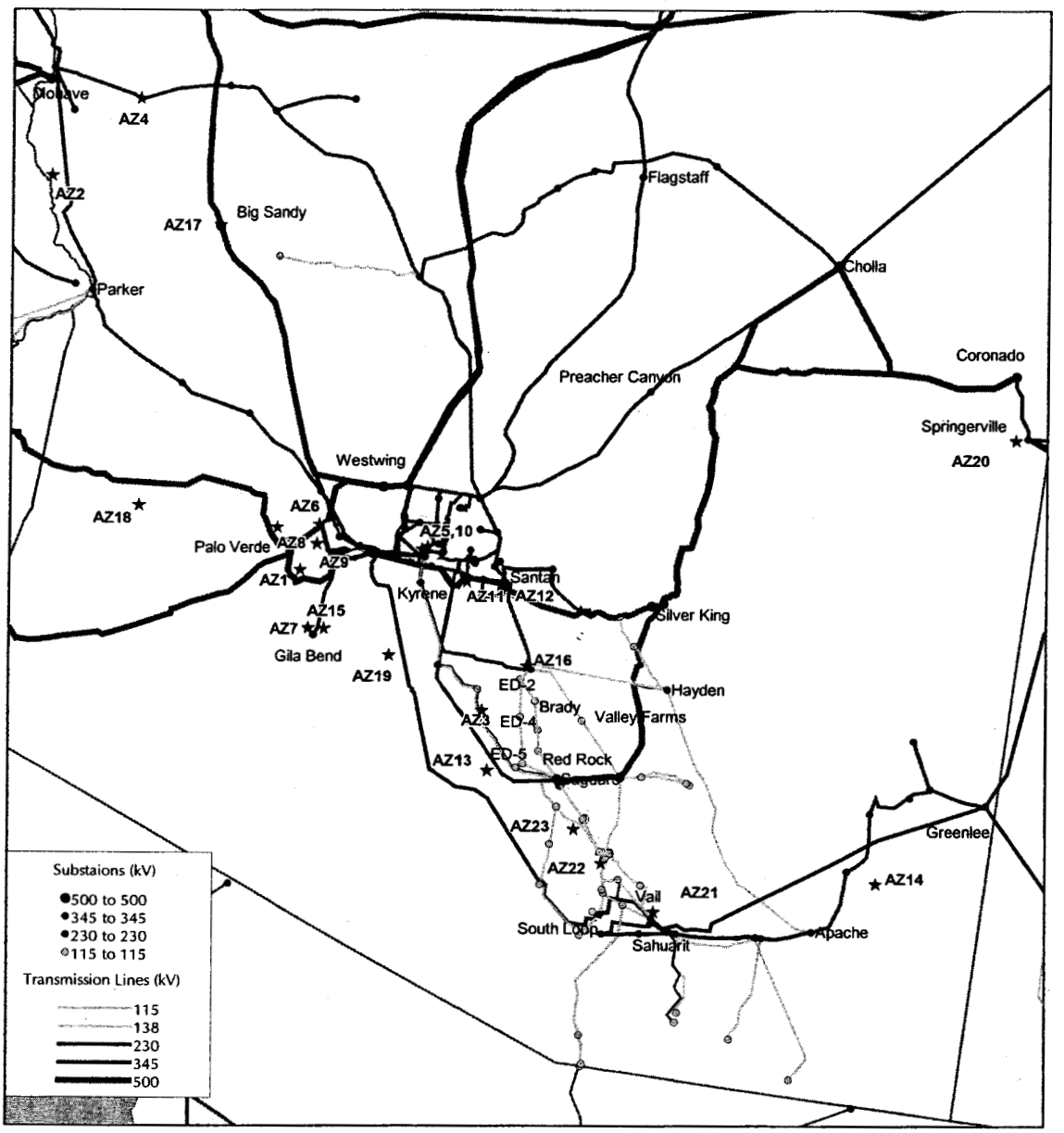
## Proposed Generation Table

| # | Developer | Plant Name | Location | State | Summer MW | ISDN | Comments |
|---|---|---|---|---|---|---|---|
| AZ1 | Duke Energy Power Services | Arlington Valley | SW of Buckeye | AZ | 500 | 2002 | Under Construction |
| AZ6a | Pinnacle West Energy | Red Hawk | Palo Verde | AZ | 1000 | 2002 | Under Construction |
| AZ6b | Pinnacle West Energy | Red Hawk | Palo Verde | AZ | 1000 | 2006 | CEC Approval |
| AZ7a | Panda Energy International | Gila River | Gila River | AZ | 1000 | 2003 | Under Construction |
| AZ7b | Panda Energy International | Gila River | Gila River | AZ | 1000 | 2004 | CEC Approval |
| AZ8 | PG&E Generating | Harquahala | Harquahala | AZ | 1000 | 2003 | Under Construction |
| AZ9 | Sempra Energy Resources | Mesquite | Near Palo Verde | AZ | 1000 | 2003 | Under Construction |
| AZ13a | Toltec Power Station, LLC. | Toltec Power Station | Eloy (Toltec) | AZ | 1200 | 2003 | CEC Pending |
| AZ13b | Toltec Power Station, LLC. | Toltec Power Station | Eloy (Toltec) | AZ | 600 | 2004 | CEC Pending |
| AZ14 | Bowie Power Station, LLC. | Bowie Power Station | Bowie | AZ | 1000 | 2004 | CEC filed on July 27, 2001 |
| AZ15 | Gila Bend Power Partners | Gila Bend | Gila Bend | AZ | 750 | 2003 | CEC approval |
| AZ16 | PP&L | PPL Sundance Energy | Coolidge | AZ | 540 | 2002 | CEC approval (80%)– Peaking unit |
| AZ17 | Caithness Big Sandy LLC | | Wikieup | AZ | 720 | 2002 | CEC Pending |
| AZ18 | Allegheny Energy Supply Co | La Paz | La Paz Co. | AZ | 1080 | 2005 | Status of CEC unknown |
| AZ19 | AES | Montezuma Energy | Mobile | AZ | 520 | 2003? | Status of CEC unknown |
| AZ20a | Unisource/Bechtel | Springerville | Springerville | AZ | 380 | 2004 | ACC Approval in 1977 |
| AZ20b | Unisource/Bechtel | Springerville | Springerville | AZ | 380 | 2005 | ACC Conditional Approval in 1987 Updated Application Filed |
| AZ21 | Tucson Electric Power Co | Vail Generating Station | Rita Ranch | AZ | 150 | 2002 | Peaking |
| AZ22 | Tucson Electric Power Co | DeMoss Petrie | DeMoss Petrie | AZ | 75 | 2002 | Peaking |
| AZ23 | Tucson Electric Power Co | North Loop | North Loop | AZ | 21 | 2002 | Peaking |

| | |
|---|---|
| Darker Highlight | Indicates the plant was already modeled in the WSCC Summer Peak Case |
| Lighter Highlight | Indicates the plant was modeled in the Base Case and may or may not be dispatched |
| No Highlight | Indicates the plant was not added to the Base Case |

The following figure provides a geographic representation of the proposed and planned generation plants.

**Proposed Generation Figure**




# Local Market Assessment Summary

In addition to evaluating the impact of integration of the Project on power flows in the region, it is also important, when siting new generation, to evaluate how a proposed resource may meet the projected resource needs of the region. Although the load and resource balance of the entire Arizona region is a consideration, the ability to serve regional load pockets, e.g., the East Valley and Tucson markets, is a significant consideration applicable to the Project site. This consideration applies both to the interconnection, discussed previously, and the resource capacity in the region.

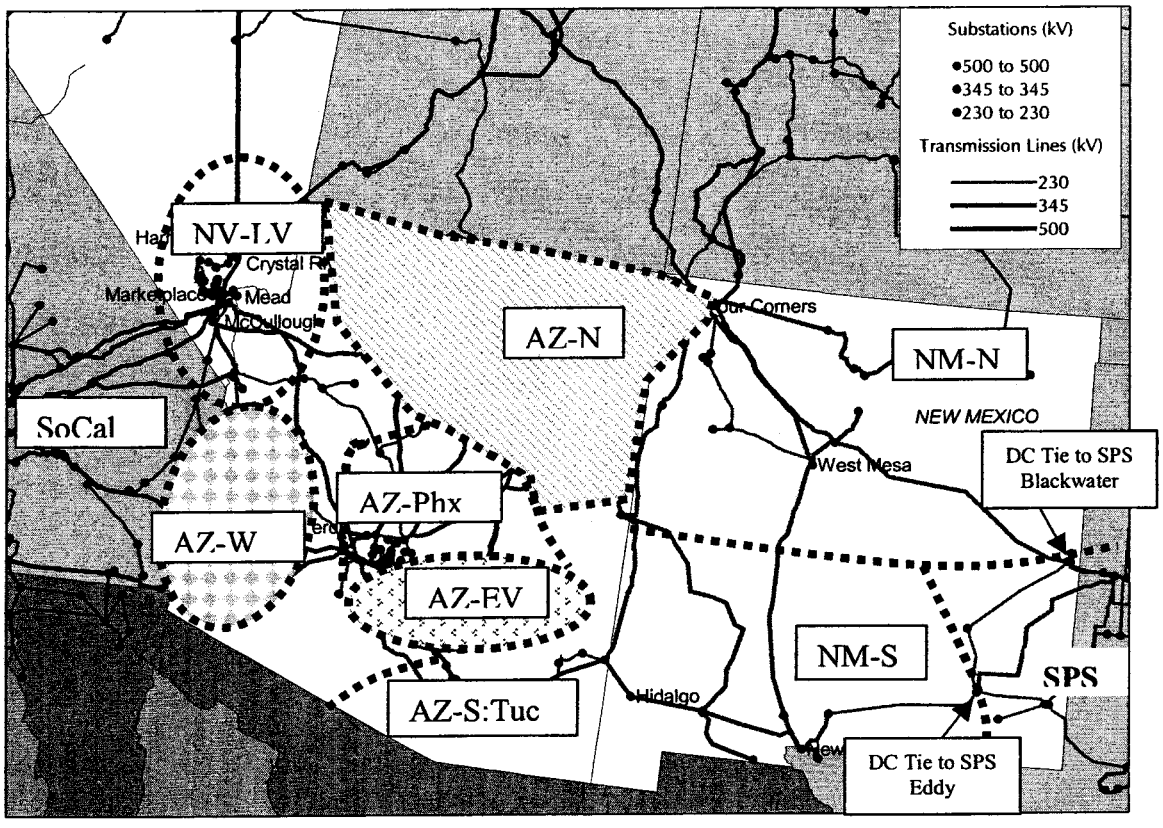
Based on a number of factors including, but not limited to, the existing location of generation, load and announced generation, Beck has separated the target areas into the Load Zones described in the following table.

**ARIZONA LOAD/RESOURCE ZONES**

| NAME | GENERAL LOCATION | COMMENTS |
|---|---|---|
| **AZ-N** | Northern and Eastern AZ | Heavy generation area; includes coal plant in northeastern and eastern Arizona. |
| **AZ-Phx** | Phoenix, Arizona | Zone covers the Phoenix region generally north of I-10 up to Prescott north of Phoenix. The Load Zone also includes the Palo Verde area generation. |
| **AZ-EV** | East Valley (Arizona) | The East Valley has experienced constraints in delivering power to the area. SRP has a large portion of the load within the zone and the major delivery points are Kyrene, Coronado to Silver King and Saguaro 500 kV ties. |
| **AZ-S:Tuc** | Southeast Arizona including Tucson | The area of Arizona southeast of Saguaro and south of Greenlee experiences existing constraints in importing power mainly into Tucson. As such, there is existing "must-run" generation in the zone. |
| **AZ-W** | Western Arizona (Yuma/Parker) | The Yuma area has only a small amount of existing generation, but likewise does not have a large amount of load. This region is, however, in the major corridor from Palo Verde to San Diego and has experienced regional transmission constraints. The northern portion of the Zone has less load (mainly Lake Havasu,, Kingman), and two new generating plants, Griffiths and Southpoint. |
| **NM-N** | Northern New Mexico | The area primarily consists of Public Service of New Mexico ("PNM") load in Albuquerque. |
| **NM-S** | Southern New Mexico | This area is primarily El Paso Electric's ("EPE") service territory. This is not expected to be a primary market for new Arizona generation. |
| **NV-LV** | Las Vegas, Nevada | The Las Vegas region has strong ties to both Arizona and Southern California. |
| **SoCal** | Southern California | Arizona transmission could face congestion tied to deliveries to the Southern California market. |

These zones are shown graphically on the following figure.

LOAD/RESOURCE ZONES



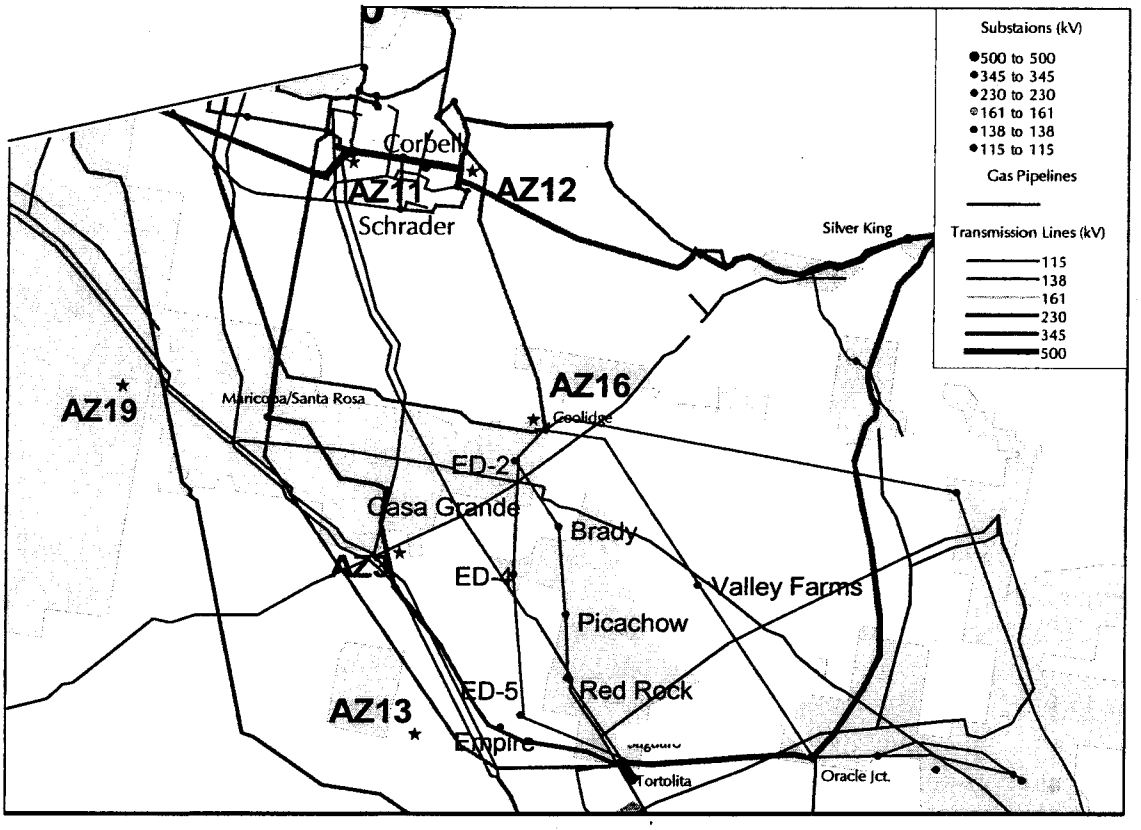

The Toltec Project site is located on the southern edge of the AZ-EV zone. Details pertaining to this zone are provided below.

## AZ-EV Zone

The East Valley zone includes the fast growing East Valley region (e.g., Tempe, Mesa, Chandler) of the Phoenix metropolitan area as well as Coolidge and down to Saguaro generating station. Utilities within the zone primarily include SRP, APS, WAPA, Mesa Electric Utility, San Carlos Irrigation Project and several Electrical/Irrigation Districts.

The zone has an existing deficiency in generation. This deficiency would turn to a surplus if all planned generation were constructed.

**AZ-EV ZONE**

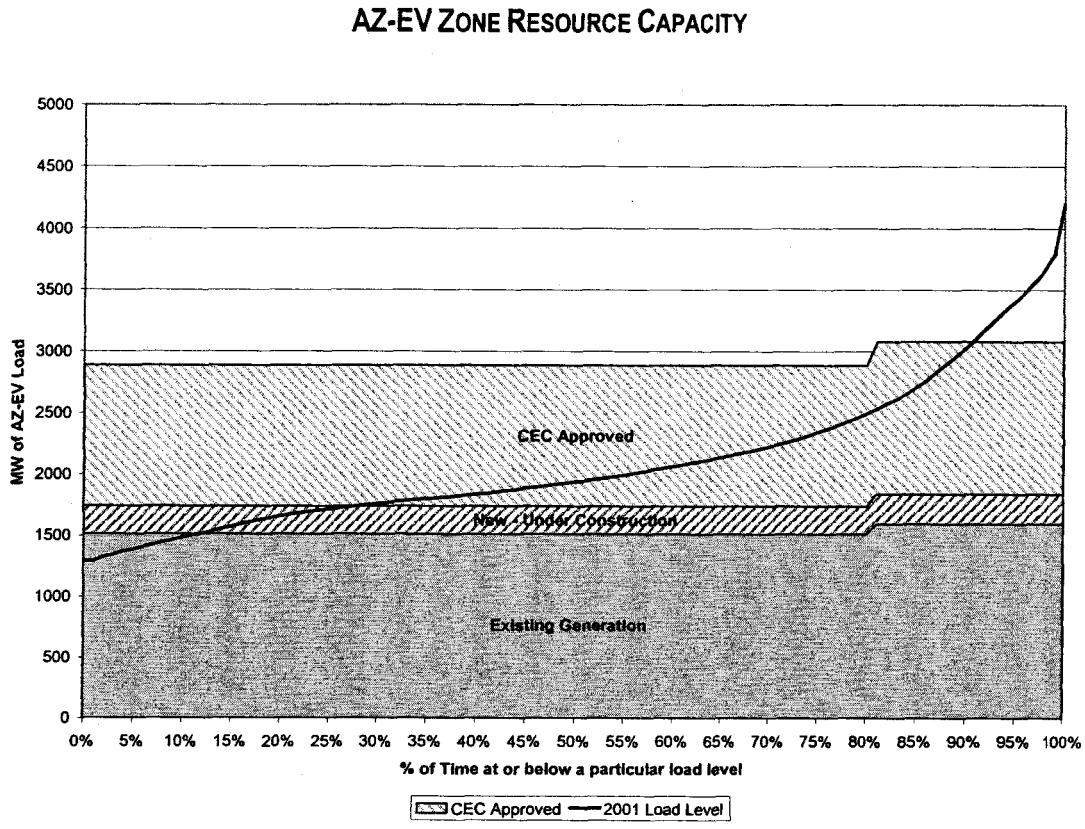



The following table lists the existing and the proposed generation in the East Valley region. The table is divided into sections representing the status of the various units. The top of the list contains existing plants, that were for this region put into operation between 1920 and 1975. While the oldest units are Hydro plants, the fossil fuel plants began operation as early as 1955 and as late as 1975. There is also one new 540 MW combined cycle generating unit that came on-line in 2001.

| Plant Name | Cap Factor (%) | # of Units | Fuel Type | Year(s) Built/ ISD | Net Generation (MWh) | Total Prod ($/MWh) | Maximum Capability (MW) | Ownership |
|---|---|---|---|---|---|---|---|---|
| Stewart Mt. | 61.44 | 1 | Hydro | 1929 | 33,565 | 27.81 | 13 | SRP |
| Roosevelt | 31.47 | 1 | Hydro | 1972 | 70,299 | 26 | 34 | SRP |
| Mormon Flat | 27.26 | 2 | Hydro | 1920/71 | 109,749 | 15.18 | 51 | SRP |
| Horse Mesa | 24.41 | 4 | Hydro | 1927/72 | 207,372 | 16.75 | 125 | SRP |
| Saguaro | 9.74 | 2 | ST Gas/Oil | 1955 | 178,262 | 46.47 | 209 | APS |
| Santan | 9.69 | 4 | CC (Old) | 1974-5 | 714,062 | 35.11 | 307 | SRP |
| Kyrene | 5.39 | 2 | ST Gas/Oil | 1954 | 50,072 | 76.48 | 106 | SRP |
| Saguaro GT | 2.71 | 2 | CT Gas/Oil (Old) | 1973 | 26,142 | 65.35 | 109 | APS |
| Kyrene GT | 1.18 | 3 | CT Gas/Oil (Old) | 1973 | 18,990 | 75.2 | 158 | SRP |
| Desert Basin (AZ3) | New/IO | 3 | CC (New) | 2001 | - | - | 540 | Reliant |
| Kyrene (AZ11) | New/UC | 2 | CC (New) | 2002 | - | - | 250 | SRP |
| Santan (AZ12) | New/CEC | 4 | CC (New) | 2005 | - | - | 726 | SRP |
| PPL Sundance Energy (AZ16) | New/CEC | 1 | CC (New) | 2003 | - | - | 540 | PP&L |
| Toltec Power Station Phase I (AZ13) | New/PEN | 2 | CC (New) | 2003 | - | - | 1200 | Toltec |
| Toltec Power Station Phase II (AZ13) | New/PEN | 1 | CC (New) | 2004 | - | - | 600 | Toltec |
| Mobile (AZ19) | New/PLN | 1 | CC (New) | 2003 | - | - | 520 | AES |
| **Total** | | | | | | | 5488 | |

IO – In operation UC – Under construction CEC – CEC Approval PEN – CEC Pending FLD – CEC Filed PLN - Planned

The following figure shows the level of existing, under construction and CEC approved generation plotted against the 2001 load duration curve (inclusive of reserve margin) for the zone. It is noted that much of this generation is not even yet under construction, let alone operating. With the exception of the applied forced and maintenance outage rate, the generation level shown assumes no retirements and that the full output level of the units (as shown above in the generation summary table) is available on-peak.




Even with the operating Desert Basin plant (included with the existing generation) and the under construction Kyrene expansion (shown marked as New – Under Construction), the zone will have to import power to serve zone load over 70% of the time, and at peak, close to its import limit of approximately 2500 MW.

The following tables provide a summary of the projected load and resource balance for the zone from 2001 to 2008. New generation plants that are under construction are included in the Base while in addition new generation plants with CEC approval or a CEC application filed are included in the Stress.

## AZ-EV BASE

| AZ-EV | New Gen Capacity (MW) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| **WSCC Growth - 2.5%** | | | | | | | | | |
| **Peak Demand - MW** | | 3747 | 3841 | 3937 | 4035 | 4136 | 4239 | 4345 | 4454 |
| **Historical Growth - 5.2%** | | | | | | | | | |
| **Peak Demand - MW** | | 3747 | 3942 | 4147 | 4362 | 4589 | 4828 | 5079 | 5343 |
| Resources: | | | | | | | | | |
| Hydro | | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 |
| ST Coal/Gas | | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 |
| CC (New) | | 540 | 540 | 540 | 540 | 540 | 540 | 540 | 540 |
| CC (Old) | | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 |
| CT Gas/Oil (Old) | | 267 | 267 | 267 | 267 | 267 | 267 | 267 | 267 |
| New Generation: | | | | | | | | | |
| SRP Kyrene (AZ11) | 250 | 0 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| SRP Santan (AZ12) | 726 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PPL Sundance (AZ16) | 540 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SPG Toltec Phase I (AZ13) | 1760 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SPG Toltec Phase II (AZ13) | 880 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **New Resources Added** | | 0 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| **Total Resources** | | 1652 | 1902 | 1902 | 1902 | 1902 | 1902 | 1902 | 1902 |
| ***2.5% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | 450 | 461 | 472 | 484 | 496 | 509 | 521 | 534 |
| ***Surplus(Deficit) - MW*** | | *(2545)* | *(2400)* | *(2507)* | *(2617)* | *(2730)* | *(2846)* | *(2965)* | *(3086)* |
| ***% of Peak Demand*** | | *-68%* | *-62%* | *-64%* | *-65%* | *-66%* | *-67%* | *-68%* | *-69%* |
| ***5.2% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | *450* | *473* | *498* | *523* | *551* | *579* | *609* | *641* |
| ***Surplus(Deficit) - MW*** | | *(2545)* | *(2513)* | *(2742)* | *(2984)* | *(3238)* | *(3505)* | *(3786)* | *(4082)* |
| ***% of Peak Demand*** | | *-68%* | *-64%* | *-66%* | *-68%* | *-71%* | *-73%* | *-75%* | *-76%* |

Projecting the load levels from the current levels demonstrates how the Toltec Project, in conjunction with the already approved Santan plant, scheduled to come on-line by 2005 summer peak, and the Sundance peaking project, shows there would still be a deficiency assuming the historical growth rate. Additionally, the graph does not factor in the use restrictions of the older Kyrene units or those that may apply to Santan. Even thought the total capacity increase added for these two units is 976 MW (250 for Kyrene plus 726 MW for Santan), operating restriction may in reality only result in a net increase in the order of 400 MW. This would result in lowering the level of existing generation by over 500 MW. This reduction is not shown in the following table nor is the fact that almost 900 MW of the gas/oil generation in the zone (including the Kyrene and Santan units that may be operationally limited per CEC) will be 30 years or older by 2003 and 315 MW of this same generation will be over 40 years old by 2005.

### AZ-EV STRESS

| AZ-EV | New Gen Capacity (MW) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| **WSCC Growth - 2.5%** | | | | | | | | | |
| **Peak Demand - MW** | | 3747 | 3841 | 3937 | 4035 | 4136 | 4239 | 4345 | 4454 |
| **Historical Growth - 5.2%** | | | | | | | | | |
| **Peak Demand - MW** | | 3747 | 3942 | 4147 | 4362 | 4589 | 4828 | 5079 | 5343 |
| Resources: | | | | | | | | | |
| Hydro | | 223 | 223 | 223 | 223 | 223 | 223 | 223 | 223 |
| ST Coal/Gas | | 315 | 315 | 315 | 315 | 315 | 315 | 315 | 315 |
| CC (New) | | 540 | 540 | 540 | 540 | 540 | 540 | 540 | 540 |
| CC (Old) | | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 |
| CT Gas/Oil (Old) | | 267 | 267 | 267 | 267 | 267 | 267 | 267 | 267 |
| New Generation: | | | | | | | | | |
| SRP Kyrene (AZ11) | 250 | 0 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| SRP Santan (AZ12) | 726 | 0 | 0 | 0 | 0 | 726 | 726 | 726 | 726 |
| PP&L Sundance (AZ16) | 540 | 0 | 0 | 540 | 540 | 540 | 540 | 540 | 540 |
| SPG Toltec Phase I (AZ13) | 1160 | 0 | 0 | 0 | 1200 | 1200 | 1200 | 1200 | 1200 |
| SPG Toltec Phase II (AZ13) | 580 | 0 | 0 | 0 | 0 | 600 | 600 | 600 | 600 |
| **New Resources Added** | | 0 | 250 | 790 | 1990 | 3316 | 3316 | 3316 | 3316 |
| **Total Resources** | | 1652 | 1902 | 2442 | 3642 | 4968 | 4968 | 4968 | 4968 |
| ***2.5% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | 450 | 461 | 472 | 484 | 496 | 509 | 521 | 534 |
| ***Surplus(Deficit) - MW*** | | *(2545)* | *(2400)* | *(1967)* | *(877)* | *336* | *220* | *101* | *(20)* |
| ***% of Peak Demand*** | | *-68%* | *-62%* | *-50%* | *-22%* | *8%* | *5%* | *2%* | *0%* |
| ***5.2% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | *450* | *473* | *498* | *523* | *551* | *579* | *609* | *641* |
| ***Surplus(Deficit) - MW*** | | *(2545)* | *(2513)* | *(2202)* | *(1244)* | *(172)* | *(439)* | *(720)* | *(1016)* |
| ***% of Peak Demand*** | | *-68%* | *-64%* | *-53%* | *-29%* | *-4%* | *-9%* | *-14%* | *-19%* |

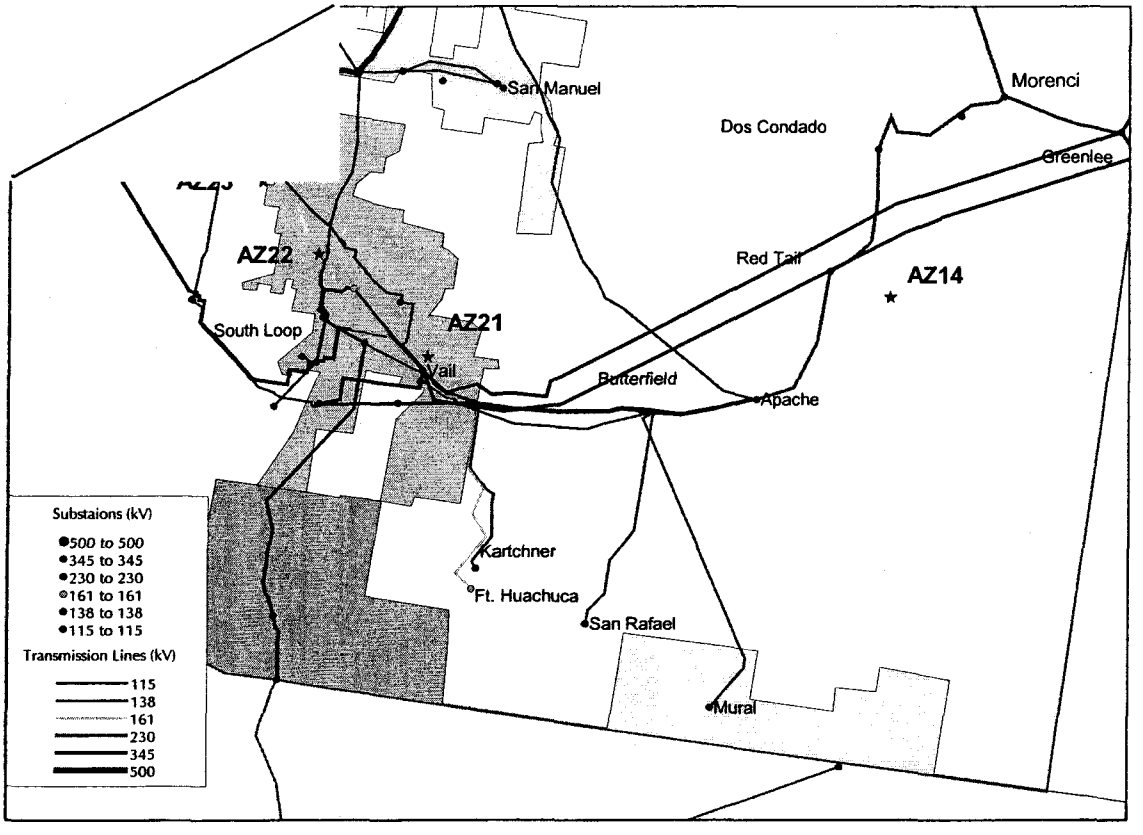
# AZ-S: TUC Zone

This zone covering southeastern Arizona has, at it center, the city of Tucson. The Toltec Project interconnection has a tie directly to this zone via its 345 kV Westwing to South connection.

Utilities within the zone primarily include TEP, AEPCO (including member Coops), Citizens Utilities, Thatcher Municpal Utilities, Morenci Water and Electric Company and Electrical/Irrigation Districts.

The Tucson zone has a large number of older gas/oil generating units and few megawatts of announced new plants within the zone. However, TEP has announced and expansion of its coal-fired Springerville generating station and an associated new transmission line addition from Springerville to Greenlee. This power would be delivered along with the existing Springerville plant into the Tucson system at Vail. There has also been some talk of a line to Mexico from this zone, which, if constructed, would increase the need for generation within or import capability into the zone.

AZ-S:TUC



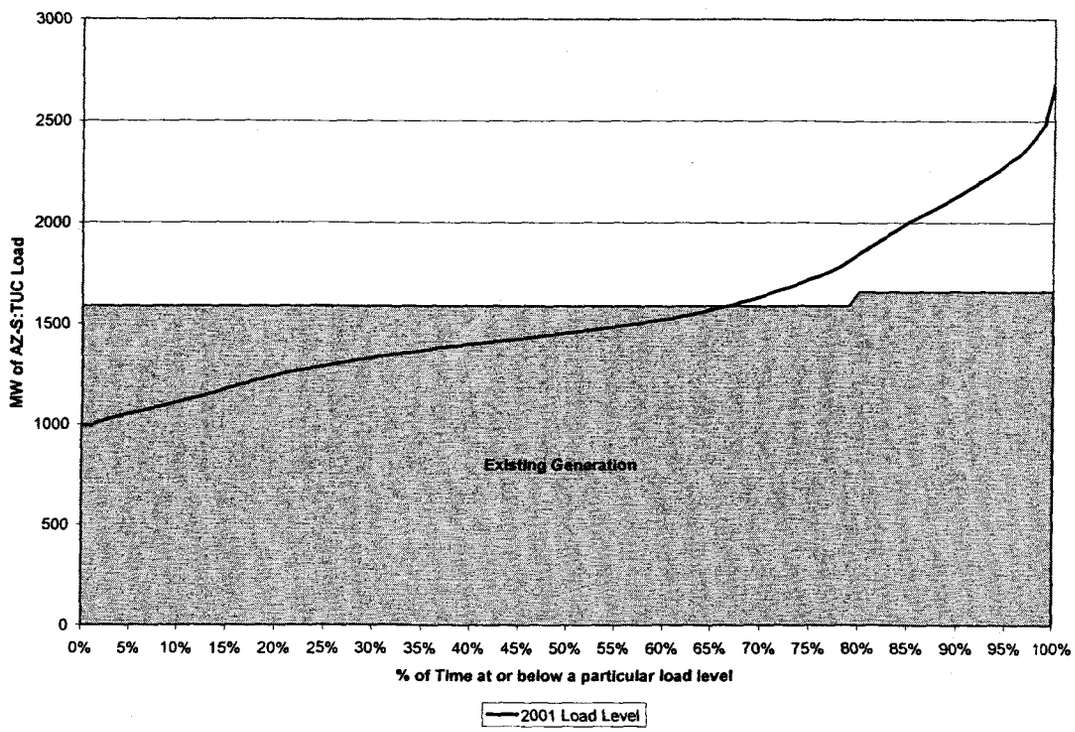

The following table lists the existing generation and the proposed new generation in the region. The table is divided into sections representing the status of the various units. The top of the list contains existing plants, that were for this region put into operation between 1964 and 1990. Within the City of Tucson load area of the zone, there are fossil fuel plants that began operation as early as 1955 and as late as 1973. Additionally two plant expansions totaling 96 MW were placed in operation in 2001.

| Plant Name | Cap Factor (%) | # of Units | Fuel Type | Year(s) Built/ ISD | Net Generation (MWh) | Total Prod ($/MWh) | Maximum Capability (MW) | Ownership |
|---|---|---|---|---|---|---|---|---|
| Apache ST | 54.04 | 3 | ST Coal/Gas | 1964/79 | NA | NA | 425 | AEPCO |
| Irvington | 29.88 | 4 | ST Coal/Gas | 1967 | 1,104,485 | 45.7 | 425 | TEP |
| Apache CT | 1.23 | 2 | CT Gas/Oil (Old) | 1963/75 | NA | NA | 30 | AEPCO |
| Irvington GT | 0.81 | 2 | CT Gas/Oil (Old) | 1973 | 5,161 | 72.68 | 60 | TEP |
| North Loop | 0.68 | 5 | CT Gas/Oil (Old) | 1973 | 5,631 | 70.64 | 310 | TEP |
| DeMoss Petrie | 0.14 | 1 | CT Gas/Oil (Old) | 1973 | 569 | 441.7 | 130 | TEP |
| Apache CC | NA | 2 | CC (Old) | 1964 | NA | NA | 140 | AEPCO |
| Vail CT | NA | 1 | CT Gas/Oil (Old) | NA | NA | NA | 130 | NA |
| DeMoss Petrie (New) (AZ22) | New/IO | 1 | CT Gas | 2001 | - | - | 75 | TEP |
| North Loop (New) (AZ23) | New/IO | 1 | CT Gas | 2001 | - | - | 21 | Millenium |
| Bowie Power Station (AZ14) | New/FLD | 2 | CC (New) | 2004 | - | - | 1000 | Bowie |
| Vail Generating Station (AZ21) | New/PLN | 1 | CT Gas | 2002 | - | - | 150 | TEP |
| **Total** | | | | | | | 2926 | |

IO – In operation UC – Under construction CEC – CEC Approval PEN – CEC Pending FLD – CEC Filed PLN - Planned

The following figure shows the level of existing, under construction and CEC approved generation plotted against the load duration curve (inclusive of reserve margin) for the zone.

**AZ- S: TUC ZONE RESOURCE CAPACITY**




The load in the zone must be served a majority of the time with older higher cost generation or via imports from Springville and other units.

The following tables provide a summary of the projected load and resource balance for the zone from 2001 to 2008. New generation plants that are under construction are included in the Base while in addition new generation plants with CEC approval or a CEC application filed are included in the Stress.

## AZ-S:TUC BASE

| AZ - S: TUC | New Gen Capacity (MW) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| **WSCC Growth - 2.5%** | | | | | | | | | |
| **Peak Demand - MW** | | 2387 | 2447 | 2508 | 2571 | 2635 | 2701 | 2768 | 2837 |
| **Historical Growth - 3.7%** | | | | | | | | | |
| **Peak Demand - MW** | | 2387 | 2475 | 2567 | 2662 | 2760 | 2863 | 2968 | 3078 |
| Resources: | | | | | | | | | |
| ST Coal/Gas | | 850 | 850 | 850 | 850 | 850 | 850 | 850 | 850 |
| CC (Old) | | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 |
| CT Gas | | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 |
| CT Gas/Oil (Old) | | 660 | 660 | 660 | 660 | 660 | 660 | 660 | 660 |
| New Generation: | | | | | | | | | |
| SPG Bowie (AZ14) | 1000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vail CT (AZ21) | 150 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **New Resources Added** | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Resources** | | 1746 | 1746 | 1746 | 1746 | 1746 | 1746 | 1746 | 1746 |
| ***2.5% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | *286* | *294* | 301 | 308 | 316 | 324 | 332 | 340 |
| ***Surplus(Deficit) - MW*** | | *(927)* | *(994)* | *(1063)* | *(1133)* | *(1205)* | *(1279)* | *(1354)* | *(1432)* |
| ***% of Peak Demand*** | | *-39%* | *-41%* | *-42%* | *-44%* | *-46%* | *-47%* | *-49%* | *-50%* |
| ***3.7% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | 286 | 297 | 308 | 319 | 331 | 344 | 356 | 369 |
| ***Surplus(Deficit) - MW*** | | *(927)* | *(1026)* | *(1129)* | *(1235)* | *(1346)* | *(1460)* | *(1579)* | *(1702)* |
| ***% of Peak Demand*** | | *-39%* | *-41%* | *-44%* | *-46%* | *-49%* | *-51%* | *-53%* | *-55%* |

## AZ-S:TUC STRESS

| AZ - S: TUC | New Gen Capacity (MW) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|
| **WSCC Growth - 2.5%** | | | | | | | | | |
| **Peak Demand - MW** | | 2387 | 2447 | 2508 | 2571 | 2635 | 2701 | 2768 | 2837 |
| **Historical Growth - 3.7%** | | | | | | | | | |
| **Peak Demand - MW** | | 2387 | 2475 | 2567 | 2662 | 2760 | 2863 | 2968 | 3078 |
| Resources: | | | | | | | | | |
| ST Coal/Gas | | 850 | 850 | 850 | 850 | 850 | 850 | 850 | 850 |
| CC (Old) | | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 |
| CT Gas | | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 |
| CT Gas/Oil (Old) | | 660 | 660 | 660 | 660 | 660 | 660 | 660 | 660 |
| New Generation: | | | | | | | | | |
| SPG Bowie (AZ14) | 1000 | 0 | 0 | 0 | 1000 | 1000 | 1000 | 1000 | 1000 |
| Vail CT (AZ21) | 150 | 0 | 0 | 150 | 150 | 150 | 150 | 150 | 150 |
| **New Resources Added** | | 0 | 0 | 150 | 1150 | 1150 | 1150 | 1150 | 1150 |
| **Total Resources** | | 1746 | 1746 | 1896 | 2896 | 2896 | 2896 | 2896 | 2896 |
| ***2.5% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | 286 | 294 | 301 | 308 | 316 | 324 | 332 | 340 |
| ***Surplus(Deficit) - MW*** | | *(927)* | *(994)* | *(913)* | *17* | *(55)* | *(129)* | *(204)* | *(282)* |
| ***% of Peak Demand*** | | *-39%* | *-41%* | *-36%* | *1%* | *-2%* | *-5%* | *-7%* | *-10%* |
| ***3.7% Growth*** | | | | | | | | | |
| ***12% Reserve Margin - MW*** | | 286 | 297 | 308 | 319 | 331 | 344 | 356 | 369 |
| ***Surplus(Deficit) - MW*** | | *(927)* | *(1026)* | *(979)* | *(85)* | *(196)* | *(310)* | *(429)* | *(552)* |
| ***% of Peak Demand*** | | *-39%* | *-41%* | *-38%* | *-3%* | *-7%* | *-11%* | *-14%* | *-18%* |

# Section 3

# CASE DEVELOPMENT AND ASSUMPTIONS

As with all load flow analyses, the results of the study are driven by the assumptions used in developing the load flow case. To minimize the impact of these assumptions, Beck starts the process with a publicly filed load flow case model and then details the changes made to the model in evaluating the Project.

## Case Development

The Base Case was created from the FERC-715 Filing 2001 Series WSCC Summer Peak Case., The case was acquired from the CAISO site, but had no changes to Arizona load or generation from the filed WSCC case. The Arizona load level was assumed to be reflective of the 2001 time frame based on peak load data. The WSCC cases are filed with FERC as part of the annual 715 filing requirement. Beck relies upon these load flow models but does not independently verify all of the data in the models.

The selected case included the Palo Verde to Southwest Valley 500 kV line and associated 230 kV modifications. The WSCC case also included WAPA's announced system modification of the Phoenix WAPA – Lone Butte – Santa Rosa from its current operating level of 115 kV to its designed operating level of 230 kV. However, based on new information from WAPA, this operational modification was removed from the Base Case, resulting in a return to how the facility currently operates at the 115 kV level.

The Base Case is then used to create the Change Case(s) by adding the Project. For generating project additions, the generation is re-dispatched to accommodate the generation addition(s). The method used to re-dispatch the generation and a table showing the modifications to the dispatch are shown under Dispatch Assumptions.

The cases developed for this analysis are described below:

- Base Case – WSCC Summer Peak load flow case modified to include proposed generation in the region with a dispatch as shown in Table 3.
- Alternative 1 – Proposed interconnection with Project at 1200 MW.
- Alternative 2 – Same as Alternative 1 with Silverking modification.
- Alternative 3 – Proposed interconnection with project at the 1800 MW.
- Alternative 4 – Same as Alternative 3 with Silverking modification.

While a detailed line design would be required for Alternatives 2 and 4, for the purpose of this analyses, it was assumed that the series compensation, currently

existing on the Cholla – Saguaro 500 kV line, would be relocated from Cholla to Silverking so that the modeling of the Cholla to Silverking 500 kV line more closely matches that of the Coronado to Silverking. The modeled Saguaro to Silverking connection will permit deliveries of power from the Saguaro area directly into the west side of the East Valley without having to contractually schedule over the 230 and/or 115 kV regional system or to Silverking via Cholla and Coronado.

## New Generation Projects in Base Case

The dispatch of generation in a region impacts transmission system power flows. While it is not possible to evaluate all possible operational impacts, for planning purposes, it is necessary to assume a certain level of generation to meet the projected load. In this regard, assumptions need to be made as to which new generation projects should be included in the Base Case model used.

The Base Case includes all generation project in Arizona currently under construction. Additionally, SRP's Santan plant expansion was assumed in-service for the full output of the Project planned by summer peak of 2005.

1. The Duke Energy Arlington Valley plant modeled at 500 MW and dispatched at 498 MW (added to the Base Case)
2. The Calpine Southpoint plant modeled at 520 MW and dispatched at 420 MW (already in the Base Case)
3. The Reliant Desert Basin plant modeled at 540 MW and dispatched at 460 MW (already in the Base Case)
4. The Griffith Energy modeled at 650 MW and dispatched at 540 MW (already in the Base Case)
5. The Pinnacle West Red Hawk plant modeled at 1000 MW and dispatched at 873 MW (added to the Base Case)
6. The Panda Gila River plant modeled at 1000 MW and dispatched at 873 MW (added to the Base Case)
7. The PG&E Harquahala plant modeled at 1000 MW and dispatched at 873 MW (added to the Base Case)
8. The Sempra Mesquite plant modeled at 1000 MW and dispatched at 873 MW (added to the Base Case)
9. The Pinnacle West/Calpine 43rd Avenue (West Phoenix) plant modeled at 525 MW and dispatched at 480 MW (already in the Base Case)
10. The Kyrene expansion modeled at 240 MW and dispatched at 240 MW (already in the Base Case)
11. The Santan expansion modeled at 726 MW and dispatched at 726 MW for the 1800 MW Project output
12. The TEP DeMoss Petrie expansion modeled at 75 MW and dispatched at 75 MW (added to the Base Case)

13. The TEP North Loop expansion modeled at 21 MW and dispatched at 21 MW (added to the Base Case)

## Transaction Scenarios

Toltec has identified it primary target market as Arizona. As such, the transaction schedules shown in Table 2 were simulated in the load flow case models. For each Alternative, the transactions were simulated in two separate ways, first by proportionately scaling Arizona load and second by proportionally reducing Arizona generation. While neither of these will be completely reflective of actual transactions, the combination of the two helps to identify which overloads are caused or partially caused by load growth and which may attributable to integration of the Project. This methodology also provides a representative evaluation of impacts on the system prior to specific transmission service receipt and delivery points being specified.

**Table 2**
**Transaction Schedules in MW**

| Region | "Alt 1&2 A" Load Scale | "Alt 1&2 B" Gen Scale | "Alt 3&4 A" Load Scale | "Alt 3&4 B" Gen Scale |
|---|---|---|---|---|
| Arizona | 1200 | 1200 | 1800 | 1800 |

## Dispatch Assumptions

Generation is adjusted to accommodate other new generation projects assumed in the study to create the Base Case. Generation is further adjusted to accommodate the proposed Project to create the Change Case(s).

Table 3 shows the generation dispatch used to simulate the transactions for the analysis for each dispatch level.

**Table 3**
**Generation Dispatch and Area Interchange Summary**

| Area: Generating Units (Bus #) | Capacity Factor | Generation Dispatch Modifications (MW) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | WSCC Case | Base Case | Base Case w/ Santan | Alternative Scenarios | | | |
| | | | | | Alt 1&2 A | Alt 1&2 B | Alt 3&4 A | Alt 3&4 B |
| AZ: Palo Verde (14931-3) | 92.00% | 4186 | 3810 | 3810 | 3810 | 3810 | 3810 | 3810 |
| AZ: Aqua Fria (15901-3) | 24.60% | 281 | 386 | 25 | 386 | 386 | 25 | 25 |
| AZ: Ocotillo (14924-5) | 15.90% | 230 | 230 | 150 | 230 | 230 | 150 | 150 |
| AZ: Santan (19521,4) | 9.69% | 134 | 285 | 0 | 285 | 285 | 0 | 0 |
| AZ: Apache CT (17024-7) | 1.23% | 158 | 158 | 158 | 158 | 158 | 158 | 158 |
| AZ: Apache ST (17028-30) | 54.04% | 425 | 425 | 425 | 425 | 425 | 425 | 425 |
| AZ: North Loop CT (16510,5-6) | 0.68% | 205 | 205 | 205 | 205 | 205 | 205 | 205 |
| AZ: Irvington CT (16504) | 0.81% | 50 | 0 | 0 | 50 | 50 | 50 | 50 |
| AZ: Vail CT (16517) | NA | 130 | 0 | 0 | 130 | 130 | 130 | 130 |
| AZ: Irvington GT (16503,7-9) | 29.88% | 415 | 415 | 415 | 415 | 415 | 415 | 415 |
| LADWP: Haynes (26026-31) | 4.03% | 1530 | 1305 | 1305 | 1305 | 1305 | 1305 | 1305 |
| PG&E: Morro Bay (36408-10) | 18.04% | 725 | 0 | 0 | 0 | 0 | 0 | 0 |
| SCE Scaled Load | NA | 0 | -550 | -550 | -550 | -550 | -550 | -550 |
| SDGE Scaled Load | NA | 0 | -758 | -758 | -758 | -758 | -758 | -758 |
| NM: Person | NA | 220 | 140 | 140 | 140 | 140 | 140 | 140 |
| NM: Scaled Load | NA | 0 | -420 | -420 | -420 | -420 | -420 | -420 |
| WAPALC: Griffith (19311-3) | NA | 540 | 540 | 540 | 540 | 540 | 540 | 540 |
| WAPALC: Southpoint (19317-9) | NA | 420 | 420 | 420 | 420 | 420 | 420 | 420 |
| AZ: AZ Load Scale | NA | 0 | 0 | 0 | -1200 | 0 | -1800 | 0 |
| AZ: AZ Gen Scale | NA | 0 | 0 | 0 | 0 | -1200 | 0 | -1800 |
| AZ: Red Hawk (14974-85) | NA | 886 | 873 | 873 | 873 | 873 | 873 | 873 |
| AZ: Santan (15926-7) | NA | 726 | 0 | 726 | 0 | 0 | 726 | 726 |
| AZ: Desert Basin (14501-3) | NA | 460 | 460 | 460 | 460 | 460 | 460 | 460 |
| AZ: West Phoenix (14966-8) | NA | 300 | 480 | 480 | 300 | 300 | 300 | 300 |
| AZ: Kyrene (15918) | NA | 240 | 240 | 240 | 240 | 240 | 240 | 240 |
| AZ: Gila River (90001-12) | NA | 0 | 873 | 873 | 873 | 873 | 873 | 873 |
| AZ: Sempra (79221-6) | NA | 0 | 873 | 873 | 873 | 873 | 873 | 873 |
| AZ: Harquahala (79201-4) | NA | 0 | 873 | 873 | 873 | 873 | 873 | 873 |
| AZ: Arlington Valley (79206-16) | NA | 0 | 498 | 498 | 498 | 498 | 498 | 498 |
| NM: Luna | NA | 0 | 500 | 500 | 500 | 500 | 500 | 500 |
| AZ: Toltec (93000) | NA | 0 | 0 | 0 | 1200 | 1200 | 1800 | 1800 |
| **Total Dispatched (Selected units)** | | | 12261 | 12261 | 12261 | 12261 | 12261 | 12261 |
| Change in Area Interchange | | | | | | | | |
| AZ | | | 0 | 2258 | 2258 | 2258 | 2258 | 2258 |
| SCE | | | 0 | -550 | -550 | -550 | -550 | -550 |
| SDGE | | | 0 | -758 | -758 | -758 | -758 | -758 |
| LADWP | | | 0 | -225 | -225 | -225 | -225 | -225 |
| PG&E | | | 0 | -725 | -725 | -725 | -725 | -725 |

# Contingencies Evaluated

Beck evaluated the system for single contingency (N-1) outages as identified in Appendix A.

For the Base Case and the Alternatives, Beck monitored flows and voltages on Arizona facilities.

# Evaluation Criteria

Criteria are necessary to evaluate the performance of the transmission system within this analysis. This section describes the applicable criteria used for evaluation in this analysis.

WSCC, under their Reliability Criteria for Transmission System Planning, requires its members to comply with standards set forth by the organization. WSCC, however, acknowledges the need for planning criteria to reflect "practical considerations such as the geography, type of load being served, system configuration, weather, local acceptance, or political and regulatory oversight." Therefore, the organization believes each individual member's planning criteria should "complement the reliability of the Western Interconnection with the practical needs of each individual system" and states "each individual system may use its internally applied reliability criteria to plan its internal system" as long as they meet WSCC criteria.

The following evaluation criteria are used for the analysis:

- During normal operation (e.g., prior to any contingency), line and transformer loading should not exceed the specified Normal Rating ("N" or Rating 1 within the load flow case).
- During contingency operation, line and transformer loading should not exceed the specified Emergency Rating ("E" or Rating 2 in the load flow case). Some Arizona systems supply only one rating or set the Normal Rating and the Emergency Rating equal to each other. For these, it is possible that the emergency rating could be assumed to be 110% of the Normal rating value.

The results of the contingency analyses for the Change Case(s) are compared with the Base Case loadings for the same contingency to determine if integration of the Project resulted in any new overloads. The Results section details the overloads occurring in the change case(s) both with and without contingencies.

# Section 4

# RESULTS

There are several considerations when examining the impact of a particular project on the grid. Discussed within this section is the impact on facilities where the loading exceeds the rating of the facility. Loading violations such as these may indicate that (1) transmission system upgrades are necessary, (2) special protection schemes need to be implemented in conjunction with the Project, (3) other system configuration change(s) is(are) warranted or (4) that staging of integration of various output levels of the Project requires coordination with future transmission expansion plans.

The power flow analysis results have two key components, an AC analysis to identify facilities that are overloaded at maximum output and a Linear, DC, analysis which projects the Project output level at which loading violation occurs ("FCITC"). In conjunction with these results are the presentation of the transaction distribution factors ("TDF") of the Project on these same facilities.

Both Normal and Outage Conditions are presented in separate tables.

Table description:

| | |
|---|---|
| Column 1: | FCITC, i.e., First Contingency Incremental Transfer Capability (This column identifies the level of Project dispatch for which the applicable overload element occurs. Negative FCITC numbers represent pre-existing Base Case loading violations.) |
| Column 2: | TDF, i.e., Normal "N" or Outage "O" Transaction Distribution Factor (The percent of the transaction that flows over the element under either normal or outage conditions. Positive and negative denotes the direction of flow on the facility.) |
| Column 3: | Type "Tp" (Designation of overloaded element as either a line "L" or transformer "X".) |
| Column 4: | Overloaded Element (Element that overloads for the identified contingency. The value identified in the FCITC column corresponds to the Project output level at which this overload may occur.) |
| Column 5: | Area (Area designation of the overloaded element) |
| Column 6: | Contingency (Outage resulting in the overloaded element. This includes "No Outage" for all lines in service.) |
| Column 7: | Rating (Normal/Emergency rating of the overloaded element) |
| Columns 8 –9: | Base and Change loading of the element considering the Project at maximum output. |

For the analyses "Normal Condition" or "continuous loading" is defined as all facilities normally in-service. "Post-Contingency" is defined as a single contingency (N-1), i.e., one line or transformer out of service.

Although the following tables show the facility loadings for the full output at 1800 MW, the FCITC indicates at what level those violations may occur. Therefore, the FCITC results are applicable to the Phase 1 Project output of 1200 MW as well.

The results are first presented for the transactions simulated by increasing Arizona load, followed by the transaction simulated by reducing Arizona generation. The results of both analyses must be examined together to identify which violations are attributable (all or part) to increase in load. Violations occurring as a result of an increase in load should be addressed via regional utility planning.

# Alts 1 & 3: Project at 1200 or 1800 MW w/o Silverking

The system was first examined with all facilities in service.

## Normal Condition Summary

### ARIZONA LOAD INCREASE (ALTS 1A AND 3A)

### NORMAL (PRE-CONTINGENCY) SUMMARY

| Project Full Output : 1800 MW | | Overloaded Element | Area | Contingency | Rating N/E (MVA) | AC Power Flow % of N Rating | |
|---|---|---|---|---|---|---|---|
| FCITC | Tp | | | | | Base | Chg |
| 273 | X | Whitetnk To Whitetnk 230/ 69kv | AZ | No Outage | 280/349 | 100% | 111% |
| 1255 | X | Corbell To Corbelrs 230/ 69kv #2 | AZ | No Outage | 302 | 94% | 107% |
| 1482 | X | Corbell To Corbelrs 230/ 69kv #3 | AZ | No Outage | 309 | 93% | 105% |
| 1729 | L | Sag.West To Ed-5 115kv | AZ | No Outage | 120 | 58% | 102% |

### ARIZONA GENERATION REDUCTION (ALTS 1B AND 3B)

### NORMAL (PRE-CONTINGENCY) SUMMARY

| Project Full Output : 1800 MW | | Overloaded Element | Area | Contingency | Rating N/E (MVA) | AC Power Flow % of N Rating | |
|---|---|---|---|---|---|---|---|
| FCITC | Tp | | | | | Base | Chg |
| 0 | X | Whitetnk To Whitetnk 230/ 69kv | AZ | No Outage | 280/349 | 100% | 100% |

The study indicates that under normal condition, integration of the Project results in no new loading violations (not attributable to load growth) for either a 1200 or an 1800 MW Project output.

# Post Contingency Summary

## ARIZONA LOAD INCREASE (ALTS 1A AND 3A)

### POST-CONTINGENCY SUMMARY

| Project Full Output : 1800 MW | | | | | | AC Power Flow % of E Rating | |
|---|---|---|---|---|---|---|---|
| FCITC | Tp | Overloaded Element | Area | Contingency | Rating N/E (MVA) | Base | Chg |
| -1366 | L | Santan To Thundrst 230kv[1] | AZ | Silverkg To Silverkg 500/100kv | 363/438 | 105% | 116% |
| 0 | L | Avra To Marana 115kv[1] | AZ | Bicknell To Bicknell 230/115kv | 57 | 108% | 123% |
| 1033 | L | Sag.West To Ed-5 115kv[2] | AZ | Coronado To Silverkg 500kv | 120 | 73% | 123% |
| 1129 | L | Sag.East To Red Rock 115kv[2] | AZ | Coronado To Silverkg 500kv | 120 | 72% | 118% |
| 1161 | X | Westwing To Ww.3wp 345/100kv | AZ | Saguaro To Toltec 500kv | 600 | 21% | 152% |
| 1218 | X | Corbell To Corbelrs 230/ 69kv #2[3] | AZ | Coronado To Silverkg 500kv | 302 | 94% | 107% |
| 1271 | L | Ed-5 To Ed-4 115kv[2] | AZ | Coronado To Silverkg 500kv | 120 | 70% | 118% |
| 1299 | X | Cholla To Cholla 500/345kv[2] | AZ | Coronado To Silverkg 500kv | 500 | 74% | 121% |
| 1352 | X | Cholla To Cholla 500/345kv #2[2] | AZ | Coronado To Silverkg 500kv | 500 | 73% | 120% |
| 1379 | X | Tortolit To Tortolit 500/138kv[2] | AZ | South To Toltc345 345kv | 600/672 | 67% | 112% |
| 1482 | X | Corbell To Corbelrs 230/ 69kv #3 | AZ | Coronado To Silverkg 500kv | 309 | 93% | 106% |
| 1500 | L | Vlyfarms To Coolidge 115kv[2] | AZ | Coronado To Silverkg 500kv | 80 | 61% | 112% |
| 1562 | L | Coolidge To Ed-2 115kv[2] | AZ | Coronado To Silverkg 500kv | 120 | 62% | 116% |
| 1615 | L | Westwing To Toltc345 345kv[4] | AZ | Saguaro To Toltec 500kv | 672/806 | 16% | 115% |
| 1692 | L | Westwing To Aguafria 230kv[3] | AZ | Saguaro To Toltec 500kv | 526 | 87% | 103% |
| 1750 | L | South To Toltc345 345kv[4] | AZ | Saguaro To Toltec 500kv | 672/806 | 9% | 110% |
| 1846 | L | Sag.East To Oracle 115kv | AZ | Sag.West To Snmanuel 115kv | 120 | 83% | 107% |
| 1875 | L | Picachow To Red Rock 115kv[3] | AZ | Coronado To Silverkg 500kv | 120/132 | 61% | 102% |
| 2000 | L | Ed-2 To Brady 115kv[3] | AZ | Coronado To Silverkg 500kv | 120 | 58% | 103% |
| 2400 | L | Marana To Maranatp 115kv[3] | AZ | Bicknell To Bicknell 230/115kv | 80 | 91% | 104% |
| 3000 | L | Haydenaz To Apache 115kv[5] | AZ | Buterfld To Apache 230kv | 99 | 103% | 115% |
| 3450 | L | Haydenaz To Apache 115kv | AZ | Coronado To Silverkg 500kv | 99 | 85% | 105% |
| | | | AZ | Saguaro To Tortolit 500kv | | | div |

1 Pre-existing violation. Overload was not present in generation reduction transaction simulation.

2 Higher FCITC limit in generation reduction transaction simulation.

3 Overload was not present in generation reduction transaction simulation. Assumed attributable to load growth.

4 Construction of facility, a double bundled 954 ACSR, indicates that thermal capability of the line may be considerably higher than the rating identified. Rating may be based on contractual path rating.

5 Pre-existing voltage problem

## ARIZONA GENERATION REDUCTION (ALTS 1B AND 3B)

### POST-CONTINGENCY SUMMARY

| Project Full Output : 1800 MW | | | | | | AC Power Flow % of E Rating | |
|---|---|---|---|---|---|---|---|
| FCITC | Tp | Overloaded Element | Area | Contingency | Rating N/E (MVA) | Base | Chg |
| 1131 | X | Westwing To Ww.3wp 345/100kv[1] | AZ | Saguaro To Toltec 500kv | 600 | 21% | 157% |
| 1213 | L | Sag.West To Ed-5 115kv | AZ | Coronado To Silverkg 500kv | 120 | 73% | 112% |
| 1232 | X | Westwing To Ww.3wp 500/100kv | AZ | Saguaro To Toltec 500kv | 600 | 21% | 163% |
| 1340 | L | Sag.East To Red Rock 115kv | AZ | Coronado To Silverkg 500kv | 120 | 72% | 108% |
| 1434 | X | Cholla To Cholla 500/345kv | AZ | Coronado To Silverkg 500kv | 500 | 74% | 114% |
| 1473 | L | Ed-5 To Ed-4 115kv | AZ | Coronado To Silverkg 500kv | 120 | 70% | 108% |
| 1487 | X | Cholla To Cholla 500/345kv #2 | AZ | Coronado To Silverkg 500kv | 500 | 73% | 112% |
| 1573 | L | Westwing To Toltc345 345kv | AZ | Saguaro To Toltec 500kv | 672/806 | 16% | 117% |
| 1690 | L | Coolidge To Ed-2 115kv | AZ | Coronado To Silverkg 500kv | 120 | 62% | 108% |
| 1742 | L | Vlyfarms To Coolidge 115kv | AZ | Coronado To Silverkg 500kv | 80 | 61% | 102% |
| 1769 | X | Tortolit To Tortolit 500/138kv | AZ | South To Toltc345 345kv | 600/672 | 67% | 101% |
| 1798 | L | South To Toltc345 345kv | AZ | Saguaro To Toltec 500kv | 672/806 | 9% | 106% |
| 2323 | L | Sag.East To Oracle 115kv | AZ | Sag.West To Snmanuel 115kv | 120 | 83% | 103% |
| - | L | Haydenaz To Apache 115 kv[2] | AZ | Buterfld To Apache 230kv | 99 | 103% | 104% |

1 Internal transformer winding. No emergency rating provided

2 Pre-existing violation

The post contingency results for Alternative 1 and 3 show that the first new violation occurs at the 1033 MW Project output level assuming a transaction simulated by increasing load. However, this same contingency does not occur until a Project output level of 1213 MW when scaling back generation. It is therefore, expected that the first potentially limiting contingency would be the Westwing transformer occurring at a Project output level of approximately 1150 MW. It is noted however, that for this facility only one rating is provided. In that regard, it is not unusual for a transformer to have an emergency rating up to 25% higher than the normal rating. Assuming that an emergency rating does exist, it is expected that the Project can deliver approximately 1200 MW to the grid prior to a violation occurring, based on the generator reduction case loadings on the Sag West to Ed-5 and Sag. East to Red Rock 115 kV lines.

To integrate the 1800 MW Project, regional 115 kV upgrades, system modification or implementation of operating schemes could be necessary. While the loading on the Cholla transformer is well within 125% of normal rating, loading on the Westwing 500/345 kV transformer may require a remedial action scheme or other system modification. The "announced" second Westwing – South 345 kV line included in TEP's 10-year plan would presumably alleviate this violation.

The following tables identify facilities on which integration of the Project alleviated pre-existing loading violations.

### ARIZONA LOAD INCREASE (ALTS 1B AND 3B)

### VIOLATIONS ALLEVIATED

| Tp | Overloaded Element | Area | Contingency | Rating N/E (MVA) | AC Power Flow % of E Rating | |
|---|---|---|---|---|---|---|
| | | | | | Base | Chg |
| L | Apache To Buterfld 230kv | AZ | Vail To Greenlee 345kv | 268 | 106% | 93% |
| X | Bicknell To Bicknell 230/345kv | AZ | Red Tail To Doscondo 230kv | 150/193 | 103% | 90% |
| L | Buterfld To Pantano 230kv | AZ | Red Tail To Doscondo 230kv | 268 | 102% | 95% |

### ARIZONA GENERATION REDUCTION (ALTS 1B AND 3B)

### VIOLATIONS ALLEVIATED

| Tp | Overloaded Element | Area | Contingency | Rating N/E (MVA) | AC Power Flow % of E Rating | |
|---|---|---|---|---|---|---|
| | | | | | Base | Chg |
| L | Apache To Buterfld 230kv | AZ | Vail To Greenlee 345kv | 268 | 106% | 81% |
| X | Bicknell To Bicknell 230/345kv | AZ | Red Tail To Doscondo 230kv | 150/193 | 103% | 83% |
| L | Buterfld To Pantano 230kv | AZ | Red Tail To Doscondo 230kv | 268 | 102% | 86% |
| L | Avra To Marana 115kv | AZ | Saguaro To Tortolit 500kv | 57 | 104% | 95% |
| L | Santan To Thundrst 230kv | AZ | Silverkg To Silverkg 500/100kv | 363/438 | 105% | 98% |

# Alts 2 & 4: Project at 1200 or 1800 MW w/Silverking

The system was first examined with all facilities in service.

## Normal Condition Summary

### ARIZONA LOAD INCREASE (ALTS 2A AND 4A)

### NORMAL (PRE-CONTINGENCY) SUMMARY

| Project Full Output : 1800 MW | | Overloaded Element | Area | Contingency | Rating N/E (MVA) | AC Power Flow % of N Rating | |
|---|---|---|---|---|---|---|---|
| FCITC | Tp | | | | | Base | Chg |
| 273 | X | Whitetnk To Whitetnk 230/ 69kv | AZ | No Outage | 280/349 | 100% | 111% |
| 1255 | X | Corbell To Corbelrs 230/ 69kv #2 | AZ | No Outage | 302 | 94% | 107% |
| 1482 | X | Corbell To Corbelrs 230/ 69kv #3 | AZ | No Outage | 309 | 93% | 105% |
| 1605 | L | Glendale To Aguafria 230kv | AZ | No Outage | 457/569 | 85% | 104% |
| 1895 | L | Pnpkaps To Pinpk 230kv | AZ | No Outage | 637/700 | 91% | 103% |
| 1950 | L | Meadowbk To Sunyslop 230kv | AZ | No Outage | 325/490 | 97% | 108% |
| 2074 | X | Ocotillo To Ocotillo 230/ 69kv #E | AZ | No Outage | 296 | 84% | 100% |

### ARIZONA GENERATION REDUCTION (ALTS 2B AND 4B)

### NORMAL (PRE-CONTINGENCY) SUMMARY

| Project Full Output : 1800 MW | | Overloaded Element | Area | Contingency | Rating N/E (MVA) | AC Power Flow % of N Rating | |
|---|---|---|---|---|---|---|---|
| FCITC | Tp | | | | | Base | Chg |
| 0 | X | Whitetnk To Whitetnk 230/ 69kv | AZ | No Outage | 280/349 | 100% | 100% |

As with Alternatives 1 and 3 (without the Silverking connection), the study indicates that under normal condition, integration of the Project results in no new loading violations (not attributable to load growth) for either a 1200 or an 1800 MW Project output.

# Post Contingency Summary

### ARIZONA LOAD INCREASE (ALTS 2A AND 4A)

### POST-CONTINGENCY SUMMARY

| Project Full Output : 1800 MW | | | | | Rating N/E (MVA) | AC Power Flow % of E Rating | |
|---|---|---|---|---|---|---|---|
| FCITC | Tp | Overloaded Element | Area | Contingency | | Base | Chg |
| -1550 | L | Santan To Thundrst 230kv[1] | AZ | Silverkg To Silverkg 500/100kv | 363/438 | 114% | 135% |
| 0 | L | Avra To Marana 115kv[1] | AZ | Bicknell To Bicknell 230/115kv | 57 | 107% | 122% |
| 800 | L | Avra To Marana 115kv | AZ | Buterfld To Apache 230kv | 57 | 93% | 111% |
| 1335 | X | Westwing To Ww.3wp 345/100kv | AZ | Saguaro To Toltec 500kv | 600 | 26% | 145% |
| 1336 | X | Westwing To Ww.3wp 500/100kv | AZ | Saguaro To Toltec 500kv | 600 | 26% | 150% |
| 1602 | L | Ctryclub To Meadowbk 230kv | AZ | Saguaro To Toltec 500kv | 518 | 87% | 107% |
| 1654 | L | South To Toltc345 345kv | AZ | Saguaro To Toltec 500kv | 672/806 | 14% | 115% |
| 1720 | L | Westwing To Toltc345 345kv | AZ | Saguaro To Toltec 500kv | 672/806 | 19% | 109% |
| 1800 | X | Tortolit To Tortolit 500/138kv | AZ | South To Toltc345 345kv | 600/672 | 59% | 101% |
| 1800 | L | Westwing To Aguafria 230kv | AZ | Saguaro To Toltec 500kv | 526 | 86% | 102% |
| 2400 | L | Marana To Maranatp 115kv | AZ | Bicknell To Bicknell 230/115kv | 80 | 90% | 103% |
| 7800 | L | Haydenaz To Apache 115kv | AZ | Buterfld To Apache 230kv | 99 | 99% | 104% |
| | | | AZ | Saguaro To Tortolit 500kv | | | div |

### ARIZONA GENERATION REDUCTION (ALTS 2B AND 4B)

### POST-CONTINGENCY SUMMARY

| Project Full Output : 1800 MW | | | | | Rating N/E (MVA) | AC Power Flow % of E Rating | |
|---|---|---|---|---|---|---|---|
| FCITC | Tp | Overloaded Element | Area | Contingency | | Base | Chg |
| -10145 | L | Santan To Thundrst 230kv[1] | AZ | Silverkg To Silverkg 500/100kv | 363/438 | 114% | 117% |
| 0 | L | Avra To Marana 115kv[1] | AZ | Bicknell To Bicknell 230/115kv | 57 | 107% | 107% |
| 1304 | X | Westwing To Ww.3wp 345/100kv[2] | AZ | Saguaro To Toltec 500kv | 600 | 26% | 150% |
| 1305 | X | Westwing To Ww.3wp 500/100kv | AZ | Saguaro To Toltec 500kv | 600 | 26% | 155% |
| 1680 | L | Westwing To Toltc345 345kv[3] | AZ | Saguaro To Toltec 500kv | 672/806 | 19% | 112% |
| 1702 | L | South To Toltc345 345kv[3] | AZ | Saguaro To Toltec 500kv | 672/806 | 14% | 111% |
| | | | AZ | Saguaro To Tortolit 500kv | | | div |

1 Pre-existing violation worsen primarily due to load growth.

2 Internal transformer winding. No emergency rating provided

3 Construction of facility, a double bundled 954 ACSR, indicates that thermal capability of the line may be considerably higher than the rating identified. Rating may be based on contractual path rating.

With the Silverking interconnection, the first new loading violation occurs at a Project output level of 1304 MW. It is noted that the Avra to Marana 115 kV line was a pre-existing violation, the level of which did not change for the generation reduction transaction.

Loading on the Westwing 500/345 kV transformer may require a remedial action scheme or other system modification. The "announced" second Westwing – South 345 kV line included in TEP's 10-year plan would presumably alleviate this violation.

A loading violation occurs on the Westwing to Toltec to South lines at approximately 1700 MW Project output level, the emergency rating of this line appears limited by path rating as opposed to thermal capability of a double bundled 954 ACSR constructed line.

The following tables identify facilities on which integration of the Project alleviated pre-existing loading violations.

### ARIZONA LOAD INCREASE (ALTS 2A AND 4A)

### VIOLATIONS ALLEVIATED

| Tp | Overloaded Element | Area | Contingency | Rating N/E (MVA) | AC Power Flow % of E Rating | |
|---|---|---|---|---|---|---|
| | | | | | Base | Chg |
| L | Cholla To Silverkg 500kv | AZ | Coronado To Silverkg 500kv | 889/1332 | 100% | 88% |
| L | Apache To Buterfld 230kv | AZ | Vail To Greenlee 345kv | 268 | 107% | 99% |
| X | Bicknell To Bicknell 230/345kv | AZ | Red Tail To Doscondo 230kv | 150/193 | 101% | 94% |
| L | Buterfld To Pantano 230kv | AZ | Red Tail To Doscondo 230kv | 268 | 103% | 98% |

### ARIZONA GENERATION REDUCTION (ALTS 2B AND 4B)

### VIOLATIONS ALLEVIATED

| Tp | Overloaded Element | Area | Contingency | Rating N/E (MVA) | AC Power Flow % of E Rating | |
|---|---|---|---|---|---|---|
| | | | | | Base | Chg |
| L | Cholla To Silverkg 500kv | AZ | Coronado To Silverkg 500kv | 889/1332 | 100% | 78% |
| L | Apache To Buterfld 230kv | AZ | Vail To Greenlee 345kv | 268 | 107% | 87% |
| L | Buterfld To Pantano 230kv | AZ | Red Tail To Doscondo 230kv | 268 | 103% | 89% |
| X | Bicknell To Bicknell 230/345kv | AZ | Red Tail To Doscondo 230kv | 150/193 | 101% | 87% |

# Facility Flow Summary

A summary of flows on regional facilities is provided below.

| Element | Rating | Flows over Selected Facilities | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Base | Alt 1A Load Scale | Alt 1B Gen Scale | Base w/ Silverking | Alt 2A Load Scale w/ Silverking | Alt 2B Gen Scale w/ Silverking | Base w/ Santan | Alt 3A Load Scale w/ Santan | Alt 3B Gen Scale w/ Santan | Base w/ Santan & Silverking | Alt 4A Load Scale w/ Santan & Silverking | Alt 4B Gen Scale w/ Santan & Silverking |
| **Silverking/EV Area Facilities** | | | 1200MW | 1200MW | | 1200MW | 1200MW | | 1800MW | 1800MW | | 1800MW | 1800MW |
| Cholla – Saguaro 500 kV line | 2018 | 571 | 255 | 208 | - | - | - | 569 | 66 | -5 | - | - | - |
| Cholla – Silverking 500 kV line | 2018 | - | - | - | 1064 | 967 | 902 | - | - | - | 1038 | 893 | 799 |
| Silverking – Saguaro 500 kV line | 2018 | - | - | - | 364 | -175 | -207 | - | - | - | 372 | -427 | -477 |
| Coronado – Silverking 500 kV line | 1732 | 735 | 861 | 823 | 476 | 456 | 426 | 715 | 909 | 855 | 467 | 437 | 395 |
| Browning - Silverking 500 kV line | 1732/2217 | -372 | -458 | -451 | -722 | -1051 | -1026 | -367 | -499 | -491 | -698 | -1186 | -1152 |
| Kyrene - Browning 500 kV line | 1732/2217 | 117 | 73 | 40 | -172 | -420 | -438 | 24 | -44 | -88 | -250 | -614 | -636 |
| Kyrene 500/230 kV Xfmr #6 | 1233 | 699 | 743 | 682 | 781 | 877 | 811 | 700 | 766 | 674 | 778 | 919 | 821 |
| Kyrene 500/230 kV Xfmr #7 | 1233 | 630 | 668 | 613 | 706 | 791 | 733 | 630 | 686 | 605 | 702 | 827 | 741 |
| Jojoba – Kyrene 500 kV line | 1732/2217 | 1454 | 1494 | 1343 | 1322 | 1254 | 1111 | 1362 | 1417 | 1196 | 1236 | 1137 | 929 |
| **Project Ties** | | | | | | | | | | | | | |
| Toltec – Saguaro 500 kV line | 2598 | 0 | 642 | 641 | 0 | 861 | 852 | 0 | 1025 | 1025 | 0 | 1277 | 1266 |
| Westwing – Toltec 345 kv | 672/806 | NA | -279 | -295 | NA | -100 | -123 | NA | -429 | -450 | NA | -225 | -257 |
| Westwing – South 345 kV line | 672/806 | 79 | - | - | 124 | - | - | 73 | - | - | 115 | - | - |
| Toltec – South 345 kV | 672/806 | NA | 275 | 260 | NA | 239 | 225 | NA | 339 | 315 | NA | 298 | 276 |
| **Tucson Delivery Ties** | | | | | | | | | | | | | |
| Saguaro – Tortolit 500 kV line | 672/806 | 417 | 525 | 488 | 352 | 481 | 445 | 420 | 598 | 543 | 357 | 546 | 492 |
| Westwing – South 345 kV line | 672/806 | 79 | - | - | 124 | - | - | 73 | - | - | 115 | - | - |
| Toltec – South 345 kV line | 672/806 | NA | 275 | 260 | NA | 239 | 225 | NA | 339 | 315 | NA | 298 | 276 |
| Greenlee – Vail 345 kV line | 896/1210 | 321 | 251 | 218 | 331 | 290 | 256 | 323 | 225 | 176 | 332 | 270 | 219 |
| Springerville – Vail 345 kV line | 666/806 | 424 | 375 | 341 | 439 | 411 | 376 | 425 | 356 | 305 | 440 | 396 | 345 |

In addition to the impacts identified previously, integration of the Project has several positive impact on system flows. For example, integration of the Project reduces flow on the Kyrene transformers. Additionally, integration of the Project appears to better balance delivery of power to the Tucson system. It increases the flow into Tucson at both Tortolita and South potentially providing more flexibility in regards to future system modifications.

# Contingency List

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| C- 1 | Line | 16101 | GREENLEE | 345kV | to | 11080 | HIDALGO | 345kV | Ckt 1 |
| C- 2 | Line | 16101 | GREENLEE | 345kV | to | 16104 | SPRINGR | 345kV | Ckt 1 |
| C- 3 | Line | 16101 | GREENLEE | 345kV | to | 17010 | GREEN-AE | 345kV | Ckt 1 |
| C- 4 | Line | 16105 | VAIL | 345kV | to | 16103 | SOUTH | 345kV | Ckt 1 |
| C- 5 | Line | 16105 | VAIL | 345kV | to | 17005 | BICKNELL | 345kV | Ckt 1 |
| C- 6 | Transformer | 16105 | VAIL | 345kV | to | 16308 | VAIL.3WP | 100kV | Ckt 1 |
| C- 7 | Line | 11080 | HIDALGO | 345kV | to | 11093 | LUNA | 345kV | Ckt 1 |
| C- 8 | Line | 16103 | SOUTH | 345kV | to | 93001 | TOLTC345 | 345kV | Ckt 1 |
| C- 9 | Line | 16104 | SPRINGR | 345kV | to | 16102 | MCKINLEY | 345kV | Ckt 1 |
| C- 10 | Line | 16104 | SPRINGR | 345kV | to | 16102 | MCKINLEY | 345kV | Ckt 2 |
| C- 11 | Line | 16104 | SPRINGR | 345kV | to | 11093 | LUNA | 345kV | Ckt 1 |
| C- 12 | Line | 16104 | SPRINGR | 345kV | to | 16100 | CORONADO | 345kV | Ckt 1 |
| C- 13 | Transformer | 17005 | BICKNELL | 345kV | to | 17004 | BICKNELL | 230kV | Ckt 1 |
| C- 14 | Transformer | 17010 | GREEN-AE | 345kV | to | 17009 | GREEN-AE | 230kV | Ckt 1 |
| C- 15 | Transformer | 17010 | GREEN-AE | 345kV | to | 17009 | GREEN-AE | 230kV | Ckt 2 |
| C- 16 | Transformer | 16103 | SOUTH | 345kV | to | 16306 | SO.3WP2 | 100kV | Ckt 1 |
| C- 17 | Transformer | 16308 | VAIL.3WP | 100kV | to | 16220 | VAIL | 138kV | Ckt 1 |
| C- 18 | Transformer | 16100 | CORONADO | 345kV | to | 15001 | CORONADO | 500kV | Ckt 1 |
| C- 19 | Line | 16102 | MCKINLEY | 345kV | to | 10292 | SAN_JUAN | 345kV | Ckt 1 |
| C- 20 | Line | 16102 | MCKINLEY | 345kV | to | 10292 | SAN_JUAN | 345kV | Ckt 2 |
| C- 21 | Line | 93001 | TOLTC345 | 345kV | to | 16107 | WESTWING | 345kV | Ckt 1 |
| C- 22 | Line | 17004 | BICKNELL | 230kV | to | 17102 | SAHUARIT | 230kV | Ckt 1 |
| C- 23 | Line | 17009 | GREEN-AE | 230kV | to | 17014 | MORENCI | 230kV | Ckt 1 |
| C- 24 | Transformer | 17004 | BICKNELL | 230kV | to | 17006 | BICKNELL | 115kV | Ckt 1 |
| C- 25 | Line | 16220 | VAIL | 138kV | to | 16204 | IRVNGTN | 138kV | Ckt 1 |
| C- 26 | Line | 16220 | VAIL | 138kV | to | 16211 | ROBERTS | 138kV | Ckt 1 |
| C- 27 | Line | 16220 | VAIL | 138kV | to | 16213 | S.TRAIL | 138kV | Ckt 1 |
| C- 28 | Line | 16220 | VAIL | 138kV | to | 16222 | LITTLE | 138kV | Ckt 1 |
| C- 29 | Line | 16220 | VAIL | 138kV | to | 16223 | LOSREALS | 138kV | Ckt 1 |
| C- 30 | Transformer | 16306 | SO.3WP2 | 100kV | to | 16216 | SOUTH | 138kV | Ckt 1 |
| C- 31 | Line | 15001 | CORONADO | 500kV | to | 14000 | CHOLLA | 500kV | Ckt 1 |
| C- 32 | Line | 15001 | CORONADO | 500kV | to | 15041 | SILVERKG | 500kV | Ckt 1 |
| C- 33 | Line | 17014 | MORENCI | 230kV | to | 17011 | HACKBRRY | 230kV | Ckt 1 |
| C- 34 | Line | 17016 | PANTANO | 230kV | to | 17007 | BUTERFLD | 230kV | Ckt 1 |
| C- 35 | Line | 17016 | PANTANO | 230kV | to | 17102 | SAHUARIT | 230kV | Ckt 1 |
| C- 36 | Line | 16202 | E. LOOP | 138kV | to | 16208 | NE.LOOP | 138kV | Ckt 1 |
| C- 37 | Line | 16202 | E. LOOP | 138kV | to | 16211 | ROBERTS | 138kV | Ckt 1 |
| C- 38 | Line | 16202 | E. LOOP | 138kV | to | 16224 | R.BILLS | 138kV | Ckt 1 |
| C- 39 | Line | 16202 | E. LOOP | 138kV | to | 16213 | S.TRAIL | 138kV | Ckt 1 |
| C- 40 | Line | 16202 | E. LOOP | 138kV | to | 16215 | SNYDER | 138kV | Ckt 1 |
| C- 41 | Line | 16204 | IRVNGTN | 138kV | to | 16201 | DREXEL | 138kV | Ckt 1 |
| C- 42 | Line | 16204 | IRVNGTN | 138kV | to | 16216 | SOUTH | 138kV | Ckt 1 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| C-43 | Line | 16204 | IRVNGTN | 138kV | to | 16218 | TUCSON | 138kV | Ckt 1 | |
| C-44 | Line | 16204 | IRVNGTN | 138kV | to | 16222 | LITTLE | 138kV | Ckt 1 | |
| C-45 | Line | 16204 | IRVNGTN | 138kV | to | 16214 | SN.CRUZ | 138kV | Ckt 1 | |
| C-46 | Line | 16216 | SOUTH | 138kV | to | 16206 | MIDVALE | 138kV | Ckt 1 | |
| C-47 | Line | 16223 | LOSREALS | 138kV | to | 16224 | R.BILLS | 138kV | Ckt 1 | |
| C-48 | Line | 17006 | BICKNELL | 115kV | to | 17022 | THREEPNT | 115kV | Ckt 1 | |
| C-49 | Line | 14004 | SAGUARO | 500kV | to | 16000 | TORTOLIT | 500kV | Ckt 1 | |
| C-50 | Transformer | 14004 | SAGUARO | 500kV | to | 14356 | SAG.EAST | 115kV | Ckt 1 | |
| C-51 | Transformer | 14004 | SAGUARO | 500kV | to | 14357 | SAG.WEST | 115kV | Ckt 1 | |
| C-52 | Transformer | 15041 | SILVERKG | 500kV | to | 15042 | SILVERKG | 100kV | Ckt 1 | |
| C-53 | Transformer | 14101 | FOURCORN | 345kV | to | 14001 | FOURCORN | 500kV | Ckt 1 | |
| C-54 | Line | 17007 | BUTERFLD | 230kV | to | 17002 | APACHE | 230kV | Ckt 1 | |
| C-55 | Line | 17008 | DOSCONDO | 230kV | to | 17011 | HACKBRRY | 230kV | Ckt 1 | |
| C-56 | Line | 16208 | NE.LOOP | 138kV | to | 16210 | RILLITO | 138kV | Ckt 1 | |
| C-57 | Line | 16208 | NE.LOOP | 138kV | to | 16215 | SNYDER | 138kV | Ckt 1 | |
| C-58 | Line | 16214 | SN.CRUZ | 138kV | to | 16200 | DMP | 138kV | Ckt 1 | |
| C-59 | Line | 16218 | TUCSON | 138kV | to | 16221 | WESTINA | 138kV | Ckt 1 | |
| C-60 | Line | 10206 | MIMBRES | 115kV | to | 12014 | CABALLOT | 115kV | Ckt 1 | |
| C-61 | Line | 17022 | THREEPNT | 115kV | to | 17003 | AVRA | 115kV | Ckt 1 | |
| C-62 | Transformer | 16309 | WW.3WP | 100kV | to | 14005 | WESTWING | 500kV | Ckt 1 | |
| C-63 | Line | 17002 | APACHE | 230kV | to | 17018 | RED TAIL | 230kV | Ckt 1 | |
| C-64 | Transformer | 17002 | APACHE | 230kV | to | 17001 | APACHE | 115kV | Ckt 1 | |
| C-65 | Transformer | 17002 | APACHE | 230kV | to | 17001 | APACHE | 115kV | Ckt 2 | |
| C-66 | Line | 16200 | DMP | 138kV | to | 16207 | N. LOOP | 138kV | Ckt 1 | |
| C-67 | Line | 16210 | RILLITO | 138kV | to | 16207 | N. LOOP | 138kV | Ckt 1 | |
| C-68 | Line | 16210 | RILLITO | 138kV | to | 16205 | LACANADA | 138kV | Ckt 1 | |
| C-69 | Line | 16221 | WESTINA | 138kV | to | 16207 | N. LOOP | 138kV | Ckt 1 | |
| C-70 | Transformer | 14356 | SAG.EAST | 115kV | to | 14225 | SAGUARO | 230kV | Ckt 1 | |
| C-71 | Line | 12014 | CABALLOT | 115kV | to | 12041 | HOT_SPRG | 115kV | Ckt 1 | |
| C-72 | Line | 12059 | PICACHO | 115kV | to | 12028 | EL_BUTTE | 115kV | Ckt 1 | |
| C-73 | Line | 14356 | SAG.EAST | 115kV | to | 14357 | SAG.WEST | 115kV | Ckt 1 | |
| C-74 | Line | 14356 | SAG.EAST | 115kV | to | 19057 | ORACLE | 115kV | Ckt 1 | |
| C-75 | Line | 14356 | SAG.EAST | 115kV | to | 17013 | MARANATP | 115kV | Ckt 1 | |
| C-76 | Line | 14357 | SAG.WEST | 115kV | to | 14358 | SNMANUEL | 115kV | Ckt 1 | |
| C-77 | Line | 14357 | SAG.WEST | 115kV | to | 19048 | EMPIRE | 115kV | Ckt 1 | |
| C-78 | Line | 17003 | AVRA | 115kV | to | 17012 | MARANA | 115kV | Ckt 1 | |
| C-79 | Transformer | 15042 | SILVERKG | 100kV | to | 15215 | SILVERKG | 230kV | Ckt 1 | |
| C-80 | Line | 14004 | SAGUARO | 500kV | to | 93000 | TOLTEC | 500kV | Ckt 1 | |
| C-81 | Line | 16105 | VAIL | 345kV | to | 16101 | GREENLEE | 345kV | Ckt 1 | |
| C-82 | Line | 16106 | VAIL2 | 345kV | to | 16104 | SPRINGR | 345kV | Ckt 1 | |
| C-83 | Line | 17018 | RED TAIL | 230kV | to | 17008 | DOSCONDO | 230kV | Ckt 1 | |
| C-84 | Line | 14000 | CHOLLA | 500kV | to | 14004 | SAGUARO | 500kV | Ckt 1 | Alt 1 & 3 Only |
| C-84 | Line | 14000 | CHOLLA | 500kV | to | 15041 | SILVERKG | 500kV | Ckt 1 | Alt 2 & 4 Only |
| C-85 | Line | 15041 | SILVERKG | 500kV | to | 14004 | SAGUARO | 500kV | Ckt 1 | Alt 2 & 4 Only |