LEWIS AND ROCA LLP
LAWYERS

Phoenix Office
40 North Central Avenue
Phoenix, Arizona 85004-4429
Telephone (602) 262-5311
Facsimile (602) 262-5747

Tucson Office
One South Church Avenue
Suite 700
Tucson, Arizona 85701-1611
Telephone (520) 622-2090
Facsimile (520) 622-3088

Las Vegas Office
3993 Howard Hughes Parkway
Suite 600
Las Vegas, Nevada 89109
Telephone (702) 949-8200
Facsimile (702) 949-8398

Thomas H. Campbell
Direct Dial: (602) 262-5723
Direct Fax: (602) 734-3841
E-Mail: TCampbell@lrlaw.com
Admitted in Arizona

ORIGINAL

0000125808

50TP

Our File Number 43431-00001

January 29, 2007

VIA HAND DELIVERY

Arizona Corporation Commission
DOCKETED
JAN 29 2007
DOCKETED BY nr

Arizona Corporation Commission
Docket Control – Utilities Division
1200 W. Washington Street
Phoenix, Arizona

Re: Ten Year Plan
Docket No: E-00000D-05-0040

Attached for filing in the above docket is the original and thirteen (13) copies of Southern California Edison Company's 2007-2016 Ten Year Plan.

Very truly yours,

LEWIS AND ROCA LLP

Thomas H. Campbell
Attorneys for Southern California Edison Company

THC/bjg
Attachment

cc: Michael Mackness (w/encs.)

RECEIVED
2007 JAN 29 P 4: 45
AZ CORP COMMISSION
DOCUMENT CONTROL

1805756.1

SOUTHERN CALIFORNIA EDISON COMPANY

2007-2016

TEN-YEAR PLAN

Prepared for the

Arizona Corporation Commission

January 2007

1805751_1.DOC

SOUTHERN CALIFORNIA EDISON COMPANY
2007-2016
TEN-YEAR PLAN

General Information

Pursuant to A.R.S. § 40-360.02, Southern California Edison ("SCE") submits its 2007-2016 Ten-Year Plan ("Plan") to the Arizona Corporation Commission ("Commission"). The attached Plan (contained in Attachment A) describes planned transmission facilities of 115 kV or higher voltage that SCE may construct in Arizona over the next ten-year period. Pursuant to A.R.S. § 40-360(1), underground facilities are not included.

This Plan provides tentative information that, pursuant to A.R.S. § 40-360.02(F), is subject to change. At this time, SCE plans to go forward with one project: the Devers-Palo Verde No. 2 (2009) ("DPV2"). However, SCE cannot be certain that it is going forward with the second project described in the Plan, the Series Capacitor Upgrade Project (2011) ("Series Capacitor II"). SCE will need to perform the technical studies and economic analyses to cost-justify and design the second project.

The DPV2 Project was approved by the California Independent System Operator in 2004. Also the Arizona to California path rating increases associated with DPV2's plan of service were approved in 2005 and last year, respectively, by the Western Arizona Transmission System Group and the Western Electricity Coordinating Council. An application for a CEC is currently pending before the Arizona Power Plant and Transmission Line Siting Committee. Series Capacitor II described in the Plan will be analyzed in several stakeholder processes, including those before the California Independent System Operator's Southwest Transmission Expansion Plan process, the Western Arizona Transmission System process, and the Western Electricity Coordinating Council Regional Planning Process.

The two maps (shown as Diagrams 1 and 2) attached to this report provide a general illustration of the project location. They are general maps and subject to revision. Specific location will be determined based on appropriate regulatory approvals and through subsequent right-of-way acquisition.

Different levels of certainty are associated with the projects in SCE's Plan. DPV2 will be a second 500 kV transmission line between SCE's existing Devers Substation (near Palm Springs) to a new

Harquahala Junction Switching Station (west of Phoenix, Arizona), tentatively scheduled for operation in 2009. The Harquahala Junction Switching Station would be located at the juncture where the existing Harquahala Generating Station-Hassayampa 500 kV and the Palo Verde-Devers 500 kV lines begin to share common right of way about 5 miles from the Harquahala Generating Station. The proposed Harquahala Junction Switching Station would also provide the terminus for APS' proposed 500 kV line to a planned TS5 substation. SCE also identified an alternative connection of the proposed line to the Harquahala Generating Station switchyard. SCE must still obtain approval from the Arizona Corporation Commission.

The more tentative project is Series Capacitor II, which involves SCE upgrading series capacitors in the Moenkopi-Eldorado 500 kV line. The operating date of this project is expected to be 2011. The final design of the project may not require changes to transmission lines, towers, or poles, but SCE has included the project in this filing in case that assumption is incorrect.

Pursuant to A.R.S. § 40-360.02(c)(7), where available, the submitted Plan should also include technical study results and power flow stability analyses showing the effect in the current Arizona electric transmission system for the project identified. The latest available study that has been performed is provided in Attachment B (Devers-Palo Verde No. 2 Project – Accepted Path 46 Rating Study Report). Written descriptions of each of the proposed projects are provided in Attachment A.

ATTACHMENT A

SOUTHERN CALIFORNIA EDISON COMPANY
2007-2016
TEN-YEAR PLAN

Planned Transmission Project Descriptions

SOUTHERN CALIFORNIA EDISON COMPANY
2007-2016
TEN-YEAR PLAN
2009

Line Description	Devers-Palo Verde No. 2
Size a) Voltage b) Capacity c) Point of Origin d) Intermediate Point e) Point of Termination f) Length	 500 kV AC 1200 MW Harquahala Junction Switching Substation (or alternatively Harquahala Generating Station) None Devers Substation 230 miles (104 miles in Arizona and 126 miles in California)
Routing	The proposed line route between Devers and Harquahala parallels SCE's existing Palo Verde-Devers 500 kV line. Twenty miles of new right of way acquisition is required, assuming the existing BLM right of way is still available to SCE for the remaining 210 miles of the line route.
Purpose	This 500 kV line will increase transfer capability from Arizona to Southern California.
Date a) Construction Start b) Estimated In-Service	 2007 2009

SOUTHERN CALIFORNIA EDISON COMPANY
2007-2016
TEN-YEAR PLAN
2011

Line Description	Series Capacitor Upgrade Project SCE's Participation With APS: Moenkopi-Eldorado 500 kV line
Size g) Voltage h) Capacity i) Point of Origin j) Intermediate Point k) Point of Termination l) Length	 500 kV AC to be determined Moenkopi Substation None Eldorado Substation N/A
Routing	The upgraded series capacitors will replace the existing series capacitors in the SCE's 500 kV lines without a change of location.
Purpose	The upgrading of the series capacitors allows for the increase in transfer capability from Arizona and Southern Nevada to Southern California and has an economic value from an adequacy stand point.
Date c) Construction Start d) Estimated In-Service	 2010 2011

Diagram 1
Devers – Palo Verde No. 2 (2009)

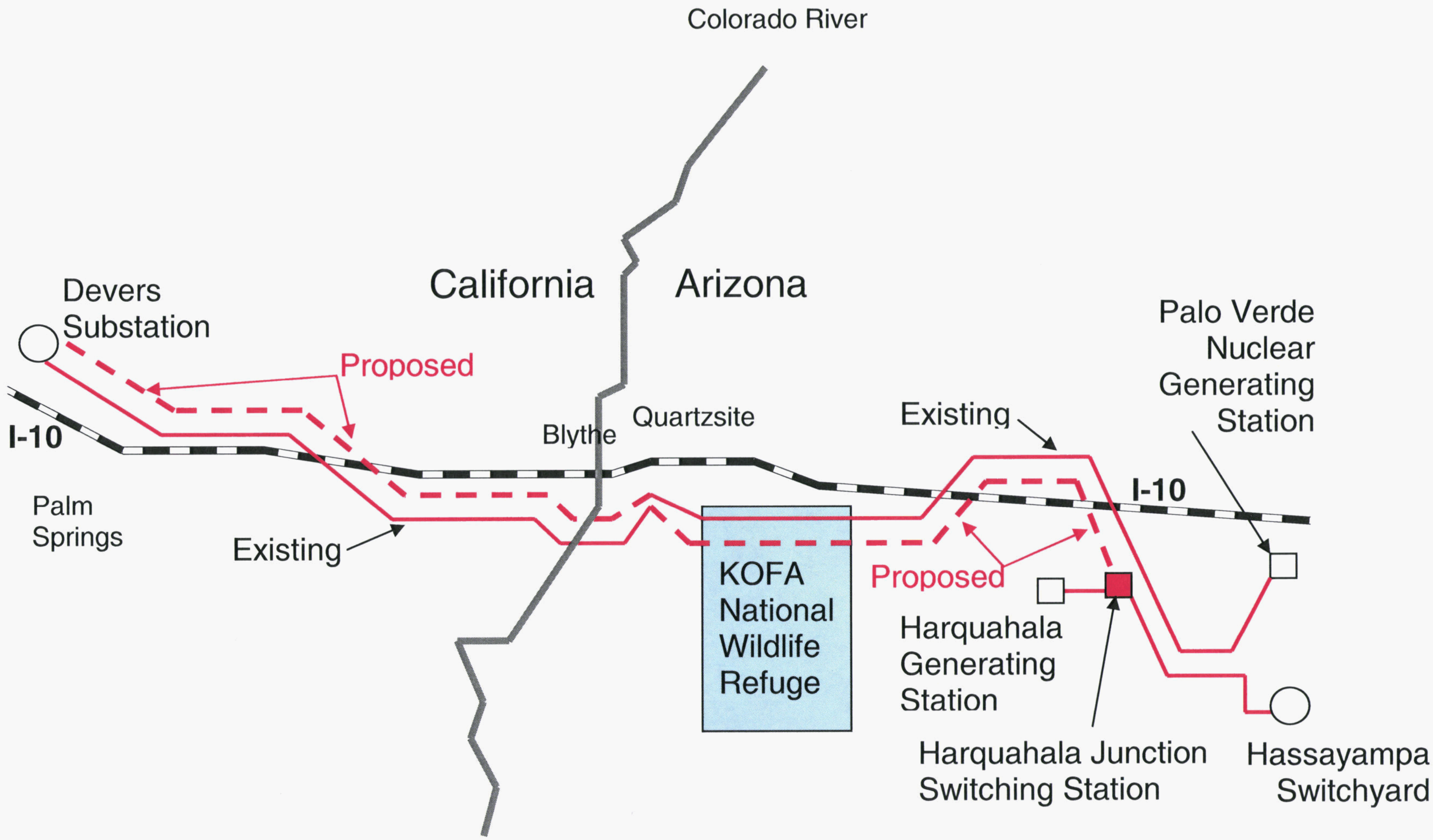
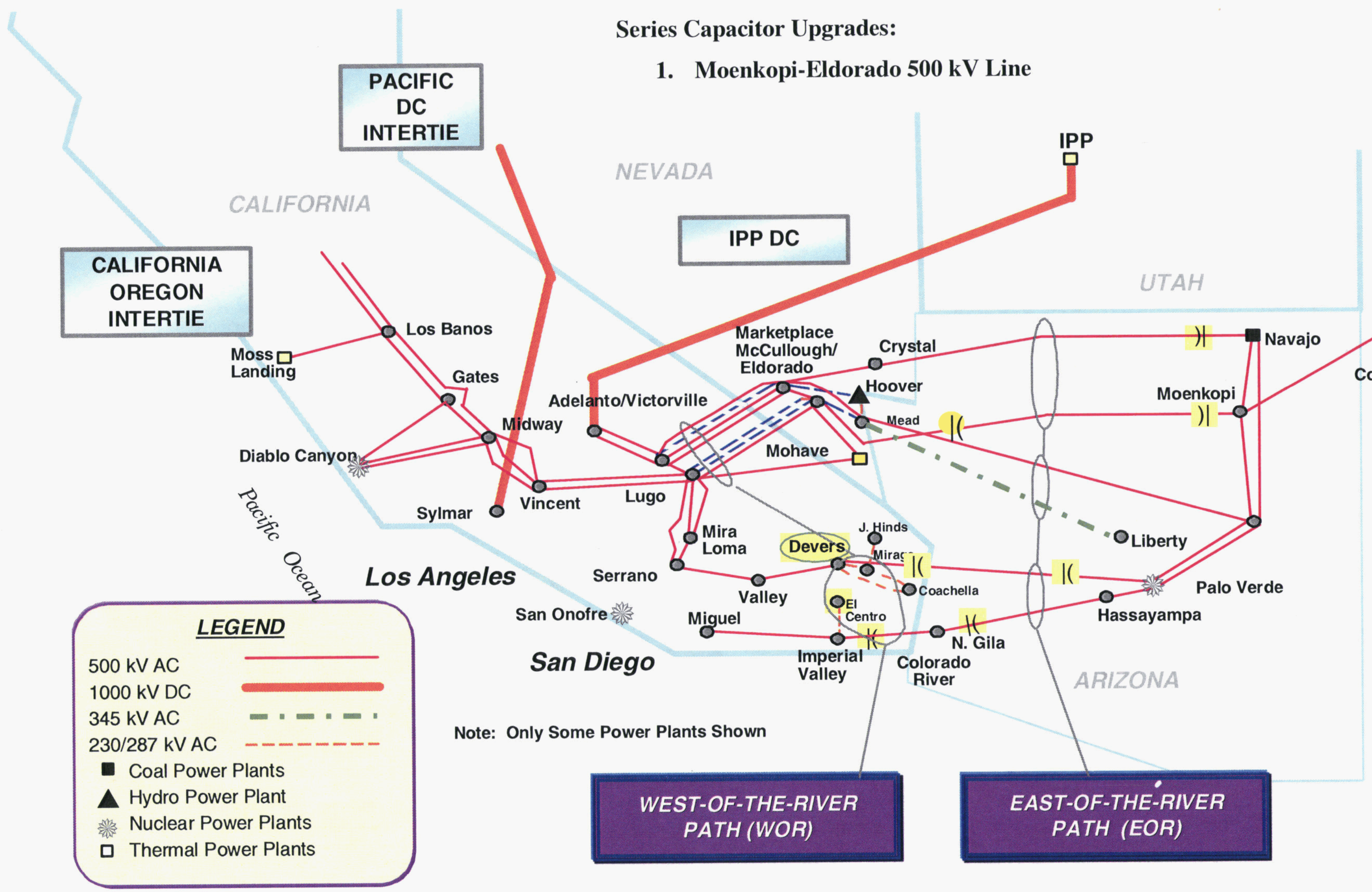


Diagram 2
Series Capacitor Upgrade Project (2011)



ATTACHMENT B

SOUTHERN CALIFORNIA EDISON COMPANY
2007-2016
TEN-YEAR PLAN

Devers-Palo Verde No. 2 Project
WECC Accepted Path 46 Rating Study Report

SOUTHERN CALIFORNIA
EDISON®
An *EDISON INTERNATIONAL®* Company

DEVERS – PALO VERDE NO. 2 (DPV2)

ACCEPTED PATH 46 RATING STUDY REPORT

VOLUME I – MAIN REPORT

APRIL 21, 2006

Prepared by the Western Electricity Coordinating Council (WECC)
And Western Arizona Transmission System (WATS)
Peer Review Group

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

The Southern California Edison Company (SCE) is proposing to build a 230 mile, Harquahala-Devers 500 kV transmission line. Together with the new 500 kV line, other transmission-related reinforcements and procedures comprise the project plan of service, which is described in section III.B. The project is referred to as Devers-Palo Verde No. 2 or DPV2. DPV2 is being pursued to increase the transfer capability between Arizona and California by 1,200 MW for economic reasons. The planned operating date for DPV2 is 2009.

Like the existing Palo Verde-Devers 500 kV line, DPV2 will be a part of both the Arizona-California East-of-River path (Path 49) and Arizona-California West-of-River path (Path 46) definitions. Owing to this dual nature, the DPV2 Plan of Service (POS) ultimately will be designed to increase the non-simultaneous rating of both Paths 49 and 46. The Path 49 Rating Study was completed separately on July 25, 2005 and Phase 3 status was granted by WECC on August 25, 2005. The DPV2 Path 46 Rating Study has now been completed in coordination with the Path 46 rating study for the Path 49 Series Capacitor Upgrade Project. In addition, owing to the uncertainty of continued operation of the Mohave Generating Plant during the rating study period, two complete DPV2 plans of service were developed, one with and the other without the Mohave Generating Plant in service. However, owing to SCE's continued support of efforts to return Mohave Generating Plant to service at the conclusion of this Path 46 rating study, SCE correspondingly plans to pursue the DPV2 plan of service based on the Mohave Generating Plant returning to service. If a future decision is made to permanently shutdown the Mohave generating plant, SCE will work with the Mohave owners and other interested parties to determine the preferred and technically acceptable plan to ensure reliable system performance and balance the interests of all the parties at that point in time. Clearly details of any future plan will involve commercial issues that are beyond the purview of this rating study. The main objective of this DPV2 Path 46 Rating Study (Study) is to establish a new Accepted Rating of 11,823 MW on Path 46 as a result of DPV2.

On October 10, 2003, SCE submitted a notification letter to the Western Electricity Coordinating Council (WECC) Planning Coordination Committee and the WECC Technical Studies Subcommittee formally initiating Phase 1 of the WECC rating process for DPV2. After completing Phase 1 requirements, TSS granted Phase 2 status to DPV2 on October 31, 2005. In addition to the WECC rating process, DPV2 has adhered to the Western Arizona Transmission System (WATS) regional planning requirements. On August 31, 2005, SCE formed a combined WECC/WATS Peer Review Group (PRG) to review and approve the Study, and prepare this final DPV2 Accepted Path 46 Rating Study Report (Report).

Based on the findings of this Study, the DPV2 POS is adequate to increase the Path 46 non-simultaneous rating by 1,200 MW from 10,623 MW to 11,823 MW, while meeting the NERC/WECC Planning Standards and the regional WATS planning requirements. With the inclusion of reactive support equipment in the DPV2 POS, the Southern California Import Transmission (SCIT) path simultaneous capability as defined in the SCIT Nomogram will also be increased by 1,200 MW. In addition, the DPV2 POS is adequate to achieve a 1,200 MW rating increase on Path 46 simultaneously with four WECC defined Paths 26 (Midway-Vincent), 27 (IPPDC), 41 (Sylmar), and 65 (PDCI) at their respective maximum ratings. Nomograms and/or operating procedures will have to be implemented to mitigate the simultaneous interaction between Path 46 and Path 61 (Victorville-Lugo). Conceptual nomograms have been developed in this Study. Summaries of the DPV2 POS requirements for each of the analyses are presented in the following Tables I.A and I.B.

At the request of PRG members, the Study includes assessments of three sensitivities for information purposes, which are described in section VIII of this Report.

SCE would like to express its gratitude to PRG members for their professionalism and expertise in providing support to this Study and completing the Report.

TABLE I.A

DPV2 Plan of Service Summary for Mohave On Line Scenario [A]

Analysis	Total Reactive Support (MVAr) [B]	Nomogram [C]	Operating Procedure [C]	SPS [C]
Non-Simultaneous	800	Yes	Yes	Yes
SCIT Nomogram	800	Yes	Yes	Yes
Path 26	800	Yes	Yes	Yes
Path 27	800	Yes	Yes	Yes
Path 41	800	Yes	Yes	Yes
Path 61	800	Yes [D]	Yes [D]	Yes
Path 65	800	Yes	Yes	Yes

A – All analyses assume the following core plan of service elements:

1. **Build new Harquahala-Devers 500 kV line**
2. **Rebuild Devers-San Bernardino 230 kV lines #1 and #2**
3. **Rebuild Devers-Vista 230 kV lines #1 and #2**

B – The Reactive Support level shown represents the total amount assumed for each analysis and consists of two 150 MVAr shunt capacitors and one 500 MVAr SVC installed at Devers 500 kV Substation.

C – Implement an integrated mitigation plan involving nomograms, operating procedures and/or an SPS (to trip generation in the Palo Verde area and/or load in Southern California) to relieve thermal overloads on 3 transmission facilities for the DPV1 and DPV2 outage. In the absence of operating procedures to bypass the Perkins phase shifters, up to 1,125 MW of generation in Arizona and up to 1,350 MW of load in Southern California may be required for the double line outage. This integrated N-2 mitigation plan also must consider tripping up to 900 MW of load in Southern California and possibly up to 400 MW of generation in the Palo Verde area to meet the stability and/or post transient planning standards for DPV1 and DPV2 outage.

D – Implement a nomogram and operating procedures to relieve a thermal overload on Victorville-Lugo 500 kV line for line outages.

TABLE I.B

DPV2 Plan of Service Summary for Mohave Off Line Scenario [A]

Analysis	Total Reactive Support (MVAr) [B]	Nomogram [C]	Operating Procedure [C]	SPS [C]
Non-Simultaneous	**1,300**	**Yes**	**Yes**	**Yes**
SCIT Nomogram	**1,300**	**Yes**	**Yes**	**Yes**
Path 26	**1,300**	**Yes**	**Yes**	**Yes**
Path 27	**1,300**	**Yes**	**Yes**	**Yes**
Path 41	**1,300**	**Yes**	**Yes**	**Yes**
Path 61	**1,300**	**Yes** [D]	**Yes**	**Yes** [D]
Path 65	**1,300**	**Yes**	**Yes**	**Yes**

A – All analyses assume the following core plan of service elements:

1. **Build new Harquahala-Devers 500 kV line**
2. **Rebuild Devers-San Bernardino 230 kV lines #1 and #2**
3. **Rebuild Devers-Vista 230 kV lines #1 and #2**

B – The Reactive Support level shown represents the total amount assumed for each analysis and consists of two 150 MVAr shunt capacitors and one 600 MVAr SVC installed at Devers 500 kV Substation and one 400 MVAr SVC installed at Lugo 500 kV Substation. Also, 70% series compensation on the Mohave-Lugo 500 kV line is assumed in the analysis.

C – Implement an integrated mitigation plan involving nomograms, operating procedures and/or an SPS (to trip generation in the Palo Verde area and/or load in Southern California) to relieve thermal overloads on 3 transmission facilities for the DPV1 and DPV2 outage. In the absence of operating procedures to bypass the Perkins phase shifters, up to 1,125 MW of generation in Arizona and up to 1,350 MW of load in Southern California may be required for the double line outage. This integrated N-2 mitigation plan also must consider tripping up to 900 MW of load in Southern California and possibly up to 400 MW of generation in the Palo Verde area to meet the stability and/or post transient planning standards for DPV1 and DPV2 outage.

D – Implement a nomogram and operating procedures to relieve a thermal overload on Victorville-Lugo 500 kV line for line outages.

II. STUDY OBJECTIVES AND SCOPE

The main objective of this DPV2 Path 46 Rating Study (Study) is to establish a new Accepted Rating of 11,823 MW on Path 46 as a result of DPV2, since DPV2 will be included in the Path 46 definition. To achieve this new rating, the Study must demonstrate that the Path 46 rating can be increased from 10,623 MW to 11,823 MW while meeting the NERC/ WECC Planning Standards and the regional WATS planning requirements (hereafter jointly referred to as Criteria). Specifically, in accordance with Phase 2 of the WECC "Procedures for Regional Planning Project Review and Rating Transmission Facilities" policy (WECC Rating Policy), the Study is designed to:

- Address comments on the DPV2 Comprehensive Progress Report.
- Address comments on the DPV2 Accepted Path 46 Rating Study.
- Demonstrate conformance with the NERC/ WECC Planning Standards.
- Identify the non-simultaneous transfer capability and simultaneous path transfer capability limits for a specific plan of service.
- Address the mitigation of simultaneous transfer capability problems relative to the existing system.

In addition, the Study included performing limited sensitivity analyses to check the interaction of DPV2 with other similarly situated projects and sub-regional projects to the extent these projects and sub-projects had developed a preferred plan of service that can be modeled in the Study.

The analyses performed in this Study were designed to be rigorous and extensive as indicated by the Study Scope of Appendix A, which provides details on the criteria, assumptions and methodology. As indicated in the Study Scope, essentially two complete analyses were performed owing to the uncertainty of continued operation of the Mohave Generating Plant. One analysis assumes that the Mohave Generating Plant will be in service when DPV2 goes into service in 2009. The other analysis assumes that the Mohave Generating Plant will be shut down.

Like the existing Palo Verde-Devers 500 kV line (DPV1), DPV2 will be a part of both the Path 49 and Path 46 definitions. Owing to this dual nature, the DPV2 Plan of Service ultimately will be designed to increase the non-simultaneous rating of both Path 46 and Path 49. The DPV2 Path 49 Rating Study was completed and Phase 3 status was granted by WECC in 2005. The Study described in this Report was performed in coordination with the Path 46 rating study being performed for the Path 49 Series Capacitor Upgrade Project (Upgrade Project). The Upgrade Project is seeking a 505 MW increase on Path 46 from the current 10,118 MW rating to a new rating of 10,623 MW. The Upgrade Project rating studies performed within the WECC and WATS reliability forums provides the baseline for performing DPV2 non-simultaneous and simultaneous analyses.

Samples of general instructions for modeling single and double contingencies (also known as "switchdecks") simulated in the dynamic stability and post-transient power flow analyses for the non-simultaneous analysis are provided in Appendix B.

III. PROJECT DESCRIPTION

III.A BACKGROUND

Southern California Edison (SCE) is proposing to build a 230 mile, 500 kV transmission line from the Palo Verde area, near Phoenix, Arizona, to SCE's Devers substation, near Palm Springs, California. Together with the new 500 kV line, other transmission-related reinforcements comprise the overall plan of service. The project is named Devers-Palo Verde No. 2 (DPV2). DPV2 is being pursued to increase the transfer capability between Arizona and California by 1,200 MW. The expected operating date for DPV2 is 2009.

On October 10, 2003, SCE submitted a notification letter to the Western Electricity Coordinating Council Planning Coordination Committee (PCC) and the WECC Technical Studies Subcommittee (TSS) formally initiating Phase 1 of the WECC Rating Process for DPV2. Regional review of DPV2 was performed through the DPV2 Regional Planning Review Group, which met in November of 2003. The DPV2 Regional Planning Compliance Report was submitted to the WECC PCC on June 8, 2004. On September 14, 2004, PCC accepted as complete the DPV2 Regional Planning Compliance Report.

The DPV2 Comprehensive Progress Report (CPR), which provided the analysis used to define DPV2's conceptual plan of service, was submitted to the WECC on August 31, 2005. The DPV2 CPR indicated that the DPV2 plan of service could reliably achieve an incremental increase of 1,200 MW in the non-simultaneous rating of Path 46.

In accordance with the WECC path rating process, TSS granted Phase 2 status to DPV2 on October 31, 2005. On August 31, 2005, SCE formed a combined WECC/WATS Peer Review Group (PRG) to review and approve the Study, and prepare this final DPV2 Accepted Path 46 Rating Study Report.

III.B PLAN OF SERVICE

To reliably increase the Path 46 rating by 1,200 MW while meeting the Criteria, the POS will need to include the following facilities and procedures. Those elements of the POS related to the DPV1 and DPV2 double line outage mitigation will be further evaluated and defined through a separate and on-going study under the supervision of the PRG.

1. Devers - Harquahala 500 kV Line

Build a new 230 mile-500 kV line between Harquahala Generating Company's Harquahala Switchyard in Arizona to SCE's Devers 500 kV Substation near Palm Springs, California. The line will be designed with 2B-2156 ACSR conductor and a nominal 50% series compensation that matches the series compensation equipment on the existing Palo Verde-Devers 500 kV line. The proposed route between Devers and Harquahala parallels the entire length of SCE's existing Palo Verde-Devers 500 kV transmission line, as shown on the diagram of section III.C.

2. Devers – San Bernardino 230 kV lines #1 and #2

Rebuild and reconductor the Devers–San Bernardino 230 kV lines #1 and #2. The original single-circuit 230 kV tower lines will be removed and replaced with new double-circuit 230 kV tower structures, strung with bundled 1033 ACSR conductor. The conductor on the existing double circuit 230 kV towers will also be replaced with double bundled 1033 ACSR conductor.

3. ***Devers – Vista 230 kV lines #1 and #2***

Rebuild and reconductor the Devers–Vista 230 kV lines #1 and #2. The original single-circuit 230 kV tower lines will be removed and replaced with new double-circuit 230 kV tower structures, strung with bundled 1033 ACSR conductor. The conductor on the existing double circuit 230 kV towers will also be replaced with double bundled 1033 ACSR conductor.

4. ***230 kV Circuit Breakers***

Replace fourteen 230 kV circuit breakers at two locations and upgrade 4 circuit breakers at one location on the SCE system, as follows:

- Replace 12 CBs @ Devers Substation
- Replace 2 CBs @ Lewis Substation
- Upgrade 4 CBs @ SONGS Substation (by installing TRV L-G Capacitors)

On an allocated contribution basis, upgrade as necessary, fifteen 230 kV circuit breakers at McCullough Substation.

5. ***Reactive Power Equipment***

As a minimum, install fixed shunt capacitors and SVC capacity at Devers 500 kV substation and SVC capacity at Lugo 500 kV substation as required for the scenarios with Mohave generating station continuing operation or retired, respectively. Below are the specific requirements for each scenario.

	Reactive Power Capacity (MVAr)	
	Mohave On Line	Mohave Off Line
Shunt Capacitors @ Devers 500 kV	300	300
SVCs or equivalent @ Devers 500 kV	500	600
SVCs or equivalent @ Lugo 500 kV	0	400

SCE reserves the right to design and install reactive power equipment and associated control parameters, which may differ with what was modeled in this Study, as long as it can be demonstrated that the performance is as good as or better than the results presented in this Report.

6. ***Special Protection System (SPS)***

Install a Special Protection System (SPS) that will be designed to shed load on SCE's system to ensure acceptable performance for the double contingency loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines. Dropping generation in the Palo Verde area also may be part of the SPS. Also, operating procedures that bypass the Perkins phase shifters under defined operating conditions on a pre-contingency basis should be coordinated with the SPS as mitigation to meet the thermal criteria. SCE is committed to ensuring that the ultimate SPS mitigation plan will be designed to ensure acceptable performance for the double contingency loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines. To this end, SCE intends to work closely with the CAISO, Arizona utilities and regulators, and generator owners within the appropriate stakeholder forums to develop a workable plan. SCE formed a technical SPS study group comprised of interested stakeholders to develop the study scope and perform the studies as the basis for determining the ultimate SPS requirements. The SPS design study will include analyses of different operating conditions, including the Palo Verde hub generation and COI/PDCI transfers. Under the guidance of WATS, the operating procedures currently used for operation of the East of River Path will be amended as needed to cover the double line outage and thermal overloads. The "Palo Verde West Operating Guidelines" and the "Agreement on Operating Procedure for Reduction in Loading on the East of River Path" are enforced by Arizona Public Service as the operator of Path 49 and will be amended as needed. This process will be reviewed and approved by WATS. Also, the specific SPS design will be evaluated carefully in the WECC Remedial Action Scheme Task Force (RASTF) during the design phase.

SCE reserves the right to develop and implement an SPS, which may differ with what was modeled in this Study, as long as it can be demonstrated that the performance is as good as or better than the results presented in this Report.

7. Nomogram

Absent of or in coordination with other remediation, develop and implement the following new nomograms to meet the planning standards:

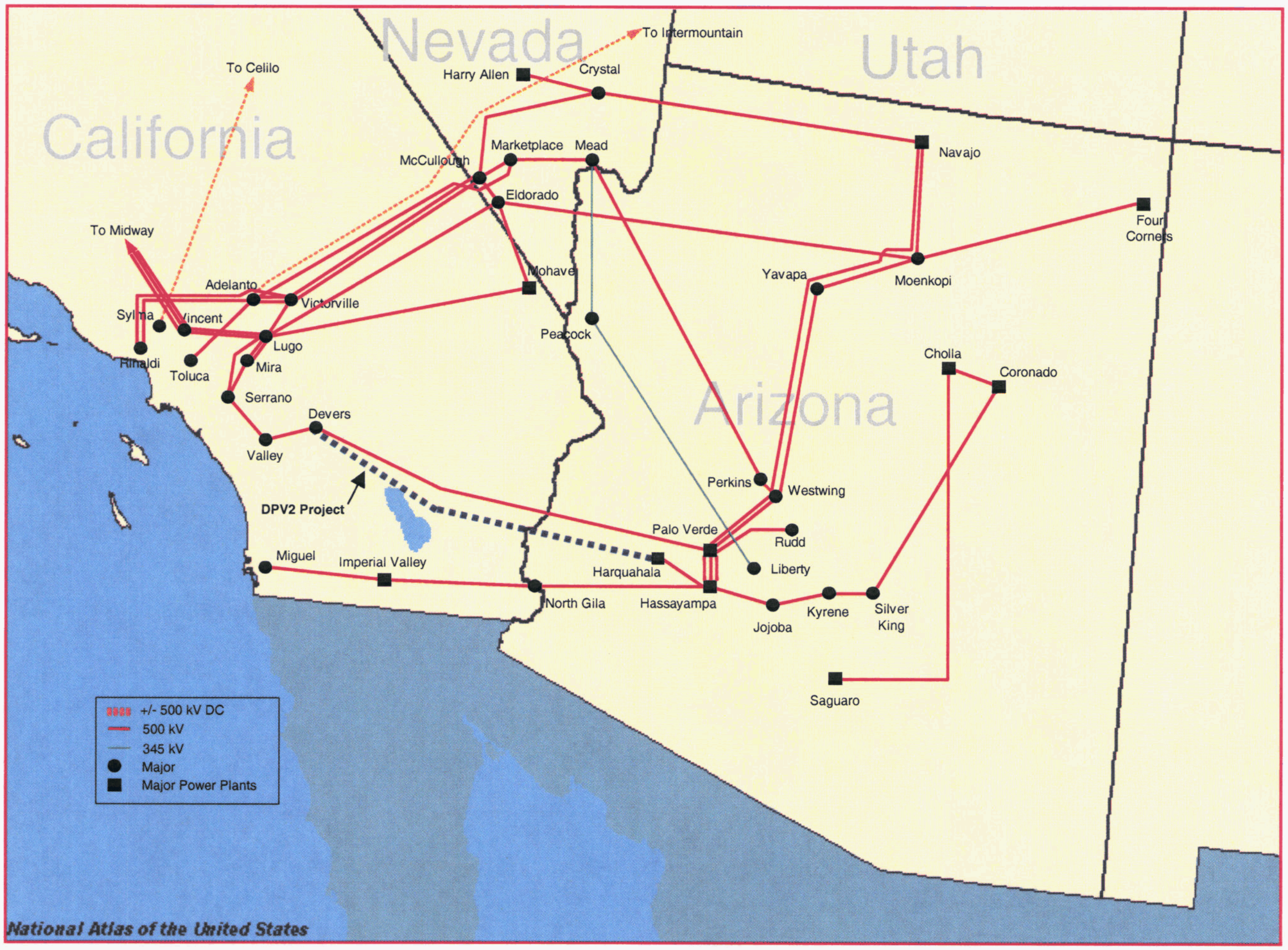
- Path 46 vs. Path 61 for loss of the Hassayampa-N.Gila 500 kV line,
- Perkins phase shifter in vs. out of service for DPV1 and DPV2 double line outage

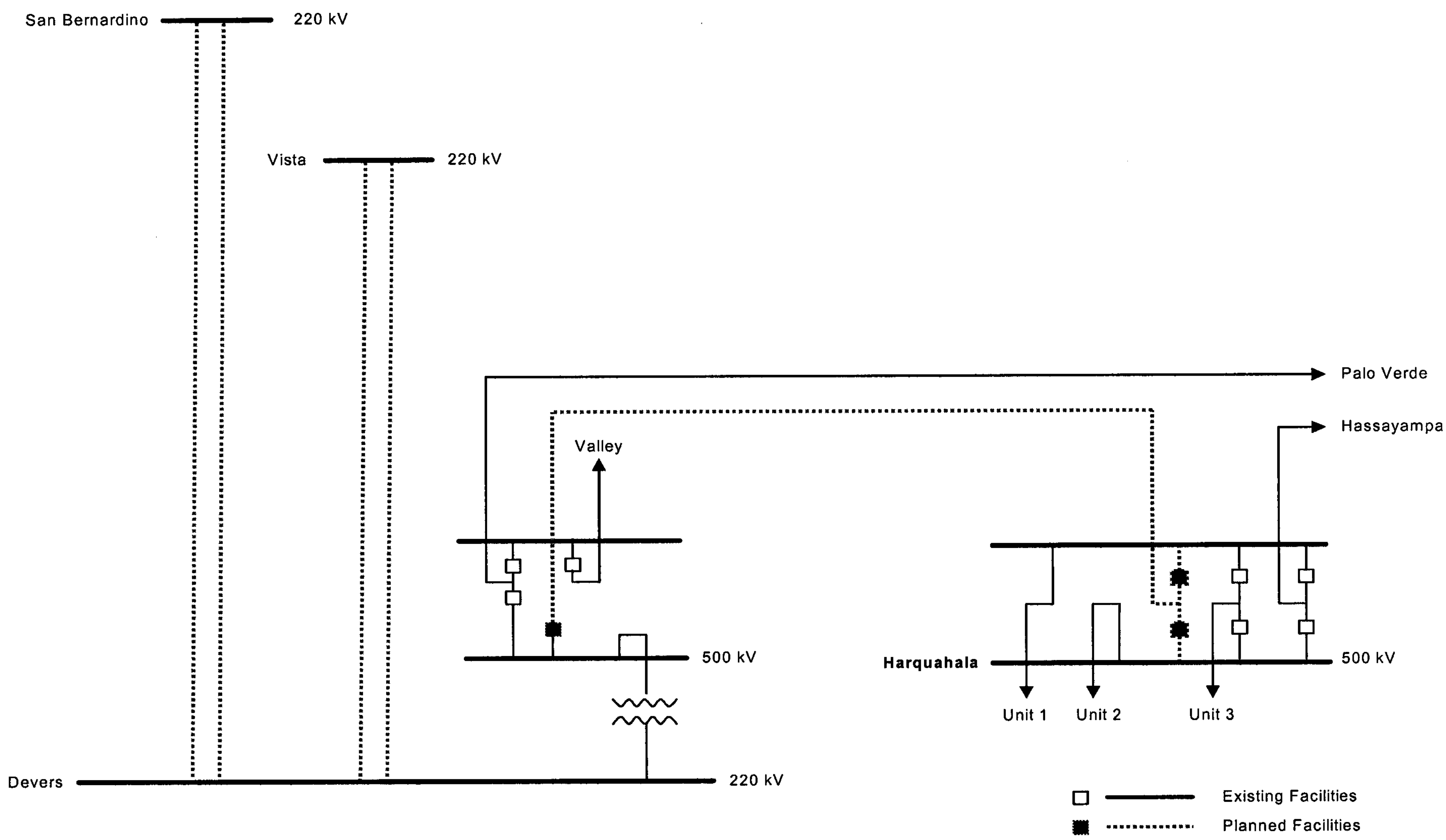
8. Operating Procedures

Absent of or in coordination with other remediation, develop and implement new operating procedures to identify schedule reductions to relieve overloads on:

- Mead-Perkins 500 kV series capacitors and two Perkins phase shifters for loss of the Palo Verde-Devers and the Harquahala-Devers 500 kV lines in lieu of or conjunction with SPS requirements,
- Path 61 (Victorville-Lugo 500 kV line) for the following contingencies:
    1. Eldorado-Lugo 500 kV line
    2. Mohave-Lugo 500 kV line
    3. Devers-Valley 500 kV line
    4. N.Gila-IV 500 kV line

III.C GEOGRAPHIC MAP OF DPV2 IN RELATION TO DSW TRANSMISSION





III.D CONCEPTUAL ONE LINE DIAGRAM OF DPV2

IV. RESPONSES TO COMMENTS

IV.A DPV2 COMPREHENSIVE PROGRESS REPORT

The DPV2 WOR Comprehensive Progress Report, which provided the analysis used to define the conceptual Plan-of-Service for DPV2, was submitted to the WECC on August 31, 2005. As established in the WECC rating review process, the 60-day review period began on August 31, 2005 and ended on October 31, 2005.

During the 60-day review period, SCE received no comments on the DPV2 WOR Comprehensive Progress Report.

IV.B DPV2 ACCEPTED PATH 46 RATING STUDY

Since the formation of the PRG, stakeholders were given several opportunities to review and comment on all aspects of the Study. Throughout the study period, SCE solicited and received comments on the DPV2 rating analysis. SCE responses to these comments are provided in Appendix G.

V. FINDINGS OF NON-SIMULTANEOUS ANALYSIS

V.A OVERALL SUMMARY

In accordance with the WECC Rating Policy, the non-simultaneous analysis is based on the key assumption that Path 46 power flow will be at its maximum target rating of 11,823 MW while flows on other paths may be less than their respective maximum ratings. Details on the criteria, assumptions and methodology for the non-simultaneous analysis are provided in section III on page 5 of the Study Scope (Appendix A). Also, all facilities expected to be in service prior to DPV2 operation were provided by PRG members and represented in the base cases used to perform the analysis. The final non-simultaneous base cases were approved by the PRG.

Results indicate that the DPV2 POS is adequate to achieve a 1,200 MW non-simultaneous rating increase on Path 46 with the DPV2 POS outlined in Section III.B while meeting the Criteria.

Results indicated thermal overloads on seven transmission elements for loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines. To the extent these overloaded facilities are not upgraded as part of a future project, SCE will need to develop and implement nomograms and operating procedures in lieu of or in conjunction with an SPS to relieve these overloads as indicated in the DPV2 POS under either Mohave operational condition.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) and Padua (435 MW) or some equivalent mitigation measure to achieve acceptable stability performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

Finally, results also indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) and Padua (435 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviations for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under both Mohave operational conditions.

Details of the Non-Simultaneous Analysis results are provided in Appendix C.

V.B POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 can achieve a 1,200 MW increase in the non-simultaneous rating of Path 46 with the DPV2 POS outlined in Section III.B while meeting the thermal limits of the transmission system. In the absence of remediation separate from DPV2, employing nomograms and operating procedures in lieu of or in conjunction with an SPS would relieve overloads on specific transmission facilities as stated in the DPV2 POS.

The "Control Area Summary of Pre-Contingency Base Cases," which was approved by the PRG, is provided in Appendix C.1.a. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix C.1.b. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix C.1.c.

The "Path 46 Non-Simultaneous Power Flow Analysis Summary," which lists the 5 highest transmission loadings for normal and contingency conditions, is provided in Appendix C.1.d. The following subsections provide highlights of the analysis.

<u>Mohave On Line</u>

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the pre-or-post-project cases. Marginal loadings of 100.4% and 100.0% occurred on the two Perkins phase shifters in the pre-and-post-project cases, respectively, which are considered acceptable by the owners of the equipment.

2. For the single line outage of the Palo Verde-Devers 500 kV line in the pre-project case, thermal overloads occurred on three transmission lines. Those three lines are the Niland-CVSUB 161 kV line, the Ave 58-Bannister 161 kV line and the RTAP2-RTP1 92 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system. For the same outage, these loadings dropped well below 100% in the post-project case, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	Pre-Project	Post-Project	Outage
AV58TP1-Bannister 161	109.0	< 90.0	DPV1
Niland-CVSUB 161	105.6	< 90.0	DPV1
RTAP2-RTP1 92	114.2	< 90.0	DPV1

3. For the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines in the post-project case, loadings of 115.1% of the emergency rating of the series

capacitor of the Mead-Perkins 500 kV line and 113.9% of the emergency rating of the two Perkins phase shifters occurred. Also, overloads occurred on three IID lines, including 123.7% on the Niland-CVSUB 161 kV line, 126.6% on the Ave 58-Bannister 161 kV line and 134.6% on the RTAP2-RTP1 92 kV line. Also, an overload of 104.8% occurred on the Victorville-Lugo 500 kV line.

4. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and sheds 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines, as shown in the table below. Pending further studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

	Emergency Loading (%)		
Limiting Element	No SPS	With SPS	Outage
Mead-Perkins Series Cap	115.1	97.4	DPV1&2
Mead-Perkins Phase Shifters	113.9	99.4	DPV1&2
AV58TP1-Bannister 161	126.6	< 90.0	DPV1&2
Niland-CVSUB 161	123.7	< 90.0	DPV1&2
RTAP2-RTP1 92	134.6	< 90.0	DPV1&2
Victorville-Lugo 500	104.8	< 90.0	DPV1&2

5. Implementing a nomogram and operating procedure, which operates the Perkins phase shifter in an out of service mode, resulted in reducing the thermal overload considerably on the series capacitor of the Mead-Perkins 500 kV line and the Perkins phase shifters. However, marginal thermal loading occurred on two other transmission lines. Those two lines are the Hassayampa-NGila 500 kV line and the Liberty 345 kV phase shifter. Overload continued on the Victorville-Lugo 500 kV line, which could be relieved by expanding the Path 46 vs Path 61 nomogram, which is discussed under the Section III.B (Plan of Service) and Section VII.D (Path 61). Even assuming separate mitigation by bypassing the Perkins phase shifters, the thermal overloads on the remaining two transmission facilities marginally exceed their respective limits, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	No SPS	With Nomogram	Outage
Mead-Perkins Series Cap	115.1	< 90.0	DPV1&2
Mead-Perkins Phase Shifters	113.9	< 90.0	DPV1&2
AV58TP1-Bannister 161	126.6	< 90.0	DPV1&2
Niland-CVSUB 161	123.7	< 90.0	DPV1&2
RTAP2-RTP1 92	134.6	< 90.0	DPV1&2
Victorville-Lugo 500	104.8	102.5	DPV1&2
Hassyamp-NGila 500	< 90.0	100.8	DPV1&2

Liberty Phase Shifter	< 90.0	100.4	DPV1&2

6. Implementing an SPS together with a nomogram and operating procedure, which operates the Perkins phase shifter in an out of service mode. Operating with the SPS, which sheds 432 MW of load in SCE's system, mitigates the remaining thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	No SPS	With SPS/Nmgrm	Outage
Victorville-Lugo 500	104.8	100.2	DPV1&2
Hassyamp-NGila 500	< 90.0	98.9	DPV1&2
Liberty Phase Shifter	< 90.0	100.2	DPV1&2

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the pre-or-post-project cases. Marginal loadings of 100.2% occurred on the two Perkins phase shifters in the pre-and-post-project cases, which were considered acceptable by the owners of the equipment..

2. For the single line outage of the Palo Verde-Devers 500 kV line in the pre-project case, thermal overloads occurred on three transmission lines. Those three lines are the Niland-CVSUB 161 kV line, the Ave 58-Bannister 161 kV line and the RTAP2-RTP1 92 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system. For the same outage, these loadings dropped well below 100% in the post-project case, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	Pre-Project	Post-Project	Outage
AV58TP1-Bannister 161	111.0	< 90.0	DPV1
Niland-CVSUB 161	108.5	< 90.0	DPV1
RTAP2-RTP1 92	116.4	< 90.0	DPV1

3. For the single line outage of the IV-Miguel 500 kV line without the RAS in the pre-project case, a thermal overload occurred on the RTAP2-RTP1 92 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system. For the same outage, these loadings dropped well below 100% in the post-project case, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	Pre-Project	Post-Project	Outage
RTAP2-RTP1 92	102.4	< 90.0	DPV1

4. For the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines in the post-project case, loadings of 115.5% of the emergency rating of

the series capacitor of the Mead-Perkins 500 kV line and 113.7% of the emergency rating of the two Perkins phase shifters occurred. Also, overloads of 102.5% and 104.2% occurred on the Victorville-Lugo 500 kV line and Marketplace-Mead 500 kV line, respectively.

5. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines, as shown in the table below. Pending further studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

	Emergency Loading (%)		
Limiting Element	No SPS	With SPS	Outage
Mead-Perkins Series Cap	115.5	97.8	DPV1&2
Mead-Perkins Phase Shifters	113.7	99.4	DPV1&2
Victorville-Lugo 500	102.5	<90.0	DPV1&2
Marketplace-Mead 500	104.2	94.1	DPV1&2

V.C DYNAMIC STABILITY ANALYSIS RESULTS

The key finding from the dynamic stability analysis is that DPV2 can achieve a 1,200 MW increase in the non-simultaneous rating of Path 46 with the DPV2 POS outlined in Section III.B while meeting the voltage dip, damping and frequency deviation limits of the transmission system.

The "Path 46 Non-Simultaneous Stability Analysis Summary" is provided in Appendix C.2.a. The following subsections provide highlights of the analysis.

Mohave On Line

1. All machines in the WECC grid remained in synchronism and were damped. Also, all bus voltage dips and frequency deviations were well within their respective limits in both the pre-and-post-project cases.
2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.

Mohave Off Line

1. All machines in the WECC grid remained in synchronism and were damped. Also, all bus voltage dips and frequency deviations were well within their respective limits in both the pre-and-post-project cases.
2. Except for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, no SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.
3. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line

outage, the transient voltage dip exceeded 30% at Needles 69 kV and Adelanto 500 kV buses. Implementing an SPS that shed Walnut (432 MW) and Padua (435 MW) loads on SCE's system resulted in acceptable voltage dip values.

V.D POST-TRANSIENT POWER FLOW ANALYSIS RESULTS

The key finding from the post-transient power flow analysis is that DPV2 can achieve a 1,200 MW increase in the non-simultaneous rating of Path 46 with the DPV2 POS outlined in Section III.B while meeting the post-transient voltage deviation limits of the transmission system.

The "Path 46 Non-Simultaneous Post Transient Analysis Summary" is provided in Appendix C.3.a. The following subsections provide highlights of the analysis.

Mohave On Line

1. Post-transient voltage deviations exceeded 5% for two single contingencies (DPV1 and IV-Miguel) in the pre-project cases only. Post-transient voltage deviations were less than 6.0% at selected busses in IID and MWD systems. At first glance the pre-project deviations over the 5% criterion may appear problematic; however the focus of this analysis is to ensure that the post-project performance is adequate. The pre-project case was only developed to represent a reference point from which to develop the post-project case. Having a starting point slightly above the limit in the pre-project case actually adds a level of conservativeness to the post-project analysis. The important result is that post-transient voltage deviations did not exceed 5% during single contingencies in the post-project cases.
2. Except for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, post-transient voltage deviations did not exceed 10% during double contingencies in both the pre-and-post-project cases.
3. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in non convergence. Implementing an SPS that shed Walnut (432 MW) and Padua (435 MW) loads on SCE's system resulted in acceptable post-transient voltage deviations.

Mohave Off Line

1. Post-transient voltage deviations exceeded 5% for two single contingencies (DPV1 and IV-Miguel) in the pre-project cases only. Post-transient voltage deviations were less than 7.5% at selected busses in IID, MWD and NPC systems. Similar to the Mohave on line case, having a starting point slightly above the limit in the pre-project case actually adds a level of conservativeness to the post-project analysis. Again, the key result is that post-transient voltage deviations did not exceed 5% during single contingencies in the post-project cases.
2. Except for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, post-transient voltage deviations did not exceed 10% during double contingencies in both the pre-and-post-project cases.

3. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in non convergence. Implementing an SPS that shed Walnut (432 MW) and Padua (435 MW) loads on SCE's system resulted in acceptable post-transient voltage deviations.

VI. FINDINGS OF SCIT NOMOGRAM SIMULTANEOUS ANALYSIS

VI.A OVERALL SUMMARY

In accordance with the WECC Rating Policy, rating studies need to determine simultaneous path transfer capability limits, as appropriate, for a specific plan of service. The Southern California Import Transmission (SCIT) Nomogram is an important simultaneous path that was assessed in this Study. SCIT defines acceptable flow limits on Path 49 in relation to 5 other paths that deliver power to Southern California. Path 46 is one of the five paths that define the SCIT path. To ensure reliable delivery from the Palo Verde Hub to Southern California, the DPV2 POS will be designed to achieve a 1,200 MW rating increase on Path 49, Path 46 and the SCIT Path. Details on the criteria, assumptions and methodology for the SCIT nomogram simultaneous analysis are provided in section IV.1 on page 13 of the Study Scope (Appendix A). The final SCIT Nomogram base cases were approved by the PRG.

Results indicate that the DPV2 POS is adequate to achieve a 1,200 MW simultaneous rating increase on Path 49, Path 46 and the SCIT path with the DPV2 POS outlined in Section III.B while meeting the Criteria.

Results indicated thermal overloads on three transmission elements (Perkins phase shifters and series capacitors on the Perkins-Mead 500 kV line) for loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines. To the extent these overloaded facilities are not upgraded as part of a future project, SCE will need to develop and implement nomograms and operating procedures in lieu of or in conjunction with an SPS to relieve these overloads as indicated in the DPV2 POS.

Finally, results also indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviation performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

Details of the SCIT Nomogram analysis results are provided in Appendix D.

VI.B POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 can achieve a 1,200 MW rating increase simultaneously on Path 49, Path 46 and SCIT with the DPV2 POS outlined in Section III.B while meeting the thermal limits of the transmission system.

The "Control Area Summary of Pre-Contingency Base Cases," which was approved by the PRG, is provided in Appendix D.1.a. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix D.1.b. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix D.1.c.

The "Simultaneous SCIT Power Flow Analysis Summary," which lists the highest transmission loadings for normal and contingency conditions, is provided in Appendix D.1.d. The following subsections provide highlights of the analysis.

Mohave On Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the pre-or-post-project cases. Marginal loadings of 100.3% and 100.3% occurred on the two Perkins phase shifters in the pre-and-post-project cases, respectively, which were considered acceptable by the owners of the equipment.

2. For the single line outage of the Palo Verde-Devers 500 kV line in the pre-project case, thermal overloads occurred on three transmission lines. Those three lines are the Niland-CVSUB 161 kV line, the Ave 58-Bannister 161 kV line and the RTAP2-RTP1 92 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system. For the same outage, these loadings dropped well below 100% in the post-project case, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	Pre-Project	Post-Project	Outage
AV58TP1-Bannister 161	111.0	< 90.0	DPV1
Niland-CVSUB 161	106.7	< 90.0	DPV1
RTAP2-RTP1 92	116.5	< 90.0	DPV1

3. For the single line outage of the IV-Miguel 500 kV line without the RAS in the pre-project case, a thermal overload occurred on the RTAP2-RTP1 92 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system. For the same outage, these loadings dropped well below 100% in the post-project case, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	Pre-Project	Post-Project	Outage
RTAP2-RTP1 92	102.7	< 90.0	DPV1

4. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the pre-or-post-project cases. Marginal loadings of 100.7% and 100.6% occurred on the two Perkins phase shifters in the pre-and-post-project cases, respectively, which were considered acceptable by the owners

of the equipment.

2. For the single line outage of the Palo Verde-Devers 500 kV line in the pre-project case, thermal overloads occurred on three transmission lines. Those three lines are the Niland-CVSUB 161 kV line, the Ave 58-Bannister 161 kV line and the RTAP2-RTP1 92 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system. For the same outage, these loadings dropped well below 100% in the post-project case, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	Pre-Project	Post-Project	Outage
AV58TP1-Bannister 161	113.5	< 90.0	DPV1
Niland-CVSUB 161	109.6	< 90.0	DPV1
RTAP2-RTP1 92	119.3	< 90.0	DPV1

3. For the single line outage of the IV-Miguel 500 kV line without the RAS in the pre-project case, a thermal overload occurred on the RTAP2-RTP1 92 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system. For the same outage, these loadings dropped well below 100% in the post-project case, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	Pre-Project	Post-Project	Outage
RTAP2-RTP1 92	104.1	< 90.0	DPV1

4. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

VI.C DYNAMIC STABILITY ANALYSIS RESULTS

The key finding from the dynamic stability analysis is that DPV2 can achieve a 1,200 MW rating increase simultaneously on Path 49, Path 46 and SCIT with the DPV2 POS outlined in Section III.B while meeting the voltage dip, damping and frequency deviation limits of the transmission system.

Also a sensitivity analysis was performed with the Mohave-Lugo series compensation level at 26% rather than 70%. Results indicated acceptable performance with the Mohave-Lugo series compensation level at 26%, though the performance was slightly worse than the case with the Mohave-Lugo series compensation level at 70%.

The "Simultaneous SCIT Stability Analysis Summary" is provided in Appendix D.2.a. The following subsections provide highlights of the analysis.

Mohave On Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the pre-and-post-project cases. However, buses at Tarzana 230 kV, Northridge 230 kV and Rinaldi 230 kV exhibited 22 cycles marginally exceeding the 20 cycle duration criterion for the Hassayampa-N.Gila 500 kV line outage in the pre-project case only. At first glance the pre-project durations over the 20 cycle criterion may appear problematic; however the focus of this analysis is to ensure that the post-project performance is adequate. The pre-project case was only developed to represent a reference SCIT Nomogram point from which to develop the post-project SCIT Nomogram point. Having a starting point slightly above the limit in the pre-project case actually adds a level of conservativeness to the post-project analysis. The important result is that the durations did not exceed 20% for more than 20 cycles during single contingencies in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.

Mohave Off Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the pre-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system

VI.D POST-TRANSIENT POWER FLOW ANALYSIS RESULTS

The key finding from the post-transient power flow analysis is that DPV2 can achieve a 1,200 MW increase simultaneously on Path 49, Path 46 and SCIT with the DPV2 POS outlined in Section III.B while meeting the post-transient voltage deviation limits of the transmission system. Also, no SPS is needed for the Mohave on line scenario.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviation performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

The "Simultaneous SCIT Post Transient Analysis Summary" is provided in Appendix D.3.a. The following subsections provide highlights of the analysis.

Mohave On Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in both the pre-and-post-project cases.

2. Post-transient voltage deviations did not exceed 10% during double contingencies in both the pre-and-post-project cases.

3. No SPS was needed to meet the post-transient voltage deviation limits of the transmission system.

Mohave Off Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in both the pre-and-post-project cases.

2. For loss of the Palo Verde–Devers 500 kV line, the post-transient voltage deviation was 5.2% and 5.4% at Iron Mountain and Eagle Mountain buses, respectively, in the pre-project case only. At first glance the pre-project post-transient voltage deviations above the 5% criterion may appear problematic; however the focus of this analysis is to ensure that the post-project performance is adequate. The pre-project case was only developed to represent a reference SCIT Nomogram point from which to develop the post-project SCIT Nomogram point. Having a starting point slightly above the limit in the pre-project case actually adds a level of conservativeness to the post-project analysis. The important result is that the post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

3. Post-transient voltage deviations did not exceed 10% during double contingencies in both the pre-and-post-project cases.

4. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in unacceptable post-transient voltage deviations of 10.1% and 10.4% at Iron Mountain and Eagle Mountain buses, respectively. Implementing an SPS that shed Walnut (432 MW) load on SCE's system resulted in acceptable post-transient voltage deviations.

VII. FINDINGS OF SIMULTANEOUS ANALYSES

In accordance with the WECC Rating Policy, rating studies may need to determine possible simultaneous impacts on other path ratings for a specific project plan of service. At the beginning of this Study, requests were made to assess what impacts DPV2 may have on the following 5 paths.

1. Path 26 (Midway-Vincent)
2. Path 27 (IPPDC)
3. Path 41 (Sylmar)
4. Path 61 (Victorville-Lugo)
5. Path 65 (PDCI)

Details on the criteria, assumptions and methodology for these simultaneous analyses are provided in section IV.2 on page 15 of the Study Scope (Appendix A).

The overall conclusion of the simultaneous analyses is that the DPV2 POS described in section III.B is adequate to achieve a 1,200 MW rating increase on Path 46 simultaneously with four of the five Paths at their respective maximum ratings while meeting the Criteria. Nomograms and/or operating procedures will be needed to mitigate the simultaneous interactions with Path 61.

Details of the Simultaneous analyses results are provided in Appendix E.

VII.A PATH 26

VII.A.1 OVERALL SUMMARY

The analysis is based on the key assumption that Path 46 and Path 26 power flows would be assessed at their respective maximum ratings, being 11,823 MW for Path 46 and 3,700 MW for Path 26.

Results indicate that the DPV2 POS described in section III.B is adequate to achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 26 at its maximum rating of 3,700 MW while meeting the Criteria.

To relieve thermal overloads for loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines, SCE will need to develop and implement nomograms and operating procedures in lieu of or in conjunction with an SPS as indicated in the DPV2 POS.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviation performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under either Mohave operational condition.

Details of the Path 26 analysis results are provided in Appendix E.(series).1.

VII.A.2 POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 26 at its maximum rating of 3,700 MW with the DPV2 POS outlined in Section III.B while meeting the thermal limits of the transmission system.

The "Control Area Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.a.1. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.b.1. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix E.1.c.1.

The "Simultaneous Path 26 Power Flow Analysis Summary," which lists the highest transmission loadings for normal and contingency conditions, is provided in Appendix E.1.d.1. The following subsections provide highlights of the analysis.

<u>Mohave On Line</u>

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case. However, a marginal loading of 100.2% occurred on each of the two Perkins phase shifters in the post-project sensitivity case, which was considered acceptable by the owners of the equipment.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case. However, a marginal overload of 101.9% occurred on the Elcentsw 161/230 kV transformer for loss of the N.Gila-IV 500 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system.

3. For the double line outage of the Midway-Vincent 500 kV lines #1 & 2, a loading of 99.3% of the emergency rating of the Midway-Vincent 500 kV line #3 occurred. To be able to model the SPS of Path 26, which is required for this double line outage, this double line outage analysis was performed using the post-transient power flow.

4. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case. However, a marginal loading of 100.6% occurred on each of the two Perkins phase shifters in the post-project sensitivity case, which was considered acceptable by the owners of the equipment.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case. However, an overload of 105.3% occurred on the Elcentsw 161/230 kV transformer for loss of the N.Gila-IV 500 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system.

3. For the double line outage of the Midway-Vincent 500 kV lines #1 & 2, a loading of 99.3% of the emergency rating of the Midway-Vincent 500 kV line #3 occurred. To be able to model the SPS of Path 26, which is required for this double line outage, this double line outage analysis was performed using the post-transient power flow.

4. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

VII.A.3 DYNAMIC STABILITY ANALYSIS RESULTS

The key finding from the dynamic stability analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 26 at its maximum rating of 3,700 MW with the DPV2 POS outlined in Section III.B while meeting the voltage dip, damping and frequency deviation limits of the transmission system. No SPS is needed.

The "Simultaneous Path 26 Stability Analysis Summary" is provided in Appendix E.2.a.1. The following subsections provide highlights of the analysis.

Mohave On Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.

Mohave Off Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system

VII.A.4 POST-TRANSIENT POWER FLOW ANALYSIS RESULTS

The key finding from the post-transient power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 26 at its maximum rating of 3,700 MW with the DPV2 POS outlined in Section III.B while meeting the post-transient voltage deviation limits of the transmission system.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviation performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under either Mohave operational condition.

The "Simultaneous Path 26 Post Transient Analysis Summary" is provided in Appendix E.3.a.1. The following subsections provide highlights of the analysis.

Mohave On Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

2. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in non convergence. Implementing an SPS that shed Walnut (432 MW) load on SCE's system resulted in acceptable post-transient voltage deviations.

Mohave Off Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in

the post-project case.

2. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in non convergence in the Mohave off line scenario. Implementing an SPS that shed Walnut (432 MW) load on SCE's system resulted in acceptable post-transient voltage deviations.

VII.B PATH 27

VII.B.1 OVERALL SUMMARY

The analysis is based on the key assumption that Path 46 and Path 27 power flows would be assessed at their respective maximum ratings, being 11,823 MW for Path 46 and 1,920 MW for Path 27.

Results indicate that the DPV2 POS is adequate to achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 27 at its maximum rating of 1,920 MW while meeting the Criteria.

To relieve thermal overloads for loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines, SCE will need to develop and implement nomograms and operating procedures in lieu of or in conjunction with an SPS as indicated in the DPV2 POS.

Results indicated the need to implement an SPS that would trip 370 MW of Harquahala generation and shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable stability performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

Finally, results also indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviations for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

Details of the Path 27 analysis results are provided in Appendix E.(series).2.

VII.B.2 POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 27 at its maximum rating of 1,920 MW with the DPV2 POS outlined in Section III.B while meeting the thermal limits of the transmission system.

The "Control Area Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.a.2. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.b.2. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix E.1.c.2.

The "Simultaneous Path 27 Power Flow Analysis Summary," which lists the highest transmission loadings for normal and contingency conditions, is provided in Appendix E.1.d.2. The following subsections provide highlights of the analysis.

Mohave On Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case.

3. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case. However, an overload of 101.7% occurred on the Elcentsw 161/230 kV transformer for loss of the N.Gila-IV 500 kV line. IID has indicated that they are in the process of developing future plans to address pre-existing overloads on its system.

3. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

VII.B.3 DYNAMIC STABILITY ANALYSIS RESULTS

The key finding from the dynamic stability analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 27 at its maximum rating of 1,920 MW with the DPV2 POS outlined in Section III.B while meeting the voltage dip, damping and frequency deviation limits of the transmission system. No SPS is needed for the Mohave on line scenario.

Results indicated the need to implement an SPS that would trip 370 MW of Harquahala generation and shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable stability performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

The "Simultaneous Path 27 Stability Analysis Summary" is provided in Appendix E.2.a.2. The following subsections provide highlights of the analysis.

Mohave On Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.

Mohave Off Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. Except for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, no SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.

3. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, instability occurred. Implementing an SPS that tripped 370 MW of Harquahala generation and shed SCE load at Walnut (432 MW) resulted in acceptable stability performance.

VII.B.4 POST-TRANSIENT POWER FLOW ANALYSIS RESULTS

The key finding from the post-transient power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 27 at its maximum rating of 1,920 MW with the DPV2 POS outlined in Section III.B while meeting the post-transient voltage deviation limits of the transmission system. Also, no SPS is needed for the Mohave on line scenario.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviations for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

The "Simultaneous Path 27 Post Transient Analysis Summary" is provided in Appendix E.3.a.2. The following subsections provide highlights of the analysis.

Mohave On Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

2. No SPS was needed to meet the post-transient voltage deviation limits of the transmission system.

Mohave Off Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

2. No SPS was needed to meet the post-transient voltage deviation limits of the transmission system for the Mohave on line scenario.

3. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in non convergence in the Mohave off line scenario. Implementing an SPS that shed Walnut (432 MW) load on SCE's system resulted in acceptable post-transient voltage deviations.

VII.C PATH 41

VII.C.1 OVERALL SUMMARY

The analysis is based on the key assumption that Path 46 and Path 41 power flows would be assessed at their respective maximum ratings, being 11,823 MW for Path 46 and 1,600 MW for Path 41.

Results indicate that the DPV2 POS is adequate to achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 41 at its maximum rating of 1,600 MW while meeting the Criteria.

To relieve thermal overloads for loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines, SCE will need to develop and implement nomograms and operating procedures in lieu of or in conjunction with an SPS as indicated in the DPV2 POS.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable stability performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage either Mohave operational condition.

Finally, results also indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviation performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

Details of the Path 41 analysis results are provided in Appendix E.(series).3.

VII.C.2 POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 41 at its maximum rating of 1,600 MW with the DPV2 POS outlined in Section III.B while meeting the thermal limits of the transmission system.

The "Control Area Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.a.3. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.b.3. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix E.1.c.3.

The "Simultaneous Path 41 Power Flow Analysis Summary," which lists the highest transmission loadings for normal and contingency conditions, is provided in Appendix E.1.d.3. The following subsections provide highlights of the analysis.

Mohave On Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case.

3. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case. However, a marginal loading of 100.5% occurred on each of the two Perkins phase shifters in the post-project sensitivity case, which was considered acceptable by the owners of the equipment.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case.

3. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

VII.C.3 DYNAMIC STABILITY ANALYSIS RESULTS

The key finding from the dynamic stability analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 41 at its maximum rating of 1,600 MW with the DPV2 POS outlined in Section III.B while meeting the voltage dip, damping and frequency deviation limits of the transmission system.

Results indicated the need to implement an SPS that would shed SCE load at Walnut

(432 MW) or some equivalent mitigation measure to achieve acceptable stability performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage either Mohave operational condition.

The "Simultaneous Path 41 Stability Analysis Summary" is provided in Appendix E.2.a.3. The following subsections provide highlights of the analysis.

Mohave On Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, a voltage dip of 30.6% occurred at the Adelanto 500 kV bus. Implementing an SPS that shed SCE load at Walnut (432 MW) resulted in acceptable stability performance.

Mohave Off Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, a voltage dip of 41.2% occurred at the Adelanto 500 kV bus. Implementing an SPS that shed SCE load at Walnut (432 MW) resulted in acceptable stability performance.

VII.C.4 POST-TRANSIENT POWER FLOW ANALYSIS RESULTS

The key finding from the post-transient power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 41 at its maximum rating of 1,600 MW with the DPV2 POS outlined in Section III.B while meeting the post-transient voltage deviation limits of the transmission system. Also, no SPS is needed for the Mohave on line scenario.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviations for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

The "Simultaneous Path 41 Post Transient Analysis Summary" is provided in Appendix E.3.a.3. The following subsections provide highlights of the analysis.

Mohave On Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

2. No SPS was needed to meet the post-transient voltage deviation limits of the transmission system.

Mohave Off Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

2. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in post-transient voltage deviations of 10.5% and 10.6% at Iron Mountain and Eagle Mountain, respectively. Implementing an SPS that shed Walnut (432 MW) load on SCE's system resulted in acceptable post-transient voltage deviations.

VII.D PATH 61

VII.D.1 OVERALL SUMMARY

The analysis is based on the key assumption that Path 46 and Path 61 power flows would be assessed at their respective maximum ratings, being 11,823 MW for Path 49 and 2.400 MW for Path 61.

Results indicate that the DPV2 POS is not adequate to achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 61 at its maximum rating of 2,400 MW while meeting the Criteria.

Results indicate that a nomogram for thermal overload mitigation can be implemented to manage a 1,200 MW rating increase on Path 46 simultaneously with Path 61 at its maximum rating of 2,400 MW while meeting the voltage dip, damping and frequency deviation limits of the transmission system. Results also indicate that an operating procedure can be employed in conjunction with the nomogram to reduce Path 61 schedules to relieve thermal overloads on the Victorville-Lugo 500 kV line for 4 single contingency outages.

To relieve thermal overloads for loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines, SCE will need to develop and implement nomograms and operating procedures in lieu of or in conjunction with an SPS as indicated in the DPV2 POS.

No SPS was needed to meet the stability criteria for the double line outage of the Palo Verde-Devers 500 kV line and the Harquahala-Devers 500 kV line or the Palo Verde-Devers 500 kV line and the Hassayampa-Harquahala 500 kV line.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviation performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

Details of the Path 61 analysis results are provided in Appendix E.(series).4.

VII.D.2 POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 cannot achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 61 at its maximum rating of 2,400 MW while meeting the thermal limits of the transmission system. A thermal overload needs to be mitigated. In the absence of other remediation, a nomogram and operating procedure can be employed to reduce schedules to relieve thermal overloads on the Victorville-Lugo 500 kV line for 4 single contingency outages. The analysis was performed on two post-project sensitivity cases representing two nomogram "Corner Points."

The "Control Area Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.a.4. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.b.4. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix E.1.c.4.

The "Simultaneous Path 61 Power Flow Analysis Summary," which lists the highest transmission loadings for normal and contingency conditions, is provided in Appendix E.1.d.4. The following subsections provide highlights of the analysis.

Mohave On Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case.

2. Except for the Victorville-Lugo 500 kV transmission line on SCE and LADWP's systems, no transmission element was loaded above 100% of its emergency rating under single contingency conditions. However, loadings up to 116.3% occurred on the Victorville-Lugo 500 kV transmission line under four single contingency conditions, in the case with flows at their respective maximum ratings on Path 46 and Path 61.

	Emergency Loading (%)	
Limiting Element	Post_Project	Outage
Victorville-Lugo 500	116.3	ELLU
Victorville-Lugo 500	112.0	MOLU
Victorville-Lugo 500	101.0	DVVL
Victorville-Lugo 500	100.8	NGIV

3. Results indicated that implementing a nomgram and an operating procedure to restrict flows on these two paths would ensure operating at safe levels. For the same outage, this loading dropped well below 100% in two post-project cases representing nomogram Corner Point 1 and Corner Point 2, as shown in the table below. Corner Point 1 represents flow limits of 11,823 MW and 1,900 MW on Path 46 and Path 61, respectively. Corner Point 2 represents flow limits of 7,700 MW and 2,400 MW on Path 46 and Path 61, respectively. Refer to the conceptual nomogram provided in Appendix E.4.a.4.

Limiting Element	Emergency Loading (%) Corner Point 1	Corner Point 2	Outage
Victorville-Lugo 500	100.6	100.7	ELLU
Victorville-Lugo 500	96.7	97.2	MOLU
Victorville-Lugo 500	<90.0	95.5	DVVL
Victorville-Lugo 500	<90.0	95.7	NGIV

4. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case.

2. Except for the Victorville-Lugo 500 kV line and the Merchant-Eldorado 500 kV line, no transmission element was loaded above 100% of its emergency rating under single contingency conditions. However, loadings up to 114.0% occurred on the Victorville-Lugo 500 kV transmission line under five single contingency conditions and a loading of 105.7% occurred on the Merchant-Eldorado 500 kV line for a single contingency, in the case with flows at their respective maximum ratings on Path 46 and Path 61.

Limiting Element	Emergency Loading (%) Post_Project	Outage
Victorville-Lugo 500	113.5	ELLU
Victorville-Lugo 500	114.0	MOLU
Victorville-Lugo 500	100.7	DVVL
Victorville-Lugo 500	100.3	NGIV
Victorville-Lugo 500	100.7	ELMC
Merchant-Eldorado 500	105.7	ELMC

3. Results indicated that implementing a nomgram and an operating procedure to restrict flows on these two paths would ensure operating at safe levels. For the same outage, this loading dropped well below 100% in two post-project cases representing nomogram Corner Point 1 and Corner Point 2, as shown in the table below. Corner Point 1 represents flow limits of 11,823 MW and 2,075 MW on Path 46 and Path 61, respectively. Corner Point 2 represents flow limits of 8,100 MW and 2,400 MW on Path 46 and Path 61, respectively. Refer to the conceptual nomogram provided in Appendix E.4.b.4.

	Emergency Loading (%)		
Limiting Element	Corner Point 1	Corner Point 2	Outage
Victorville-Lugo 500	99.2	100.1	ELLU
Victorville-Lugo 500	99.7	100.2	MOLU
Victorville-Lugo 500	<90.0	95.0	DVVL
Victorville-Lugo 500	<90.0	95.0	NGIV
Victorville-Lugo 500	<90.0	<90.0	ELMC
Merchant-Eldorado 500	93.4	<90.0	ELMC

4. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

VII.D.3 DYNAMIC STABILITY ANALYSIS RESULTS

The key finding from the dynamic stability analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 61 at its maximum rating of 2,400 MW while meeting the voltage dip, damping and frequency deviation limits of the transmission system. No SPS is needed.

The "Simultaneous Path 61 Stability Analysis Summary" is provided in Appendix E.2.a.4. The following subsections provide highlights of the analysis.

Mohave On Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.

Mohave Off Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.

VII.D.4 POST-TRANSIENT POWER FLOW ANALYSIS RESULTS

The key finding from the post-transient power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 61 at its maximum rating of 2,400 MW while meeting the post-transient voltage deviation limits of the transmission system. No SPS is needed for the Mohave On Line scenario.

However, for the Mohave Off Line scenario, an SPS that trips Arizona generation and drops load in Southern California, is required to meet the voltage deviation criteria for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage.

The "Simultaneous Path 61 Post Transient Analysis Summary" is provided in Appendix E.3.a.4. The following subsections provide highlights of the analysis.

Mohave On Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

2. No SPS was needed to meet the post-transient voltage deviation limits of the transmission system.

Mohave Off Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

2. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in post-transient voltage deviations of 10.1% and 10.2% at Iron Mountain and Eagle Mountain, respectively. Implementing an SPS that shed Walnut (432 MW) load on SCE's system resulted in acceptable post-transient voltage deviations.

VII.E PATH 65

VII.E.1 OVERALL SUMMARY

The analysis is based on the key assumption that Path 46 and Path 65 power flows would be assessed at their respective maximum ratings, being 11,823 MW for Path 46 and 3,100 MW for Path 65.

Results indicate that the DPV2 POS is adequate to achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 65 at its maximum rating of 3,100 MW while meeting the Criteria.

To relieve thermal overloads for loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines, SCE will need to develop and implement nomograms and operating procedures in lieu of or in conjunction with an SPS as indicated in the DPV2 POS.

No SPS was needed to meet the stability or post transient criteria for the double line outage of the Palo Verde-Devers 500 kV line and the Harquahala-Devers 500 kV line or the Palo Verde-Devers 500 kV line and the Hassayampa-Harquahala 500 kV line.

Details of the Path 65 analysis results are provided in Appendix E.(series).5.

VII.E.2 POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 65 at its maximum rating of 3,100 MW with the DPV2 POS outlined in Section III.B while meeting the thermal limits of the transmission system.

The "Control Area Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.a.5. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix E.1.b.5. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix E.1.c.5.

The "Simultaneous Path 65 Power Flow Analysis Summary," which lists the highest transmission loadings for normal and contingency conditions, is provided in Appendix E.1.d.5. The following subsections provide highlights of the analysis.

Mohave On Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case. However, a marginal loading of 100.6% occurred on each of the two Perkins phase shifters in the post-project sensitivity case, which was considered acceptable by the owners of the equipment.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case.

3. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case.

3. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

VII.E.3 DYNAMIC STABILITY ANALYSIS RESULTS

The key finding from the dynamic stability analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 65 at its maximum rating of 3,100 MW with the DPV2 POS outlined in Section III.B while meeting the voltage dip, damping and frequency deviation limits of the transmission system. No SPS is needed.

The "Simultaneous Path 65 Stability Analysis Summary" is provided in Appendix E.2.a.5. The following subsections provide highlights of the analysis.

Mohave On Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.

Mohave Off Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system

VII.E.4 POST-TRANSIENT POWER FLOW ANALYSIS RESULTS

The key finding from the post-transient power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 65 at its maximum rating of 3,100 MW with the DPV2 POS outlined in Section III.B while meeting the post-transient voltage deviation limits of the transmission system. Also, no SPS is needed.

The "Simultaneous Path 65 Post Transient Analysis Summary" is provided in Appendix E.3.a.5. The following subsections provide highlights of the analysis.

Mohave On Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in both the post-project case.

2. No SPS was needed to meet the post-transient voltage deviation limits of the transmission system.

Mohave Off Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in both the post-project case.

2. No SPS was needed to meet the post-transient voltage deviation limits of the transmission system.

VIII. FINDINGS OF SENSITIVITY ANALYSES

In accordance with the WECC Rating Policy, the rating study may need to assess reliability impacts of DPV2 together with other similarly situated projects. Analyses of sensitivities, which are not related to other similarly situated Phase 2 projects or involved with existing paths, may be performed at the mutual agreement of the project sponsor and the entity making the request. Two requests of this type were made. To the extent that criteria violations were found in these sensitivities, no attempt was made at identifying mitigation measures in this Study. Below is the overall list of the two sensitivity analyses evaluated in this Study.

- IID 200 MW Request
- MWD Pump Load Off

In addition, a sensitivity analysis was performed with another project in Phase 2, the rating study to increase the Path 26 rating to 4,000 MW.

Details on the criteria, assumptions and methodology for these sensitivity analyses are provided in section V on page 17 of the Study Scope (Appendix A).

Results of the Path 61 Phase 2 project sensitivity analysis indicated no interaction. Results of the non-similarly situated sensitivities were mixed. Results of IID's request for an additional 200 MW on DPV2 indicated that the DPV2 POS is not adequate to achieve a 1,400 MW rating increase on Path 46 without additional reactive support. Finally, the DPV2 POS is adequate to achieve a 1,200 MW rating increase on Path 46 with MWD pump loads off line.

Details of the Sensitivity analyses results are provided in Appendix F.

VIII.A IID 200 MW REQUEST SENSITIVITY

VIII.A.1 OVERALL SUMMARY

The analysis is based on the key assumption that the Path 46 power flow would be assessed at its maximum rating of 12,023 MW assuming a 1,400 MW DPV2 project. This 12,083 MW Path 46 rating is based on the assumption that DPV2 would add 1,200 MW plus an additional 200 MW based on the IID's request to the expected pre-DPV2 Path 46 rating of 10,623 MW.

Results indicate that the DPV2 POS is not adequate to achieve a 12,023 MW rating increase on Path 46 while meeting the Criteria, without additional reactive support.

Additional SPS would likely be needed to meet the Criteria for the double line outage of the Palo Verde-Devers 500 kV line and the Harquahala-Devers 500 kV line or the Palo Verde-Devers 500 kV line and the Hassayampa-Harquahala 500 kV line.

Details of the IID 200 MW Request analysis results are provided in Appendix F.(series).1.

VIII.A.2 POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 including the IID 200 MW request can achieve a 12,023 MW rating increase on Path 46 with the DPV2 POS outlined in Section III.B while meeting the thermal limits of the transmission system.

The "Control Area Summary of Pre-Contingency Base Cases" is provided in Appendix F.1.a.1. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix F.1.b.1. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix F.1.c.1.

The "IID 200 MW Request Sensitivity Power Flow Analysis Summary," which lists the highest transmission loadings for normal and contingency conditions, is provided in Appendix F.1.d.1. The following subsections provide highlights of the analysis.

Mohave On Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case. However, a marginal loading of 100.3% occurred on each of the two Perkins phase shifters in the post-project case.
2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-projects case.
3. Additional SPS requirements would likely be needed to mitigate the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines.

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-projects case. However, a marginal loading of 100.5% occurred on each of the two Perkins phase shifters in the post-project case.
2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-projects case.
3. Additional SPS requirements would likely be needed to mitigate the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines.

VIII.A.3 DYNAMIC STABILITY ANALYSIS RESULTS

The key finding from the dynamic stability analysis is that the reactive power equipment identified in the DPV2 POS outlined in Section III.B is not sufficient for DPV2 including the IID 200 MW request to achieve a 12,023 MW rating increase on

Path 46 while meeting the voltage dip, damping and frequency deviation limits of the transmission system.

Results indicated the need for an SPS to achieve acceptable stability performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage either Mohave operational condition.

The "IID 200 MW Request Sensitivity Stability Analysis Summary" is provided in Appendix F.2.a.1. The following subsections provide highlights of the analysis.

Mohave On Line

1. Except for the Hassayampa-N.Gila 500 kV single-contingency line outage, all machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.
2. Violations of the voltage dip, duration and frequency deviation criteria occurred for loss of the Hassayampa-N.Gila 500 kV line as shown in Appendix F.2.a.1.
3. Additional SPS requirements would likely be needed to mitigate the stability criteria violations caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines.

Mohave Off Line

1. Except for the Hassayampa-N.Gila 500 kV single-contingency line outage, all machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.
2. Violations of the voltage dip, duration and frequency deviation criteria occurred for loss of the Hassayampa-N.Gila 500 kV line as shown in Appendix F.2.a.1.
3. Additional SPS requirements would likely be needed to mitigate the stability criteria violations caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines.

VIII.A.4 POST-TRANSIENT POWER FLOW ANALYSIS RESULTS

The key finding from the post-transient power flow analysis is that DPV2 can achieve a 12,023 MW rating increase on Path 46 with the DPV2 POS outlined in Section III.B while meeting the post-transient voltage deviation limits of the transmission system. Also, no SPS is needed for the Mohave on line scenario.

Results also indicated the need to implement an SPS to achieve acceptable post-transient voltage deviation performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under the Mohave off line scenario only.

The "IID 200 MW Request Sensitivity Post Transient Analysis Summary" is provided in Appendix F.3.a.1. The following subsections provide highlights of the analysis.

Mohave On Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in both the post-project case.
2. No SPS was needed to meet the post-transient voltage deviation limits of the transmission system.

Mohave Off Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in both the post-project case.
2. Additional SPS requirements would likely be needed to mitigate the post-transient voltage deviation violations caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines.

VIII.B MWD PUMP LOAD OFF LINE SENSITIVITY

VIII.B.1 OVERALL SUMMARY

The analysis is based on the key assumption that the Path 46 power flow would be assessed at its maximum rating of 11,823 MW with the MWD pump loads off line. This sensitivity was limited to power flow analysis based on the requester's concern over possible impact on meeting facility thermal limitations.

Results indicate that the DPV2 POS is adequate to achieve a 11,823 MW rating increase on Path 46 with the MWD pump loads off line while meeting the Criteria

Details of the MWD Pump Load Off Line analysis results are provided in Appendix F.(series).2.

VIII.B.2 POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 with the MWD pump loads off line can achieve a 11,823 MW rating increase on Path 46 with the DPV2 POS outlined in Section III.B while meeting the thermal limits of the transmission system.

The "Control Area Summary of Pre-Contingency Base Cases" is provided in Appendix F.1.a.2. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix F.1.b.2. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix F.1.c.2.

The "MWD Pump Load Off Line Sensitivity Power Flow Analysis Summary," which lists the highest transmission loadings for normal and contingency conditions, is provided in Appendix F.1.d.2. The following subsections provide highlights of the analysis.

Mohave On Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-projects case. However, a marginal loading of 100.3% occurred on each of the two Perkins phase shifters in

the post-project case.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-projects case.

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-projects case. However, a marginal loading of 100.2% occurred on each of the two Perkins phase shifters in the post-project case.
2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-projects case.

VIII.C PATH 26 @ 4,000 MW SENSITIVITY

VIII.C.1 OVERALL SUMMARY

The analysis is based on the key assumption that Path 46 and Path 26 power flows would be assessed at their respective maximum ratings, being 11,823 MW for Path 46 and the proposed rating of 4,000 MW for Path 26.

Results indicate that the DPV2 POS described in section III.B is adequate to achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 26 at its proposed maximum rating of 4,000 MW while meeting the Criteria.

To relieve thermal overloads for loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines, SCE will need to develop and implement nomograms and operating procedures in lieu of or in conjunction with an SPS as indicated in the DPV2 POS.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviation performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under either Mohave operational condition.

Details of the Path 26 @ 4,000 MW analysis results are provided in Appendix F.(series).3.

VIII.C.2 POWER FLOW ANALYSIS RESULTS

The key finding from the power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 26 at its proposed maximum rating of 4,000 MW with the DPV2 POS outlined in Section III.B while meeting the thermal limits of the transmission system.

The "Control Area Summary of Pre-Contingency Base Cases" is provided in Appendix F.1.a.3. The "Path Flow Summary of Pre-Contingency Base Cases" is provided in Appendix F.1.b.3. Also, "Power Flow Diagrams of Pre-Contingency Bases Cases" are provided in Appendix F.1.c.3.

The "Path 26 @ 4,000 MW Sensitivity Power Flow Analysis Summary," which lists the highest transmission loadings for normal and contingency conditions, is provided in Appendix F.1.d.3. The following subsections provide highlights of the analysis.

Mohave On Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case. However, a marginal loading of 100.3% occurred on each of the two Perkins phase shifters in the post-project sensitivity case, which was considered acceptable by the owners of the equipment.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case.

3. For the double line outage of the Midway-Vincent 500 kV lines #1 & 2, a loading of 95.4% of the emergency rating of the Midway-Vincent 500 kV line #3 occurred. To be able to model the SPS of Path 26, which is required for this double line outage, this double line outage analysis was performed using the post-transient power flow.

4. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

Mohave Off Line

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions in the post-project case.

2. No transmission element was loaded above 100% of its emergency rating under single contingency conditions in the post-project case.

3. For the double line outage of the Midway-Vincent 500 kV lines #1 & 2, a loading of 95.7% of the emergency rating of the Midway-Vincent 500 kV line #3 occurred. To be able to model the SPS of Path 26, which is required for this double line outage, this double line outage analysis was performed using the post-transient power flow.

4. Implementing an SPS, which trips 1,125 MW of generation at Harquahala and drops 1,350 MW of load in SCE's system, mitigates the thermal overloads caused by the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Pending the findings of on-going DPV2 SPS design studies, an operating procedure may be developed to reduce the amount of generation and load dropping.

VIII.C.3 DYNAMIC STABILITY ANALYSIS RESULTS

The key finding from the dynamic stability analysis is that DPV2 can achieve a 1,200

MW rating increase on Path 46 simultaneously with Path 26 at its proposed maximum rating of 4,000 MW with the DPV2 POS outlined in Section III.B while meeting the voltage dip, damping and frequency deviation limits of the transmission system. No SPS is needed.

The "Path 26 @ 4,000 MW Sensitivity Stability Summary" is provided in Appendix F.2.a.3. The following subsections provide highlights of the analysis.

Mohave On Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system.

Mohave Off Line

1. All machines in the WECC grid remained in synchronism and were damped, and all bus voltage dips and frequency deviations were well within their respective limits in the post-project case.

2. No SPS was needed to meet the voltage dip, damping and frequency deviation limits of the transmission system

VIII.C.4 POST-TRANSIENT POWER FLOW ANALYSIS RESULTS

The key finding from the post-transient power flow analysis is that DPV2 can achieve a 1,200 MW rating increase on Path 46 simultaneously with Path 26 at its proposed maximum rating of 4,000 MW with the DPV2 POS outlined in Section III.B while meeting the post-transient voltage deviation limits of the transmission system.

Results indicated the need to implement an SPS that would shed SCE load at Walnut (432 MW) or some equivalent mitigation measure to achieve acceptable post-transient voltage deviation performance for the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage under either Mohave operational condition.

The "Path 26 @ 4,000 MW Sensitivity Post Transient Summary" is provided in Appendix F.3.a.3. The following subsections provide highlights of the analysis.

Mohave On Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

2. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in non convergence. Implementing an

SPS that shed Walnut (432 MW) load on SCE's system resulted in acceptable post-transient voltage deviations.

Mohave Off Line

1. Post-transient voltage deviations did not exceed 5% during single contingencies in the post-project case.

2. For the Palo Verde-Devers 500 kV and the Harquahala-Devers 500 kV double line outage, the post-transient analysis resulted in non convergence in the Mohave off line scenario. Implementing an SPS that shed Walnut (432 MW) load on SCE's system resulted in acceptable post-transient voltage deviations.

IX. APPENDICES

APPENDIX A - STUDY SCOPE

APPENDIX B - DYNAMIC AND POST TRANSIENT SWITCH DECKS

APPENDIX C - PATH 46 ANALYSIS DIAGRAMS & TABLES

APPENDIX D - SCIT ANALYSIS DIAGRAMS & TABLES

APPENDIX E - SIMULTANEOUS DIAGRAMS AND TABLES

APPENDIX F - SENSITIVITY DIAGRAMS AND TABLES

APPENDIX G - SCE RESPONSES TO COMMENTS ON PATH 46 STUDY