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Dana M. Cabbell, P.E.
Manager
Transmission Intertie Planning

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Arizona Corporation Commission
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AUG 28 2008
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August 25, 2008

Docket Control
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

RE: SCE's 2008 Biennial Transmission Assessment Workshop 1 Presentation and Studies to Support the Devers-Palo Verde #2 500 kV Transmission Project Submittals for 2008 Biennial Electric Transmission Assessment 2008-2017 Docket No. E-00000D-07-0376

Dear Sir/Madam,

Southern California Edison Company submits the following ten documents for use during the ACC's Fifth Biennial Transmission Assessment:

1. 2008 Biennial Transmission Assessment Workshop 1 Presentation for the Devers-Palo Verde 500 kV transmission line project.
2. Devers-Palo Verde No. 2 Project (DPV2), Accepted Path 49 Rating Study Report, cover letter, July 26, 2005, 1 page
3. Devers-Palo Verde No. 2 (DPV2): Accepted Path 49 Rating Study Report, Volume I – Main Report, July 25, 2005, executive summary, 5 pages
4. Devers-Palo Verde No. 2 (DPV2): Accepted Path 49 Rating Study Report Revision Update, June 29, 2006, entire report, 11 pages
5. Devers-Palo Verde No. 2 (DPV2) Project/Path 46 Rating Increase, cover letter, April 21, 2006, 2 pages
6. Devers-Palo Verde No. 2 (DPV2): Accepted Path 46 Rating Study Report, Volume 1 – Main Report, April 21, 2006, executive summary, 5 pages
7. Devers-Palo Verde No. 2 (DPV2): Accepted Path 46 Rating Study Report Revision Update, June 29, 2006, entire report, 11 pages
8. Short Circuit Work Group: cover letter, November 3, 2005; introduction and description, 2 pages

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2131 Walnut Grove Avenue
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Tel: 626-302-0376
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9. Combined Devers-Palo Verde No. 2 Project and EOR 9300 MW Upgrade Project: Accepted Path 49 Rating Study Report, Volume 1 – Main Report, January 26, 2007, executive summary, 4 pages
10. DPV12 SPS Arming Study, March 6, 2007, entire report, 27 pages

For document nos. 2, 3, 5, 6, 8, and 9 listed above, Staff agreed with SCE's to limit its submittal to the Executive Summaries of the reports due to the voluminous size of the study reports. A complete set of the technical study reports have been provided to Staff electronically, and the reports can be made available upon request.

Two additional reports: Palo Verde Hub Extreme Contingency Analysis and Sub Synchronous Resonance Analysis have been provided separately to Staff once an executed protective agreement is received.

Sincerely,

Dana M. Cabbell

Dana M. Cabbell, P.E.
Manager, Transmission Intertie Planning

Enclosures (10)

cc: Laurie Woodall, KR Saline
Prem Bahl, ACC

Original and 13 copies of the foregoing filed with Docket Control.

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1

Devers Palo Verde No. 2 (DPV2)

May 22, 2008

2008 Biennial Transmission Assessment
Workshop 1

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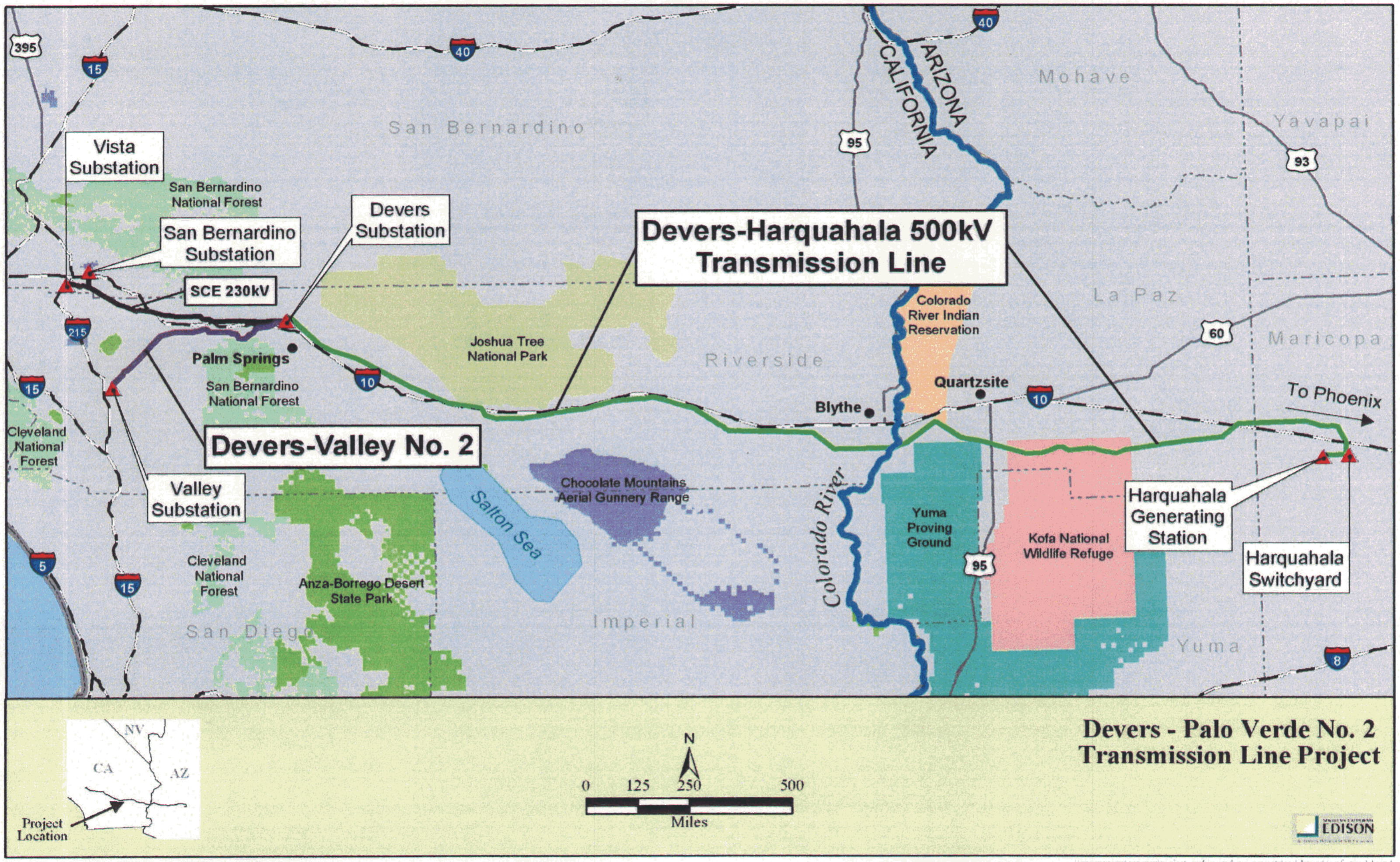
Overview of DPV2

- DPV2 involves two major transmission lines:
  - Devers-Harquahala: A new 500 kV transmission line between Arizona and California
    - About 230 miles long -- 102 miles is in Arizona, the rest is in California.
    - Parallels existing DPV1 line
  - Devers-Valley No. 2: A new 500 kV transmission line connecting SCE's Devers and Valley substations (all in California)
    - About 41.6 miles long.
    - Parallels existing Devers-Valley 500 kV line

DPV2 500 kV Transmission Line Project



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Technical Studies Performed

- East of the River (EOR) Rating Studies
  - WECC approved Aug ‘05
- West of the River (WOR) Rating Studies
  - WECC approved May ’06
- East of the River (EOR) and West of the River (WOR) Rating Studies Revision Update
  - WECC approved June ’06
- DPV2/EOR 9300 Joint Rating Studies
  - WECC approved March ‘07
- Palo Verde Hub Extreme Contingency Analysis
  - WATS and PV E&O approved April ’06
- Short Circuit Duty Analysis
  - WATS and PV E&O approved April ’06
- Sub Synchronous Resonance Analysis
  - WATS and PV E&O approved April ‘06
- Special Protection Scheme Phase 1 Analysis
  - WATS and PV E&O approved April ‘06
  - Mead-Phoenix Project E&O endorsed on April ‘06

DPV2 Project Reports - Submitted

- DPV2 Accepted Path 49 Rating Study Report, dated 7/25/05
- DPV2 Accepted Path 46 Rating Study Report, dated 4/21/06
- DPV2 Accepted Path 49 Rating Study Report – Revision Update, dated 6/29/06
- DPV2 Accepted Path 46 Rating Study Report – Revision Update, dated 6/29/06

DPV2 Project Reports – Not Submitted

- WECC Regional Planning Compliance Report Addressing the DPV2 Transmission Line Project, dated 6/7/04
- Impact of a 2nd Devers-Palo Verde (DPV2) Line Subsynchronous Resonance Frequency Scan Screening Analysis Final Report, dated 9/2/05
- DPV2 Short Circuit Work Group Fault Duty Analysis, dated 11/1/05
- DPV2 Palo Verde Hub Extreme Contingency Study, dated 12/14/05
- PV Transient Torque Study Update, dated 11/6/06
- Combined Devers – Palo Verde No. 2 Project and EOR 9300 MW Upgrade Project Accepted Path 49 Rating Study Report, dated 1/26/07
- DPV2 – DPV12 SPS Arming Studies, dated 3/6/07

Stakeholder Review / Subregional Transmission Planning Forum

- STEP
  - Evaluated six alternatives
  - DPV2 included in three of six alternatives
  - Analyses led STEP to develop a preferred sequence of upgrades to expand the southwest transmission system
  - DPV2 was included in this sequence as the preferred new 500kV line between Arizona and California
- WECC
  - Regional Planning Review
  - Path Rating Studies
- WATS/PV E&O Committee
  - All technical studies
  - PV E&O Approved on 4/2006
- SWAT
  - Included in subregional planning process

Regulatory Background

- February 24, 2005 — CAISO Report; DPV2 Deemed Cost-Effective
- April 11, 2005 — SCE Filed CPUC Application
- May 20, 2005 — SCE Filed BLM ROW Grant Amendment Application
- July 25, 2005 — WATS Approval
- May 2006 — WECC Approval
- May 1, 2006 — SCE Filed ACC Application
- May 4, 2006 — CPUC/BLM Issued Draft EIR/EIS
- October 25, 2006 — CPUC/BLM Issued Final EIR/EIS
- January 25, 2007 — CPUC Issued CPCN (D.07-01-040)
- March 21, 2007 — Arizona Siting Committee Issued Certificate of Environmental Compatibility (CEC)
- May 18, 2007 — USF&WS issued Compatibility Determination and ROW Permit (for KOFA)
- June 6, 2007 — ACC Denied CEC Previously Issued by Sitting Committee
- May 14, 2008 — SCE Filed PTM D.07-01-040/CPCN
- May 16, 2008 — SCE submits “Initial Filing” at FERC

Going Forward Regulatory Overview

- SCE's first priority and preference is to gain regulatory approval for the proposed transmission project from the ACC
  - To support a new ACC filing, SCE is working with stakeholders, regional utilities and planning groups in Arizona to develop a mutually acceptable alternative plan to present to the ACC for approval of the project
- SCE is simultaneously pursuing two approaches to secure regulatory approval:
  - New application for a Certificate of Environmental Compatibility (CEC) with the ACC
  - Section 50.6 FERC Application - Transmission Line Siting process
- Decision to file with ACC or FERC expected to be made within first quarter of 2009

Commitment to Pursue Approval of AZ Portion of DPV2 -- SCE simultaneously pursuing:

- Working with AZ Stakeholders to reconfigure DPV2 to provide increased AZ benefits
  - Performing technical studies in the SWAT/CRT forum of a western AZ Substation to integrate renewables and serve CAP pump load
  - Feasibility Studies complete
  - Developing next steps to determine DPV2 increased AZ benefits associated with western Arizona interconnection

FERC Pre-Filing

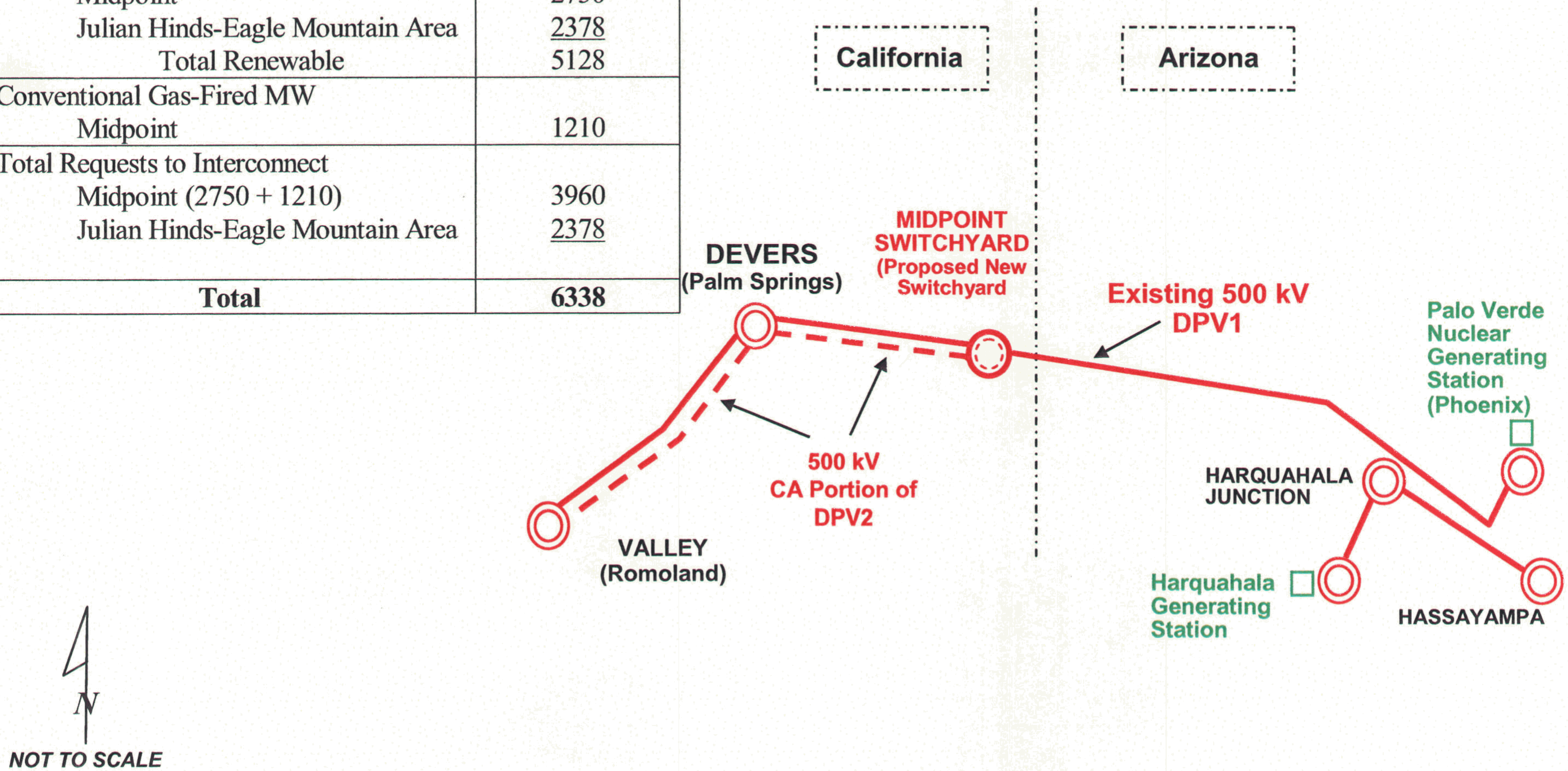
- February 25, 2008, SCE met with FERC staff for the "Initial Consultation" required under FERC's process to consider a "Pre-Filing" submittal
- On May 16, 2008, SCE filed its pre-filing application at FERC
  - FERC pre-filing process triggers a project wide NEPA review, preparation of a preliminary draft EIS, and noticing along the entire right-of-way
  - SCE requesting pre-filing process conclude by end of 2008
- The FERC pre-filling process will proceed simultaneously with SCE's preparation of a reconfigured DPV2 project filing in Arizona
- If necessary, a formal Section 50.6 application would be filed with FERC

California Public Utilities Commission (CPUC)

- On May 14, 2008, SCE filed a Petition to Modify the DPV2 CPCN with the CPUC to support interconnection needs in the region near Blythe, California.
  - SCE requested to construct DPV2 facilities in California to allow SCE to access potential new renewable and conventional gas fired generation in the Blythe, California area
    - 5128 MW of requests from renewable resources to interconnect were received after CA hearings (after November 2006)
  - SCE also requested the construction the Midpoint Substation (switchyard), near Blythe, California
    - The Midpoint facilities were reviewed by the CPUC in hearings
  - Operating Date: December 2011
- Upon CPUC acceptance of the PTM, a 30 day comment period is expected
  - SCE would like a decision from the CPUC in six months or less

Blythe Area Renewable Potential

New Generation Interconnection Requests In The Blythe Area (MW)	
Renewable	
Midpoint	2750
Julian Hinds-Eagle Mountain Area	2378
Total Renewable	5128
Conventional Gas-Fired MW	
Midpoint	1210
Total Requests to Interconnect	
Midpoint (2750 + 1210)	3960
Julian Hinds-Eagle Mountain Area	2378
Total	**6338**



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2

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Patricia L. Arons
Manager
Transmission Planning

July 26, 2005

Mr. Robert Jenkins
Chairman, Planning Coordination Committee
Mirant Americas, Inc.
696 West 10th Street
P. O. Box 192
Pittsburg, CA 94565

Subject: Devers–Palo Verde No.2 Project (DPV2) Project

On October 10, 2003, the Southern California Edison Company (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 September 21, 2004. In addition to the WECC rating process, DPV2 has adhered to the Western Arizona Transmission System (WATS) regional planning requirements.

On July 21, 2004, SCE formed a combined WECC/WATS Peer Review Group (PRG) to review and approve the DPV2 Path 49 Rating Study. All comments, requests and concerns were satisfactorily addressed through six PRG meetings, and several conference calls and e-mail exchanges among the stakeholders. The attached DPV2 Accepted Path 49 Rating Study Report was prepared and approved by the PRG and constitutes the final Phase 2 rating report.

SCE believes that the DPV2 Phase 2 study effort has satisfactorily complied with the Phase 2 requirements of the WECC Project Rating Review Process. Accordingly, SCE requests that DPV2 be granted Phase 3 status and an accepted rating of 9,255 MW on Path 49.

If you have any questions regarding this request, please contact Mr. Steven Mavis at (626) 302-8175.

Sincerely,

Patricia L. Arons

Patricia L. Arons
Southern California Edison Co.
PCC Representative

cc: Planning Coordination Committee
Operating Committee
Technical Studies Subcommittee

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3

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DEVERS – PALO VERDE NO. 2 (DPV2)

ACCEPTED PATH 49 RATING STUDY REPORT

VOLUME I – MAIN REPORT

JULY 25, 2005

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 Path 46 in addition to Path 49. However, the DPV2 Path 46 Rating Study will be done separately and in coordination with the Path 46 rating study to be completed for the Path 49 Series Capacitor Upgrade Project. In addition, owing to the uncertainty of continued operation of the Mohave Generating Plant, two complete DPV2 plans of service were developed, one with and the other without the Mohave Generating Plant in service. The main objective of this DPV2 Path 49 Rating Study (Study) is to establish a new Accepted Rating of 9,255 MW on Path 49 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 September 21, 2004. In addition to the WECC rating process, DPV2 has adhered to the Western Arizona Transmission System (WATS) regional planning requirements. On July 21, 2004, SCE formed a combined WECC/WATS Peer Review Group (PRG) to review and approve the Study, and prepare this final DPV2 Accepted Path 49 Rating Study Report (Report).

Based on the findings of this Study, the DPV2 POS is adequate to increase the Path 49 non-simultaneous rating by 1,200 MW from 8,055 MW to 9,255 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 49 simultaneously with seven WECC defined Paths 26, 27, 41, 42, 64, 65 and the Centennial path at their respective maximum ratings. Nomograms and/or operating procedures will have to be implemented to mitigate the simultaneous interaction between Path 49 and Path 61. 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. The POS will be further evaluated and defined during the aforementioned DPV2 Path 46 rating study.

At the request of PRG members, the Study includes assessments of 5 sensitivities for information purposes, which are described in section VIII of this Report. Finally, as described in Section IX of this Report, other studies in support of DPV2 are being conducted independent of this Study and will be reviewed in the appropriate forums.

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	Operating Procedure	SPS
Non-Simultaneous	**0**	**Yes [C]**	**Yes [C]**	**Yes [C]**
SCIT Nomogram	**400**	**No**	**Yes [C]**	**Yes [C]**
Path 26	**400**	**No**	**Yes [C]**	**Yes [C]**
Path 27	**400**	**No**	**Yes [C]**	**Yes [C]**
Path 41	**550**	**Yes [D]**	**Yes [C]**	**Yes [C]**
Path 42 [E]	**N/A**	**N/A**	**N/A**	**N/A**
Path 61	**1,200 [G]**	**Yes [F]**	**Yes [G]**	**Yes [C]**
Path 64	**800**	**No**	**Yes [C]**	**Yes [H]**
Path 65	**400**	**No**	**Yes [C]**	**Yes [C]**
Centennial Path	**800**	**No**	**Yes [C]**	**Yes [H]**

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 required uniquely for each analysis (e.g. 800 MVAr is required for the conditions assumed in the Path 64 analysis, however, only 400 MVAr would be required for the conditions assumed in the Path 65 analysis; i.e. they are not additive).

C – Implement an integrated mitigation plan involving nomograms, operating procedures and an SPS (to trip generation in the Palo Verde area and load in Southern California) to relieve thermal overloads on 3 transmission facilities for DPV1 and DPV2 outage. 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.

D – Implement a nomogram to meet the stability criteria for the Hassayampa-N.Gila 500 kV line outage if at least 150 MVAr of shunt capacitors are not installed at Devers 500 kV bus or they are out of service.

E – The request to perform the Path 42 analysis was made for the Mohave Off Line scenario only.

F – Implement an OP to relieve a thermal overload on Victorville-Lugo 500 kV line for 5 line outages.

G – Implement a nomogram to meet the stability criteria for Hassayampa-N.Gila 500 kV line outage in lieu of installing an additional 400 MVAr SVC at Lugo 500 kV bus (i.e. to not exceed the 800 MVAr reactive power capability identified for Path 64 and the Centennial path, which is the basis for the reactive support equipment in the plan of service).

H – Install an SPS to trip up to 400 MW of generation in the Palo Verde area and up to 400 MW of load in Southern California to meet the stability and/or post transient planning standards for DPV1 and DPV2 outage. This requirement may be met with the same SPS to relieve the thermal overloads.

TABLE I.B

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

Analysis	Total Reactive Support (MVAr) [B]	Nomogram	Operating Procedure	SPS
Non-Simultaneous	0	Yes [C]	Yes [C]	Yes [C]
SCIT Nomogram	500	No	Yes [C]	Yes [C]
Path 26	500	No	Yes [C]	Yes [C]
Path 27	500	No	Yes [C]	Yes [C]
Path 41	500	No	Yes [C]	Yes [C]
Path 42	500	No	Yes [C]	Yes [C]
Path 61	1,400 [E]	Yes [E]	Yes [D]	Yes [F]
Path 64	1,300	No	Yes [C]	Yes [F]
Path 65	500	No	Yes [C]	Yes [C]
Centennial Path	1,300	No	Yes [C]	Yes [F]

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 required uniquely for each analysis (e.g. 1,300 MVAr is required for the conditions assumed in the Path 64 analysis, however, only 500 MVAr would be required for the conditions assumed in the Path 65 analysis; i.e. they are not additive).

C – Implement an integrated mitigation plan involving nomograms, operating procedures and an SPS (to trip generation in the Palo Verde area and load in Southern California) to relieve thermal overloads on 3 transmission facilities for DPV1 and DPV2 outage. 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.

D – Implement an OP to relieve a thermal overload on Victorville-Lugo 500 kV line for 3 line outages.

E – Implement a nomogram to meet the stability criteria for Hassayampa-N.Gila 500 kV line outage in lieu of installing an additional 100 MVAr SVC at Devers 500 kV bus (i.e. to not exceed the 1,200 MVAr reactive power capability identified for Path 64 and the Centennial path, which is the basis for the reactive support equipment in the plan of service).

F – Install an SPS to trip up to 400 MW of generation in the Palo Verde area and up to 400 MW of load in Southern California to meet the stability and/or post transient planning standards for DPV1 and DPV2 outage. This requirement may be met with the same SPS to relieve the thermal overloads.

4

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DEVERS – PALO VERDE NO. 2 (DPV2)

ACCEPTED PATH 49 RATING STUDY REPORT

REVISION UPDATE

JUNE 29, 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 Path 46 Rating Study was completed separately on April 21, 2006 and Phase 3 status was granted by WECC on May 25, 2006.

Since the completion of the DPV2 rating studies, a decision was made to change to the DPV2 plan of service. The original DPV2 plan of service included the following key elements:

1. Build new Harquahala-Devers 500 kV line
2. Rebuild and Reconductor Devers-San Bernardino 230 kV lines #1 and #2
3. Rebuild and Reconductor Devers-Vista 230 kV lines #1 and #2
4. 230 kV Circuit Breaker Replacements and Upgrades
5. Reactive Power Equipment
6. SPS to Mitigate DPV1 and DPV2 outage

Recent challenges have surfaced in being able to complete in a timely manner DPV2 licensing activities related to elements 2 and 3 listed above. Owing to the likelihood that the time required to overcome these challenges would jeopardize the DPV2 project schedule, SCE has revised the DPV2 POS by replacing elements 2 and 3 with a new Devers-Valley 500 kV #2 line. For the DPV2 rating studies, the Devers-San Bernardino 230 kV lines #1 and #2 and the Devers-Vista 230 kV lines #1 and #2 will be represented as they are today. However, SCE will continue to pursue the West of Devers 230 kV upgrade as an independent project in its expansion plan.

Because of this change, SCE performed the appropriate sensitivity analyses to demonstrate that DPV2 can still achieve the 1,200 MW increase to the EOR and WOR path ratings with the Devers-Valley 500 kV #2 line while meeting the Planning Standards. It was agreed by the WECC/WATS Project Review Group to use the same approach that the WECC/WATS Project Review Group approved for demonstrating the acceptability of the change in the Devers/Valley reactive support plan of service for the Path 49 Series Capacitor Upgrade project. The Path 49 Series Capacitor Upgrade project performed the post-project SCIT nomogram analysis over again with the revised plan of service indicating that the project still achieved the target rating increase to the EOR and SCIT paths. Likewise, a DPV2 EOR Rating restudy was performed on the simultaneous SCIT nomogram case with the revised DPV2 plan of service (i.e. adding a new Devers-Valley 500 kV line #2 and keeping the west of Devers 230 kV lines unchanged). The assessment was based on the post-DPV2 case with Mohave Generating Plant in service. SCE acknowledges that Mohave Generating Plant has been off-line since December 31, 2005 and may not be returned to service. The assessment for the Mohave Generating Plant retired scenario was based on the extrapolation of the results of the Mohave on-line assessment as well as results from the original Accepted Rating study. SCE confirms the POS identified in the original DPV2 Accepted Path 49 Rating Study report dated July 25, 2005, specifically the required reactive equipment specified in the following Section II.A.4 for both the Mohave on-line and Mohave off-line, is not affected by the change of plan at West-of-Devers.

Based on the findings of this study update, the revised DPV2 POS is adequate to increase the Path 49 non-simultaneous rating by 1,200 MW from 8,055 MW to 9,255 MW on a non-simultaneous and simultaneous basis, while meeting the NERC/WECC Planning Standards and the regional WATS planning requirements. The power flow, post-transient and dynamic stability assessments indicated comparable performance between the original DPV2 POS and the revised DPV2 POS. The one difference found with the revised DPV2 POS case involved the need to address thermal overloads on SCE's west of Devers 230 kV lines in the event of the Devers-Valley 500 kV lines 1 and 2 outage. The study identified an operating procedure and/or one SPS option as mitigation of these thermal overloads.

II. PROJECT DESCRIPTION

II.A REVISED PLAN OF SERVICE

The following POS is the same as provided in the original Path 49 Rating Study with a few modifications to reflect the revised DPV2 plan of service. To reliably increase the Path 49 rating by 1,200 MW while meeting the Criteria, the revised POS will need to include the following facilities and procedures. Elements of the POS related to 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 diagrams of sections II.B and II.C.

2. Devers – Valley 500 kV line #2

Build a new 42 mile-500 kV line between SCE's Devers 500 kV Substation near Palm Springs, California and SCE's Valley 500 kV Substation near Riverside, California. The line will be designed with 2B-2156 ACSR conductor. The proposed route between Devers and Valley parallels the entire length of SCE's existing Devers-Valley 500 kV transmission line, as shown on the diagrams of sections II.B and II.C.

3. 230 kV Circuit Breakers

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

- Replace 7 CBs @ Devers Substation
- Upgrade 2 CBs @ Devers Substation

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

4. ***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.

5. ***Special Protection System 1 (SPS1)***

Install a Special Protection System (SPS1) that will be designed to adjust Perkins phase shifter operation and shed load on SCE's system to ensure acceptable thermal loading performance for the double contingency loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines. Operating procedures that adjust the Perkins phase shifters under defined operating conditions on a pre-contingency basis should be coordinated with SPS1 as mitigation to meet the thermal criteria. SCE is committed to ensuring that the ultimate SPS1 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.

6. ***Special Protection System 2 (SPS2)***

Install a Special Protection System (SPS2) that will be designed to shed load on SCE's system to ensure acceptable thermal loading performance for the double contingency loss of the Devers-Valley 500 kV lines 1 and 2. SCE may consider an operating procedure that would adjust schedules on a post-contingency basis to relieve the overloads on the west of Devers 230 kV system, in which case SPS2 would not be necessary. To the extent SCE decides to take a more automated approach in mitigating the Devers-Valley 500 kV lines 1 and 2 outage, the following SPS2 technically viable mitigation alternative was identified in this study update.

- Trip 2,000 MW of SCE load (San Bernardino 66 kV, Padua 66 kV, Walnut 66 kV, Vista 66 kV & 115 kV)

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:

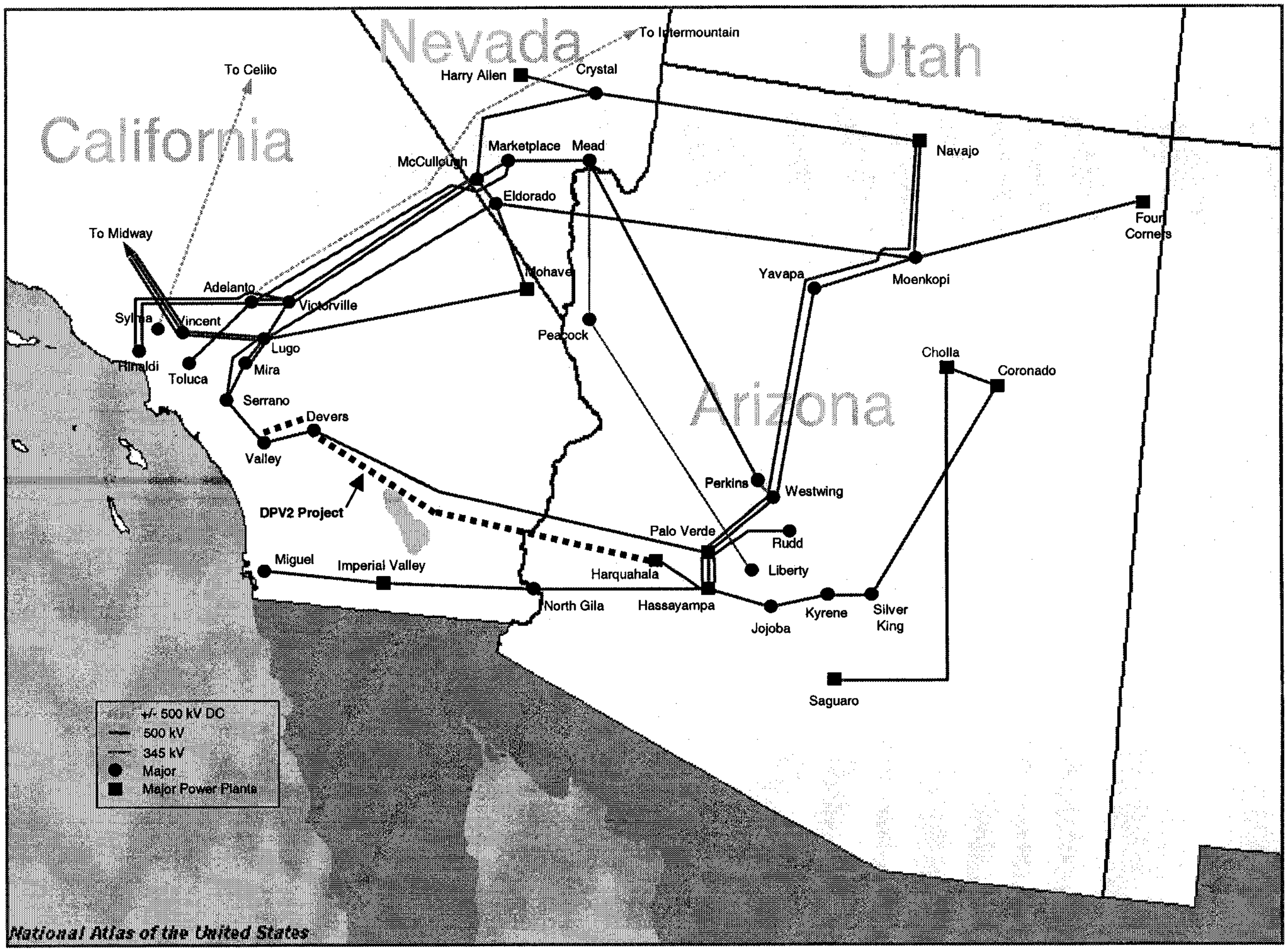
- Path 49/46 vs. Path 61 for loss of the Hassayampa-N.Gila 500 kV line (based on results of the recently completed SPS Conceptual Planning Study, a Path 61 vs Path 46 nomogram is required for loss of DPV1 and DPV2. The N-2 Path 61 vs Path 46 nomogram would be the nomogram implemented, since the N-2 nomogram is more limiting than the N-1 nomogram.)
- SPS1 arming points for DPV1 and DPV2 double line outage
- SPS2 arming points for Devers-Valley 500 kV double line outage

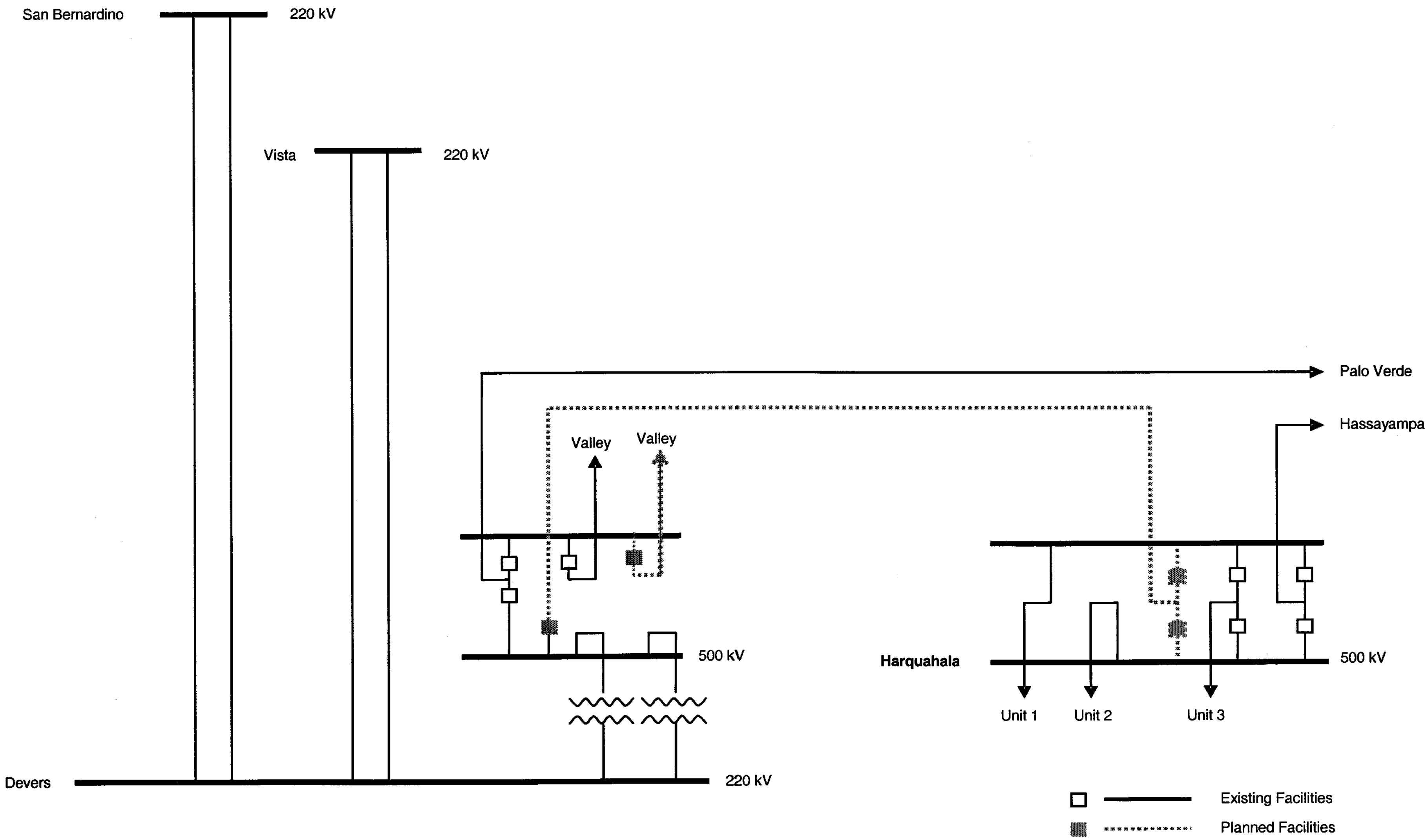
8. ***Operating Procedures***

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
- West of Devers 230 kV lines for loss of the Devers-Valley 500 kV lines 1 and 2 in lieu of or conjunction with SPS2 requirements.

II.B GEOGRAPHIC MAP OF DPV2 IN RELATION TO DSW TRANSMISSION





II.C CONCEPTUAL ONE LINE DIAGRAM OF DPV2

III. FINDINGS OF REVISED SCIT NOMOGRAM SIMULTANEOUS ANALYSIS

III.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. 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 and the SCIT Path. The simultaneous SCIT nomogram analysis performed in this revised Path 49 rating study had assumed maximum flow conditions on Path 49 (i.e. 9,255 MW) and the SCIT path (i.e. 16,332 MW) just as assumed in the original Path 49 rating study.

Results indicate that the revised DPV2 POS is adequate to achieve a 1,200 MW simultaneous rating increase on Path 49 and the SCIT path with the revised DPV2 POS outlined in Section II.A 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 SPS1 to relieve these overloads as indicated in the DPV2 POS.

Results indicated thermal overloads on the four west of Devers 230 kV lines for loss of the Devers-Valley 500 kV lines 1 and 2. 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 SPS2 to relieve these overloads as indicated in the DPV2 POS.

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

III.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 and SCIT with the revised DPV2 POS outlined in Section II.A while meeting the thermal limits of the transmission system.

SPS1 is needed to mitigate thermal overloads for the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Operating procedures or SPS2 is needed for the double line outage of the Devers-Valley 500 kV lines 1 and 2.

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

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

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions. Marginal loadings of 100.8% and 100.8% 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. No transmission element was loaded above 100% of its emergency rating under emergency (i.e. single-contingency) conditions in the post-project case.
3. For the double line outage of the Devers-Valley 500 kV lines 1 and 2, thermal overloads occurred on the Devers-San Bernardino 230 kV line, the Devers-Oak Valley 230 kV line and the Devers-Vista 230 kV lines 1 and 2. For the same outage with SPS2 (refer to section II.A.6), these loadings dropped close to 100%, as shown in the table below.

	Emergency Loading (%)		
Limiting Element	No SPS	With SPS2	Outage
DEVERS-SANBRDNO 230	123.6	95.3	DVVL12
DEVERS-OAK_VLLY 230	111.9	< 90.0	DVVL12
DEVERS-VSTA 230 1	110.3	93.9	DVVL12
DEVERS-VSTA 230 2	103.3	93.5	DVVL12

4. Implementing an operating procedure and the SPS1, which adjusts the Perkins phase shifters and drops 1,750 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.

III.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 and SCIT with the revised DPV2 POS outlined in Section II.A while meeting the voltage dip, damping and frequency deviation limits of the transmission system. Also, no SPS, including SPS1 or SPS2, are needed to maintain acceptable stability performance.

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

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 for all single contingencies.
2. 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 for

all double contingencies.

III.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 and SCIT with the revised DPV2 POS outlined in Section II.A while meeting the post-transient voltage deviation limits of the transmission system. Also, no SPS, including SPS1 or SPS2, are needed to maintain acceptable post transient performance.

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

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

2. Post-transient voltage deviations did not exceed 10% during double contingencies.

IV. REVISED APPENDIX

APPENDIX F - SCIT ANALYSIS DIAGRAMS & TABLES

5

SOUTHERN CALIFORNIA
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Patricia L. Arons
Manager, Transmission & Interconnection Planning

April 21, 2006

Mr. Robert Jenkins
Chairman, Planning Coordination Committee
Pacific Gas and Electric Company
P.O. Box 770000 Mail Code: N12G
San Francisco, CA 94177

Subject: Devers–Palo Verde No.2 (DPV2) Project/Path 46 Rating Increase

The purpose of this letter is to request the DPV2 Project be granted Phase 3 status for an accepted rating of 11,823 MW on Path 46. This letter describes the key events and process that SCE followed in completing the WECC requirements for Phase 3 status. SCE believes that it has fulfilled all rating requirements for the DPV2 Project.

On October 10, 2003, the Southern California Edison Company (SCE) submitted a notification letter to the Western Electricity Coordinating Council (WECC) Planning Coordination Committee (PCC) and the WECC Technical Studies Subcommittee (TSS) formally initiating Phase 1 of the WECC rating process for DPV2 related to rating increases on Path 49 and Path 46. In addition to the WECC rating process, DPV2 has adhered to the Western Arizona Transmission System (WATS) regional planning requirements. On July 21, 2004, SCE formed a combined WECC/WATS Peer Review Group (PRG) to review and approve both the DPV2 Path 49 Rating Study and the DPV2 Path 46 Rating Study. PCC granted Phase 3 status to DPV2 on August 30, 2005 for the Path 49 rating increase to 9,255 MW.

After completing Phase 1 requirements, TSS granted Phase 2 status to DPV2 on November 28, 2005 for the Path 46 rating increase to 11,823 MW. During the Phase 2 studies, SCE responded to all comments, requests, and concerns through four PRG meetings, and several conference calls and e-mail exchanges among the stakeholders. On March 28, 2005, the PRG approved the attached DPV2 Accepted Path 46 Rating Study Report (DPV2 Report) by a 9 to 2 vote.

The two dissenting votes that were cast expressed concern over approving the DPV2 Report ahead of the Path 46 Short-Term Upgrades Rating Study Report since the plan of service for the Short-Term Upgrades Project (Upgrades Project) is foundational to the DPV2 Project. The Upgrades Project is seeking no more than a 505 MW increase on Path 46. The two PRG members would rather wait until the Upgrades Project achieves Phase 3 status on Path 46 before approving the DPV2 Report.

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Tel: 626-302-9644
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It has been SCE's position that the plan of service for the Upgrades Project, which includes upgrading the series capacitors on the existing Palo Verde - Devers 500 kV line and the Hassayampa - N.Gila 500 kV line, adding a 2nd transformer at Devers Substation, installing reactive support at Devers and Valley 500 kV Substations, and installing a phase shifter at the Imperial Valley substation are now under various stages of engineering, construction and installation and will be operational by September 2006, well before the DPV2 target operating date of June 2009.

In the event, however, any of the underlying assumptions in the DPV2 Study were to change, SCE would be obligated to return to the PRG with appropriate studies supporting the project rating under new or revised assumptions. Therefore, the only one at risk by approving the DPV2 Report ahead of the Path 46 Short-Term Upgrades Rating Study Report would be SCE. SCE has provided a more detailed response to this issue in Appendix G of the Report.

SCE believes that the DPV2 Phase 2 Path 46 study effort has satisfactorily complied with the Phase 2 requirements of the WECC "Overview of Policies and Procedures for Regional Planning Project Review, Project Rating Review, and Progress Reports." Accordingly, SCE requests that DPV2 be granted Phase 3 status for an accepted rating of 11,823 MW on Path 46. As part of this request, SCE commits to revisiting the path ratings studies in the event any meaningful change were to occur in the plan of service for the Upgrades Project or the DPV2 Project.

If you have any questions regarding this request, please contact Mr. Steven Mavis at (626) 302-8175.

Sincerely,

Patricia L. Arons

Patricia L. Arons
Southern California Edison Company
PCC Representative

Attachments

cc: Planning Coordination Committee
Operating Committee
Technical Studies Subcommittee

6

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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.

7

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DEVERS – PALO VERDE NO. 2 (DPV2)

ACCEPTED PATH 46 RATING STUDY REPORT

REVISION UPDATE

JUNE 29, 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 Path 46 Rating Study was completed separately on April 21, 2006 and Phase 3 status was granted by WECC on May 25, 2006.

Since the completion of the DPV2 rating studies, a decision was made to change to the DPV2 plan of service. The original DPV2 plan of service included the following key elements:

1. Build new Harquahala-Devers 500 kV line
2. Rebuild and Reconductor Devers-San Bernardino 230 kV lines #1 and #2
3. Rebuild and Reconductor Devers-Vista 230 kV lines #1 and #2
4. 230 kV Circuit Breaker Replacements and Upgrades
5. Reactive Power Equipment
6. SPS to Mitigate DPV1 and DPV2 outage

Recent challenges have surfaced in being able to complete in a timely manner DPV2 licensing activities related to elements 2 and 3 listed above. Owing to the likelihood that the time required to overcome these challenges would jeopardize the DPV2 project schedule, SCE has revised the DPV2 POS by replacing elements 2 and 3 with a new Devers-Valley 500 kV #2 line. For the DPV2 rating studies, the Devers-San Bernardino 230 kV lines #1 and #2 and the Devers-Vista 230 kV lines #1 and #2 will be represented as they are today. However, SCE will continue to pursue the West of Devers 230 kV upgrade as an independent project in its expansion plan.

Because of this change, SCE performed the appropriate sensitivity analyses to demonstrate that DPV2 can still achieve the 1,200 MW increase to the EOR and WOR path ratings with the Devers-Valley 500 kV #2 line while meeting the Planning Standards. It was agreed by the WECC/WATS Project Review Group to use the same approach that the WECC/WATS Project Review Group approved for demonstrating the acceptability of the change in the Devers/Valley reactive support plan of service for the Path 49 Series Capacitor Upgrade project. The Path 49 Series Capacitor Upgrade project performed the post-project SCIT nomogram analysis over again with the revised plan of service indicating that the project still achieved the target rating increase to the EOR and SCIT paths. Likewise, a DPV2 WOR Rating restudy was performed on the simultaneous SCIT nomogram case with the revised DPV2 plan of service (i.e. adding a new Devers-Valley 500 kV line #2 and keeping the west of Devers 230 kV lines unchanged). The assessment was based on the post-DPV2 case with Mohave Generating Plant in service. SCE acknowledges that Mohave Generating Plant has been off-line since December 31, 2005 and may not be returned to service. The assessment for the Mohave Generating Plant retired scenario was based on the extrapolation of the results of the Mohave on-line assessment as well as results from the original Accepted Rating study. SCE confirms the POS identified in the original DPV2 Accepted Path 46 Rating Study report dated April 21, 2006, specifically the required reactive equipment specified in the following Section II.A.4 for both the Mohave on-line and Mohave off-line, is not affected by the change of plan at West-of-Devers.

Based on the findings of this study update, the revised DPV2 POS is adequate to increase the Path 46 rating by 1,200 MW from 10,623 MW to 11,823 MW on a non-simultaneous and simultaneous basis, while meeting the NERC/WECC Planning Standards and the regional WATS planning requirements. The power flow, post-transient and dynamic stability assessments indicated comparable performance between the original DPV2 POS and the revised DPV2 POS. The one difference found with the revised DPV2 POS case involved the need to address thermal overloads on SCE's west of Devers 230 kV lines in the event of the Devers-Valley 500 kV lines 1 and 2 outage. The study identified an operating procedure and/or three SPS options as mitigation of these thermal overloads.

II. PROJECT DESCRIPTION

II.A REVISED PLAN OF SERVICE

The following POS is the same as provided in the original Path 46 Rating Study with a few modifications to reflect the revised DPV2 plan of service. To reliably increase the Path 46 rating by 1,200 MW while meeting the Criteria, the revised POS will need to include the following facilities and procedures. Elements of the POS related to 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 diagrams of sections II.B and II.C.

2. *Devers – Valley 500 kV line #2*

Build a new 42 mile-500 kV line between SCE's Devers 500 kV Substation near Palm Springs, California and SCE's Valley 500 kV Substation near Riverside, California. The line will be designed with 2B-2156 ACSR conductor. The proposed route between Devers and Valley parallels the entire length of SCE's existing Devers-Valley 500 kV transmission line, as shown on the diagrams of sections II.B and II.C.

3. *230 kV Circuit Breakers*

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

- Replace 7 CBs @ Devers Substation
- Upgrade 2 CBs @ Devers Substation

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

4. ***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.

5. ***Special Protection System 1 (SPS1)***

Install a Special Protection System (SPS1) that will be designed to adjust Perkins phase shifter operation and shed load on SCE's system to ensure acceptable thermal loading performance for the double contingency loss of the Palo Verde-Devers 500 kV and Harquahala-Devers 500 kV lines. Operating procedures that adjust the Perkins phase shifters under defined operating conditions on a pre-contingency basis should be coordinated with SPS1 as mitigation to meet the thermal criteria. SCE is committed to ensuring that the ultimate SPS1 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.

6. Special Protection System 2 (SPS2)

Install a Special Protection System (SPS2) that will be designed to shed load on SCE's system to ensure acceptable thermal loading performance for the double contingency loss of the Devers-Valley 500 kV lines 1 and 2. SCE may consider an operating procedure that would adjust schedules on a post-contingency basis to relieve overloads on the west of Devers 230 kV system, in which case SPS2 would not be necessary. To the extent SCE decides to take a more automated approach in mitigating the Devers-Valley 500 kV lines 1 and 2 outage, the following three SPS technically viable mitigation alternatives were identified in this study update. SPS2-A is the preferred alternative.

A. SPS2-A

- Trip 2,000 MW of SCE load (San Bernardino 66 kV, Padua 66 kV, Walnut 66 kV, Vista 66 kV & 115 kV)

B. SPS2-B

- Adjust the Perkins phase shifters to operate at zero angle
- Trip all four west of Devers 230 kV lines
- Trip 432 MW of SCE load (Walnut 66 kV)

C. SPS2-C

- Adjust the Perkins phase shifters to operate at zero angle
- De-energize all four west of Devers 230 kV lines (pre-contingency)
- Trip 432 MW of SCE load (Walnut 66 kV)

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:

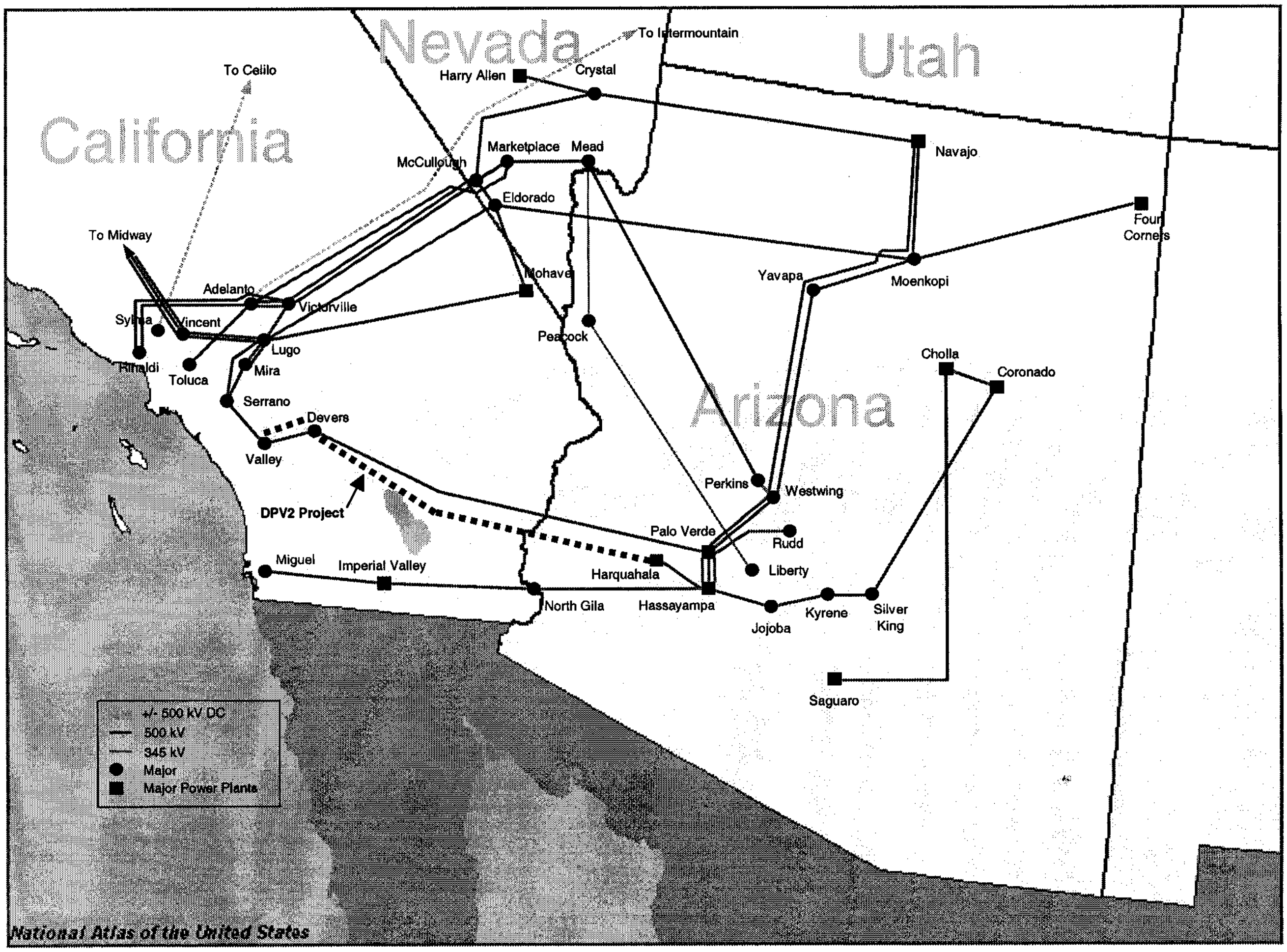
- Path 46 vs. Path 61 for loss of the Hassayampa-N.Gila 500 kV line (based on results of the recently completed SPS Conceptual Planning Study, a Path 61 vs Path 46 nomogram is required for loss of DPV1 and DPV2. The N-2 Path 61 vs Path 46 nomogram would be the nomogram implemented, since the N-2 nomogram is more limiting than the N-1 nomogram.)
- SPS1 arming points for DPV1 and DPV2 double line outage
- SPS2 arming points for Devers-Valley 500 kV double line outage

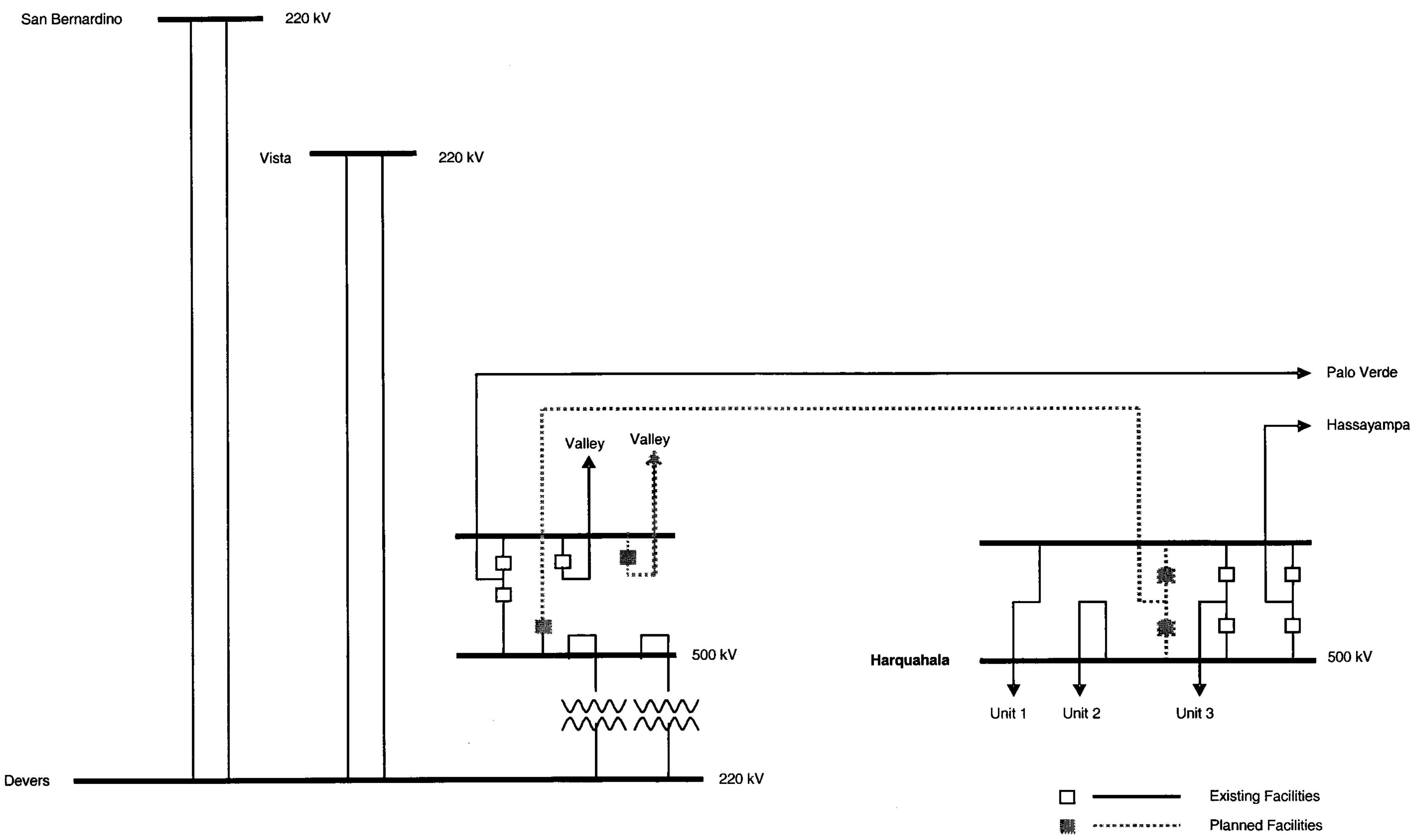
8. *Operating Procedures*

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
- West of Devers 230 kV lines for loss of the Devers-Valley 500 kV lines 1 and 2 in lieu of or conjunction with SPS2 requirements.

II.B GEOGRAPHIC MAP OF DPV2 IN RELATION TO DSW TRANSMISSION





II.C CONCEPTUAL ONE LINE DIAGRAM OF DPV2

III. FINDINGS OF REVISED SCIT NOMOGRAM SIMULTANEOUS ANALYSIS

III.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. The simultaneous SCIT nomogram analysis performed in this revised Path 46 rating study has assumed maximum flow conditions on Path 49 (i.e. 9,255 MW), Path 46 (i.e. 11,823 MW) and the SCIT path (i.e. 15,600 MW) just as assumed in the original DPV2 Path 46 rating study.

Results indicate that the revised DPV2 POS is adequate to achieve a 1,200 MW simultaneous rating increase on Path 49, Path 46 and the SCIT path with the revised DPV2 POS outlined in Section II.A 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 SPS1 to relieve these overloads as indicated in the DPV2 POS.

Results indicated thermal overloads on the four west of Devers 230 kV lines for loss of the Devers-Valley 500 kV lines 1 and 2. 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 SPS2 to relieve these overloads as indicated in the DPV2 POS.

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

III.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 revised DPV2 POS outlined in Section II.A while meeting the thermal limits of the transmission system.

SPS1 is needed to mitigate thermal overloads for the double line outage of the Palo Verde-Devers and Harquahala-Devers 500 kV lines. Operating procedures or SPS2 is needed for the double line outage of the Devers-Valley 500 kV lines 1 and 2.

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

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.REV. The following subsections provide highlights of the analysis.

1. No transmission element was loaded above 100% of its continuous rating under normal (i.e. non-contingency) conditions. Marginal loadings of 100.4% and 100.4% 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. No transmission element was loaded above 100% of its emergency rating under emergency (i.e. single-contingency) conditions in the post-project case.
3. For the double line outage of the Devers-Valley 500 kV lines 1 and 2, thermal overloads occurred on the Devers-San Bernardino 230 kV line, the Devers-Oak Valley 230 kV line and the Devers-Vista 230 kV lines 1 and 2. For the same outage with SPS2-A (refer to section II.A.6), these loadings dropped close to 100%, as shown in the table below.

Limiting Element	Emergency Loading (%) No SPS	With SPS2	Outage
DEVERS-SANBRDNO 230	129.6	101.4	DVVL12
DEVERS-VSTA 230 1	115.3	97.4	DVVL12
DEVERS-VSTA 230 2	108.1	91.3	DVVL12
DEVERS-OAK_VLLY 230	107.1	< 90.0	DVVL12

4. For the double line outage of the Devers-Valley 500 kV lines 1 and 2 with SPS2-B (refer to section II.A.6), these loadings dropped well below 100%, as shown below.

Limiting Element	Emergency Loading (%) No SPS	With SPS2	Outage
DEVERS-SANBRDNO 230	129.6	< 90.0	DVVL12
DEVERS-VSTA 230 1	115.3	< 90.0	DVVL12
DEVERS-VSTA 230 2	108.1	< 90.0	DVVL12
DEVERS-OAK_VLLY 230	107.1	< 90.0	DVVL12

5. For the double line outage of the Devers-Valley 500 kV lines 1 and 2 with SPS2-C (refer to section II.A.6), these loadings dropped well below 100%, as shown below.

Limiting Element	Emergency Loading (%) No SPS	With SPS2	Outage
DEVERS-SANBRDNO 230	129.6	< 90.0	DVVL12
DEVERS-VSTA 230 1	115.3	< 90.0	DVVL12
DEVERS-VSTA 230 2	108.1	< 90.0	DVVL12
DEVERS-OAK_VLLY 230	107.1	< 90.0	DVVL12

6. Implementing an operating procedure and the SPS1, which adjusts the Perkins phase shifters and drops 1,750 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.

III.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 revised DPV2 POS outlined in Section II.A while meeting the voltage dip, damping and frequency deviation limits of the transmission system. Also, no SPS, including SPS1 or SPS2, are needed to maintain acceptable stability performance.

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

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 for all single contingencies.

2. 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 for all double contingencies.

III.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 revised DPV2 POS outlined in Section II.A while meeting the post-transient voltage deviation limits of the transmission system. Also, no SPS, including SPS1 or SPS2, are needed to maintain acceptable post-transient performance.

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

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

2. Post-transient voltage deviations did not exceed 10% during double contingencies.

IV. REVISED APPENDIX

APPENDIX D - SCIT ANALYSIS DIAGRAMS & TABLES

8

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November 3, 2005

Ken Wilson
Western Electricity Coordinating Council
University of Utah Research Park
615 Arapeen Drive, Suite 210
Salt Lake City, UT 84108-1262

Mr. Wilson:

The interconnected transmission systems which comprise the Western Electricity Coordinating Council span many States and utility service areas. Where the State of Arizona, California and Nevada share common borders, the service boundaries of several utilities also converge. The development of transmission and generation projects at this strategic location requires coordination among neighboring utilities to address the impact of short circuit duty. The Short Circuit Work Group (SCWG) was formed to investigate the short circuit impact of the Devers – Palo Verde No. 2 (DPV2) project.

DPV2 is a 500 kV transmission line from the Palo Verde area near Phoenix, Arizona to Southern California Edison's (SCE) Devers substation near Palm Springs, California. The project is under development by SCE and has an expected operating date in the summer of 2009.

For the progress report log in the development of DPV2, enclosed is a copy of the final report from SCWG. Study results showed that DPV2 has a relatively small footprint of impact with fourteen substations in which duty increased by greater than 0.3 kA. If there are any questions related to the report please contact me at (626) 302-9653.

Sincerely,

Garry Chinn
Power System Planner

Attachment

cc (via email):

Marty Fisher (NPC)
Robert DerAshodian (NPC)
Ronald Onate (APS)
Johnny Hernandez (SRP)
David Le (CAISO)
Xiaobo Wang (CAISO)
German Gallegos (IID)
Tim Wu (LADWP)
Tammy Tran (LADWP)
Ann Finley (MWD)

Nick Saber (WAPA)
Harvey Beatty (WAPA)
Robert Jackson (Sempra)
Jay Seitz (USBR)
Don Bryce (USBR)
Alicia Lopez (SCE)
Dana Cabbell (SCE)
Steve Mavis (SCE)
Robert Tucker (SCE)

DEVERS – PALO VERDE NO. 2
SHORT CIRCUIT WORK GROUP

FAULT DUTY ANALYSIS

November 1, 2005

1.0 INTRODUCTION

The interconnected transmission systems which comprise the Western Electricity Coordinating Council span many States and utility service areas. Where the State of Arizona, California and Nevada share common borders, the service boundaries of several utilities also converge.

The development of transmission and generation projects at this strategic location requires coordination among neighboring utilities to address the impact of short circuit duty. The Short Circuit Work Group (SCWG) was formed to investigate the short circuit impact of the Devers – Palo Verde No. 2 (DPV2) project.

The DPV2 project is a 500 kV transmission line from the Palo Verde area near Phoenix, Arizona to Southern California Edison's (SCE) Devers substation near Palm Springs, California. The project is under development by SCE and has an expected operating date in the summer of 2009.

In addition to examining 2009 for DPV2, the SCWG also developed databases to address the intervening years of 2006 and 2007 since other projects have planned operating dates in these time periods. The objectives of the SCWG are:

1) Determine the short circuit duty expected in 2006, 2007 and 2009.

2) Identify if breaker replacements will be required within the study area for DPV2.

2.0 DPV2 DESCRIPTION

DPV2 consists of the following components:

a) A new 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 conductor is 2B-2156 ACSR with 48% series compensation. The preferred route between Devers and Harquahala parallels the entire length of SCE's existing Palo Verde – Devers 500 kV No. 1 line and approaches Harquahala from the east. 102 miles of the line is in Arizona with 128 miles in California for a total of 230 miles.

b) The Devers – San Bernardino 230 kV lines No. 1 and 2 will be rebuilt and reconductored. The original single circuit 230 kV towers will be removed and replaced with double circuit 230 kV towers and strung with bundled 1033 ACSR.

c) The Devers – Vista 230 kV lines No. 1 and 2 will be rebuilt and reconductored. The original single circuit 230 kV towers will be removed and replaced with double circuit 230 kV towers and strung with bundled 1033 ACSR

d) Two 388 MVAR static var compensators, one at Valley 500 kV substation and the other at Devers 500 kV substation.

e) A Special Protection System (SPS) designed to drop approximately 900 MW of generation in the Palo Verde area and 900 MW of load in SCE.

9

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COMBINED
DEVERS – PALO VERDE NO. 2 PROJECT
AND EOR 9300 MW UPGRADE PROJECT

ACCEPTED PATH 49 RATING STUDY REPORT

VOLUME I – MAIN REPORT

JANUARY 26, 2007

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

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

To realize the economic benefit of increasing the power delivery capability on both the northern and southern portions of WECC Path 49, or Arizona-California East-of-River (EOR) path, the following two projects have been planned. This Combined Devers–Palo Verde No. 2 Project and EOR 9300 MW Upgrade Project Accepted Path 49 Rating Study (Study) has been performed demonstrating the viability of these two projects to raise the Path 49 rating to 10,500 MW, an increase of 2,445 MW, while meeting the NERC/WECC Planning Standards and the regional WATS planning requirements.

The first project is proposed by Southern California Edison (SCE) to build a 500 kV transmission line project from the Palo Verde area, near Phoenix, Arizona, to SCE's Devers substation, near Palm Springs, California. The Project is named "Devers-Palo Verde No. 2 (DPV2)." DPV2 will increase the rating of Path 49 by 1,200 MW. This 1,200 MW increase is based on the recently WECC-approved Path 49 rating of 8,055 MW resulting from the Path 49 Short Term Upgrade Project, giving a post-DPV2 Path 49 rating of 9,255 MW. The DPV2 Project was granted WECC Phase 3 status on August 30, 2005. The planned in-service date of the project is 2009.

The second project is the EOR 9300 MW Project (EOR9300) proposed by Salt River Project (SRP) on behalf of the project sponsors to upgrade the northern part of Path 49 including the Perkins-Mead and the Navajo-Crystal 500 kV lines series capacitors thermal upgrades. EOR9300 will increase the rating of Path 49 by 1,245 MW. This 1,245 MW increase is also based on the recently WECC-approved Path 49 rating of 8,055 MW. The Project was granted WECC Phase 3 status on September 12, 2005. The planned in-service date of the project is April 2009.

Each of the two planned projects has demonstrated independently its technical capability of increasing Path 49 rating in the 9,255 to 9,300 MW range. Since DPV2 and EOR9300 are considered "similarly situated" as defined in the WECC path rating document, "Procedures For Regional Planning Project Review and Rating Transmission Facilities," they must be treated on an equal basis. Consequently, it was necessary to perform an additional WECC rating study to demonstrate that DPV2 and EOR9300 together can achieve a combined Path 49 rating of 10,500 MW. DPV2 and EOR9300 will hereafter be referred to as the Combined Projects.

As part of their independent WECC three-phase rating processes, DPV2 and EOR9300 had previously completed their respective Regional Planning Compliance Reports. On December 30, 2005, SCE and SRP jointly submitted a notification letter along with the Comprehensive Progress Report (CPR) for the Combined Projects in accordance with Phase 1 of the WECC Rating Review Process. TSS granted Phase 2 status to the Combined Projects on March 16, 2006. In addition to the WECC rating process, the Combined Projects have adhered to the Western Arizona Transmission System (WATS) regional planning requirements. On May 10, 2006, SCE and SRP held the first of four meetings of the WECC/WATS Peer Review Group (PRG) to review and approve the Study, and prepare this final Combined Devers–Palo Verde No. 2 Project and EOR 9300 MW Upgrade Project Accepted Path 49 Rating Study Report (Report).

Based on the findings of this Study, the Combined Projects Plan of Service (POS) is adequate to increase the Path 49 non-simultaneous rating by 2,445 MW from 8,055 MW to 10,500 MW, while meeting the NERC/WECC Planning Standards and the WATS administered "Procedures for Requesting an Interconnection with the Palo Verde 500kV Switchyard." With the inclusion of reactive support equipment in the Combined Projects POS, the Southern California Import Transmission (SCIT) path simultaneous capability as identified in the Path rating catalog under the Path 49 and Path 46 listings will be increased by 1,200 MW. In addition, the POS is adequate to achieve a 2,445 MW rating increase on Path 49 simultaneously with four WECC defined Paths 26, 42, 46 and the Centennial path at their respective maximum ratings. Nomograms and/or operating procedures will have to be implemented to mitigate the simultaneous interactions between Path 49 and Path 43 and between Path 49 and Path 61. Conceptual nomograms have been developed for Path 49 vs. Path 43 in this Study. Conceptual nomograms were developed for Path 49 vs. Path 61 in the respective EOR9300 and the DPV2 stand-alone Path 49 rating studies.

At the request of PRG members, the Study includes assessments of 3 sensitivities for information purposes only, which are described in section VIII of this Report.

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

II. STUDY OBJECTIVES AND SCOPE

The main objective of this Study is to establish a new Accepted Rating of 10,500 MW on Path 49 as a result of the Combined Projects. To achieve this new rating, the Study must demonstrate that the Path 49 rating can be increased from 8,055 MW to 10,500 MW while meeting the NERC/WECC Planning Standards and the WATS administered "Procedures for Requesting an Interconnection with the Palo Verde 500kV Switchyard" (hereafter jointly referred to as Criteria). The Study must also be in compliance with Phase 2 of the WECC "Procedures for Regional Planning Project Review and Rating Transmission Facilities" policy (WECC Rating Policy).

In addition, the Study included performing limited sensitivity analyses to check the interaction of the Combined Projects 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 the Combined Projects go into service in 2008/2009. The other analysis assumes that the Mohave Generating Plant will be shut down.

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.

10

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DEVERS – PALO VERDE NO. 2 (DPV2)

DPV12 SPS ARMING STUDY

MARCH 6, 2007

TABLE OF CONTENTS

1. INTRODUCTION

Southern California Edison ("SCE") is proposing to build a 500 kV transmission line project from the Harquahala substation in the Palo Verde area, near Phoenix, Arizona, to SCE's Devers substation, near Palm Springs, California. The Project is named Devers-Palo Verde No. 2 ("DPV2"). DPV2 is expected to increase the ratings of WECC Path 49 ("EOR") and Path 46 ("WOR") flow, and the Southern California import ("SCIT") limit, by 1,200 MW. The DPV2 Project will have a plan of service that achieves the rating objectives while meeting relevant reliability criteria. The expected operating date for DPV2 is 2009.

Salt River Project ("SRP") on behalf of the project sponsors is proposing to upgrade the northern part of Path 49 including the Perkins-Mead and the Navajo-Crystal 500 kV lines series capacitors thermal upgrades. The Project is named EOR 9300 MW Project ("EOR9300"). EOR9300 will increase the rating of Path 49 by 1,245 MW. This 1,245 MW increase is also based on the WECC-recently approved Path 49 rating of 8,055 MW, which was granted WECC Phase 3 status on September 12, 2005. The planned in-service date of the project is 2009.

The Path 49 Rating Study determined that with both Projects modeled, the DPV2/EOR9300 Combined Projects Plan of Service ("POS") is adequate to increase the Path 49 non-simultaneous rating by 2,445 MW from 8,055 MW to 10,500 MW, while meeting the NERC/WECC Planning Standards and the regional WATS planning requirements. With the inclusion of reactive support equipment in the Combined Projects POS, the SCIT path simultaneous capability as identified in the Path rating catalog under the Path 49 and Path 46 listings will be increased by 1,200 MW. In addition, the POS is adequate to achieve a 2,445 MW rating increase on Path 49 simultaneously with four WECC defined Paths 26, 42, 46 and the Centennial path at their respective maximum ratings.

This document has two reports that identify requirements when only the DPV2 Project is modeled ("Addendum I") and when the DPV2/EOR9300 Combination Project ("Addendum II") is modeled. Both reports were developed since it was not certain that the EOR9300 Project would be constructed until recently when the sponsors of the Project approved it in December, 2006.

2. EXECUTIVE SUMMARY – ONLY DPV2 PROJECT

The DPV2 Project was completed under the premise that the EOR9300 Project would not be completed and that the DPV2 Project would be the only large project added to the system by 2009. When the DPV2 Project began, the EOR9300 Project had not been approved; however, at the December 12, 2006 WATS/PRG meeting, it was identified that the EOR9300 Project had been approved by the sponsors of the project. Therefore, the credibility of the EOR9300 Project moving forward in addition to the DPV2 project was increased significantly. As a result, the Path 61 Nomograms, the Palo Verde Hub Reactive margin and MWD Pump load sensitivities were not developed; since, the EOR9300 Project was now a credible project. Therefore, efforts were focused on the DPV2/EOR9300 Combination Project. Nevertheless, results with only the DPV2 Project have been documented and provided in this document.

2.1. Loss of DPV12 Nomogram(s)

A series of base cases were developed to construct operating Nomogram(s) to ensure loss of the DPV12 lines meet the NERC/WECC reliability criteria. The following parameters were varied in developing the Nomogram(s):

- Mohave Generation was modeled on and off-line.
- East of River flow.
- West of River flow.
- Aggregate Southern Load ("ASL") was varied to determine minimum data points of the Nomogram. The ASL is defined in section 2.3.1.
  - The heavy autumn base case was used for studying minimum and intermediate load levels.
  - The heavy summer base case was used for studying data points with higher load levels.
- The Perkins PST's were modeled in-service at zero-angle for all base cases with EOR flow less than 8,750 MW.

In developing the Nomogram(s), it was determined that the post-transient voltage dip was the limiting element for all data points. The post-transient voltage dip was primarily located in the Imperial Irrigation District ("IID") system. As a result, the Devers 500 kV post-transient voltage level was critical in determining the SCE load drop requirement. Based on this factor, shunt capacitors at both the Devers and Valley 500 kV substations were switched to maintain a post-contingency voltage less than 540 kV (1.08 per unit). It should be noted that inserting the Perkins PST's at zero angle mitigates thermal overloads to the Perkins – Mead 500 kV line for EOR flow greater than 8,500 MW.

IID is in the process of proposing significant future projects that will upgrade their system. These upgrades should reduce SCE load arming requirements. However, based on the present IID system, the developed Nomogram(s) will meet the NERC/WECC reliability criteria.

Nomogram data points for EOR flow increments were determined by studying the maximum aggregate southern load based on a 2009 heavy summer base case. Minimum aggregate southern load levels were determined with the 2009 heavy autumn base case as the starting point. The minimum aggregate southern load level was determined by decreasing SCE load until no NERC/WECC reliability criteria violations were observed. Note, based on the sensitivity results, any of the Southern California system loads (i.e., LADWP, SDG&E or SCE) could have been reduced; however, SCE system load was used since it comprises over 60% of the total Southern California load and dealing with one system makes the load scaling less cumbersome. The maximum Southern California load level was determined based on dropping SCE load until no NERC/WECC reliability criteria violations were observed for the 2009 heavy summer one-in-ten forecast. Once those data points were obtained, a data point between the minimum and maximum were developed to ensure linearity between the minimum and maximum data points. SCE load arming requirements with Mohave on and off-line are plotted in **Figures 1 and 2**.

Figure 1. Loss of DPV12 Nomogram – Mohave On-Line.

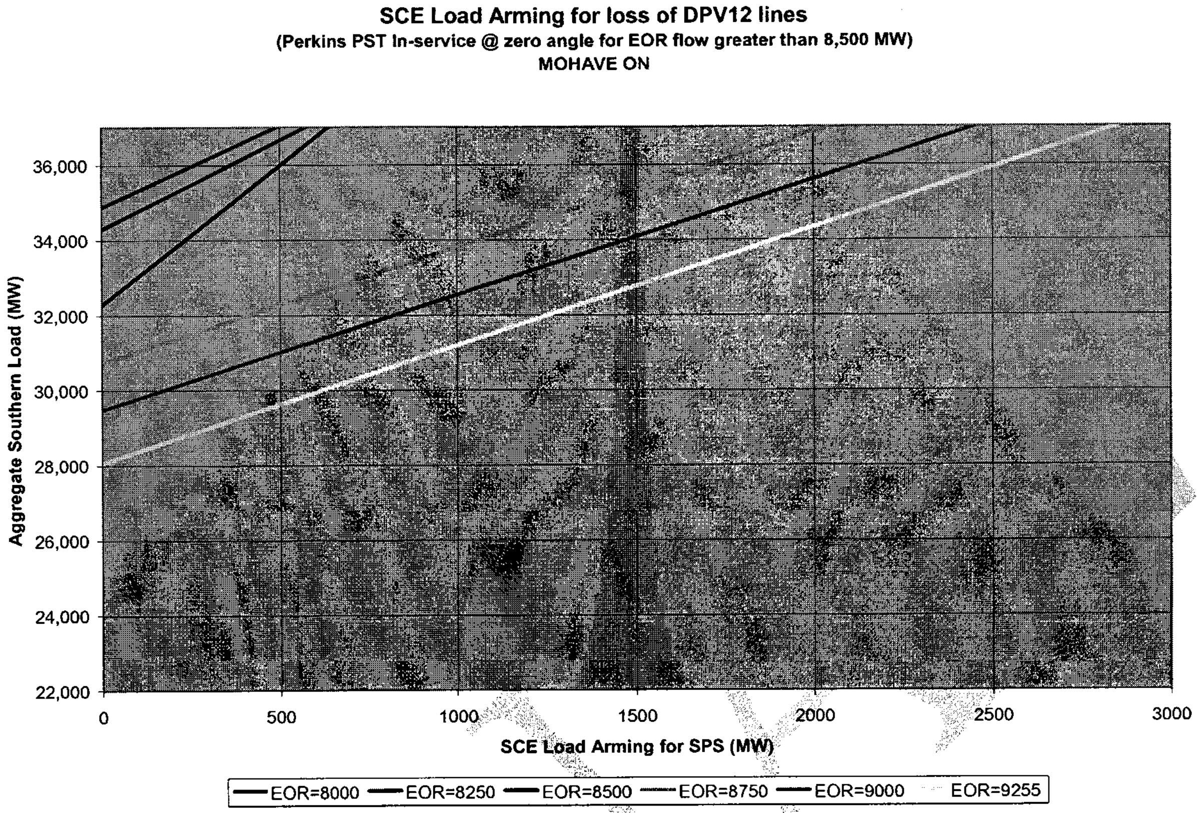
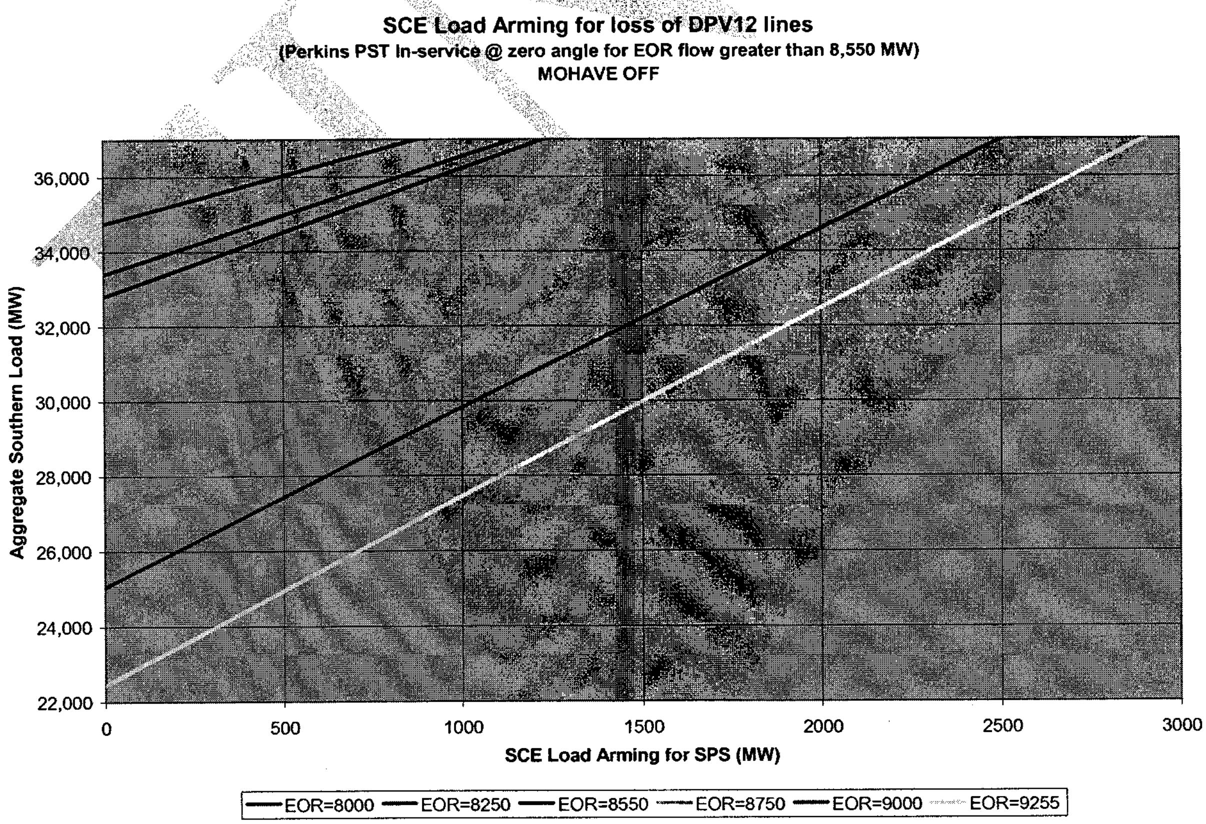


Figure 2. Loss of DPV12 Nomogram – Mohave Off-Line.



For EOR flows greater than 8,500 MW, the Perkins PST's must be in-service at zero angle to prevent the Perkins-Mead 500 kV line from exceeding its emergency rating. In comparing **Figures 1 and 2**, the load arming requirements increase significantly with insertion of the Perkins PST's at zero angle. The large space between the EOR 8,550 and 8,750 curves identifies this load arming increase.

Transient stability analysis was completed for minimum and maximum data points for all EOR flow levels with both Mohave on and off-line. With load drop requirements modeled, there were no NERC/WECC performance criteria violations with Mohave on or off-line. In addition, all transient stability plots damp out over time.

2.2. Develop Perkins Phase-Shift Transformer Operation

Management of the Perkins PST's is an integral component of the DPV12 SPS. Proper management ensures that power flow to the Perkins-Mead 500 kV line is reduced in order to mitigate thermal overloads for loss of the DPV12 lines.

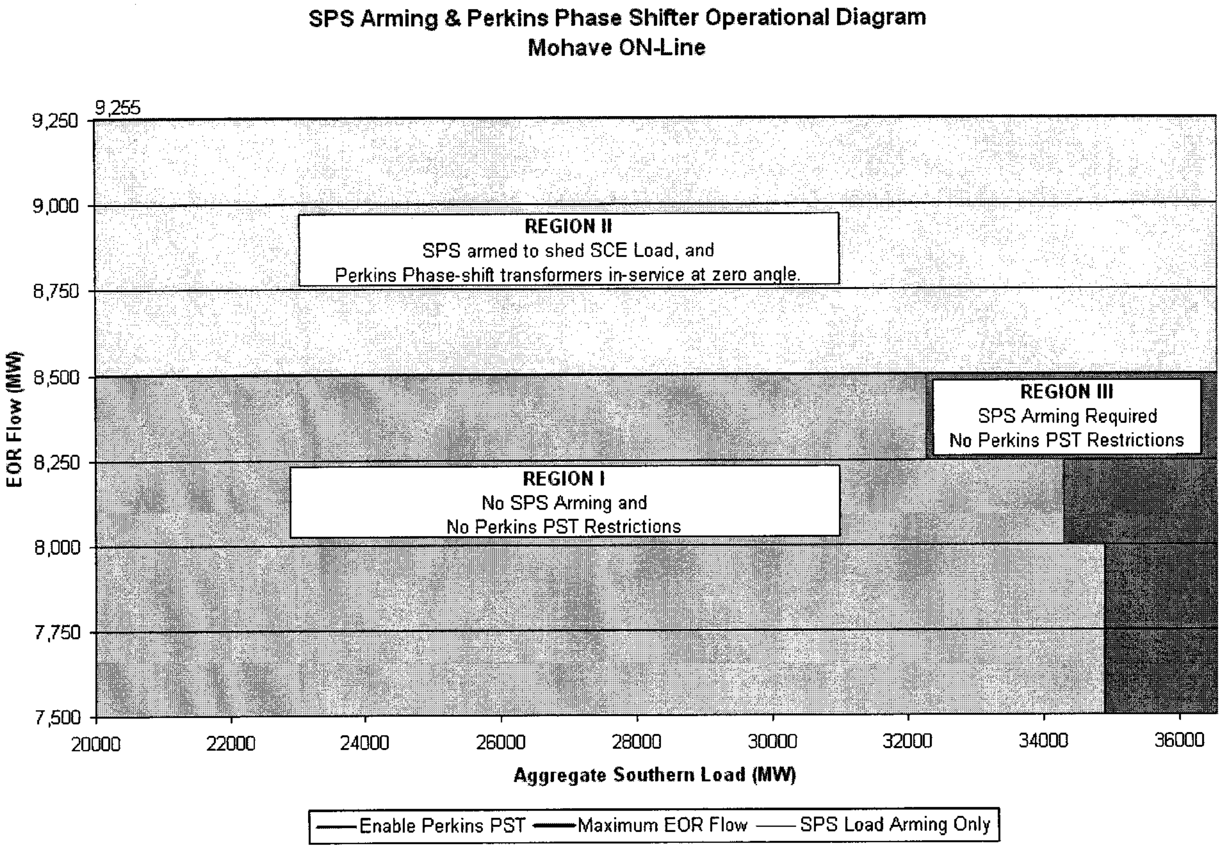
Results identified that thresholds at which insertion of the Perkins PST at zero angle differ between the Mohave on and off base cases. With Mohave off-line, insertion of the Perkins PST's does not occur until 8,550 MW; whereas, with Mohave on-line, insertion of the Perkins PST's occurs at 8,500 MW.

Three regions of operation were identified for the Perkins PST's.

- Region I identifies the operating region where no SPS arming and no Perkins PST restrictions are required for loss of the DPV12 lines.
- Region II identifies the operating region where the Perkins PST's must be in-service at zero angle and the SPS load armed.
- Region III identifies the operating region where the Perkins PST's do not help mitigate thermal loading in the AZ system; since, EOR flows are low enough. However, it does identify the region where SPS arming is required to mitigate post-transient voltage dips.

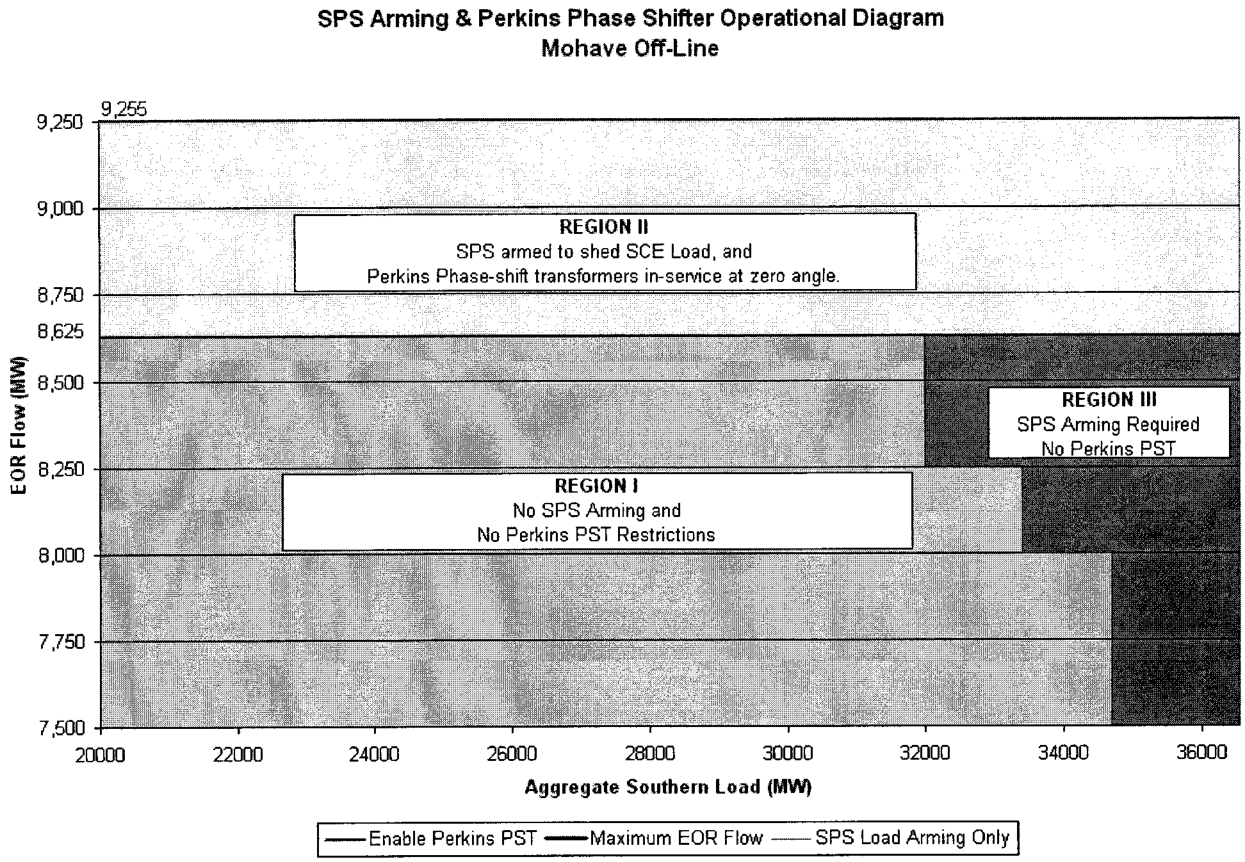
With the Perkins PST's bypassed and an EOR flow of 8,550 MW, the loss of DPV12 lines with zero load arming was simulated to determine the thermal loading of the Perkins – Mead 500 kV line. Results determined that an EOR flow of 8,550 MW resulted in a thermal limit of 99.9% on the Perkins – Mead 500 kV line. While maintaining an EOR flow of 8,550 MW, the aggregate southern load level was increased until the limiting post-transient voltage dip was observed, which was determined to be approximately 32,250 MW. The EOR flow of 8,550 MW defines the boundary up to an aggregate southern load level of 32,250 MW at which the Perkins PST's need to be inserted to mitigate thermal loading to the Perkins – Mead 500 kV line. **Figure 3** illustrates the operating regions with Mohave on-line.

Figure 3. SPS Load arming and Perkins Phase-Shift Operation – Mohave On-line.



With the Perkins PST's bypassed and an EOR flow of 8,625 MW, the loss of DPV12 lines with zero load arming was simulated to determine the thermal loading of the Perkins – Mead 500 kV line. Results determined that an EOR flow of 8,625 MW resulted in a thermal limit of 99.9% on the Perkins – Mead 500 kV line. While maintaining an EOR flow of 8,625 MW, the aggregate southern load level was increased until the limiting post-transient voltage dip was observed, which was determined to be 32,000 MW. The EOR flow of 8,625MW defines the boundary up to an aggregate southern load level of 32,000 MW at which the Perkins PST's need to be inserted to mitigate thermal loading to the Perkins – Mead 500 kV line. **Figure 4** illustrates the operating regions with Mohave off-line.

Figure 4. SPS Load arming and Perkins Phase-Shift Operation – Mohave Off-line.



2.3. Sensitivity Analysis

2.3.1. Southern California Load Sensitivity

Based on DPV12 Nomogram results, the SCE system load has an effect on the amount of SCE load arming required for loss of the DPV12 lines. Study results identified that differences in Southern California load other than SCE load also effect post-transient voltage dip results. In addition, since each Southern system load affects the DPV12 Nomogram, the aggregate Southern California load would yield a more accurate parameter for monitoring system reliability. Therefore, all study results and Nomograms were developed with use of the Aggregate Southern Load ("ASL").

The CAISO EMS system currently has a data value that calculates load plus losses for the aggregate southern system, which is defined by the following areas:

1. Anaheim load;
2. LADWP load;
3. Pasadena load;
4. Riverside load;
5. SDG&E load;
6. SCE load; which also includes,
    a. CDWR pump load

b. MWD pump load

The study base cases have all of the above loads modeled; however, some of the system loads in the SCE system are incorporated into the SCE system load model (i.e., Anaheim, Pasadena and Riverside). In addition, the CDWR and MWD pump loads are modeled as negative generation. Therefore, the pump load will be summed to the aggregate southern system load. The aggregate southern system load will be calculated and used throughout all studies.

2.3.2. SCIT Sensitivity

The SCIT sensitivity analysis determined impacts from path flows that represent the SCIT flow for loss of the DPV12 lines. The DPV12 Nomogram affects were identified by increasing path flow to the IPPDC, PDCI, Path 26, North of Lugo and WOR path flows by 250 MW. Path flow, other than the path being tested, was maintained at the benchmark flows. Two DPV12 Nomogram curves were selected for this sensitivity: 1) EOR flow of 9,255 MW and, 2) EOR flow of 8,550 MW. Data points with an EOR flow of 9,255 MW have the Perkins PST's in-service at zero angle and the other has the Perkins PST's bypassed, both represent the two topology differences.

Study results identified that negligible impacts were observed for changes in the IPPDC, PDCI, North of Lugo and path 26 flows; however, the WOR flow impacted the load arming requirements. An adjustment to each Nomogram curve was developed based on the WOR sensitivity results. The adjustment simply shifts the curve left or right depending on the WOR flow.

Based on the WOR sensitivity results with Mohave on-line, WOR flow with the Perkins PST's in-service at zero angle are less sensitive to WOR flow than with the Perkins PST's bypassed. It is recommended that the following adjustments be applied:

1. Adjust Nomogram curves with an EOR flow greater than 8,550 MW by a factor of 0.65 MW relative to the studied WOR flow of 11,300 MW. For example, using the EOR curve of 9,255 MW, a WOR flow of 11,000 MW would result in a load arming adjustment of -195 MW ([11,000 - 11,300]*0.65). Therefore, all curves with the Perkins PST's in-service at zero angle would be shifted left by 195 MW.
2. Adjust remaining Nomogram curves by a factor of 1.1 relative to the studied WOR flow of 11,300 MW.

Based on the WOR sensitivity results with Mohave off-line, WOR flow with the Perkins PST's in-service at zero angle are less sensitive to WOR flow than with the Perkins PST's bypassed. It is recommended that the following adjustment be applied:

1. Adjust Nomogram curves with an EOR flow greater than 8,625 MW by a factor of 1.2 MW relative to the studied WOR flow of 11,000 MW. For example, using the EOR curve of 9,255 MW, a WOR flow of 10,750 MW would result in a load arming adjustment of -300 MW ([10,750 - 11,000]*1.2). Therefore, all curves with the Perkins PST's in-service at zero angle would be shifted left by 300 MW.
2. Adjust remaining Nomogram curves by a factor of 1.1 relative to the studied WOR flow of 11,000 MW.

These adjustments would either increase or decrease the load arming requirement based on the WOR power flow.

2.4. Conclusions

Study results identify that the DPV2 Only Project can achieve the 1,200 MW rating increase to WECC Path 49 ("EOR"), Path 46 ("WOR") and the Southern California Import Transmission ("SCIT") paths. However, the developed DPV12 SPS Nomograms will be required to ensure system reliability. In addition, management of the Perkins PST's will be a key component for EOR flow greater than 8,500 MW.

Presently, there are a number of transmission projects being proposed and studied in and around the WATS system that may be beneficial in reducing the DPV12 SPS load arming requirements. The EOR9300 Project is the most significant project that will affect the DPV12 SPS load arming requirements. As previously stated, at the December 12, 2006 WATS/PRG meeting, it was identified that the EOR9300 Project had been approved by the sponsors of the project. Therefore, the credibility of the EOR9300 Project moving forward in addition to the DPV2 project was increased significantly. Therefore, as the DPV2 project gets closer to its in-service date, the DPV12 SPS Arming Study will need to be restudied with the most current transmission system modeled. **Addendum II** of this report analyzes and identifies the changes to the DPV12 SPS Load Arming requirements.

To account for differences between real-time system conditions and the transmission base case modeling, the studied DPV12 SPS load arming requirement should include a margin of error by increasing the load requirement for each Nomogram data point. Sources of error may be attributed to modeling and operational differences. For example, operational differences include effects of flow distribution, voltage schedule differences due to generation output and capacitor switching. A margin of error of approximately 50 MW should be sufficient in accounting for these differences.

The developed DPV12 SPS arming scheme has been explored and will ensure that no adverse system conditions result from loss of the DPV12 lines. However, should the EOR9300 Project not come to fruition, the Path 61 Nomograms will need to be developed. Based on the Conceptual report of the DPV12 SPS Load arming, the Path 61 Nomograms will be similar to those developed in the DPV2/EOR9300 Combination Project report.

3. EXECUTIVE SUMMARY – DPV2/EOR9300 COMINATION PROJECT

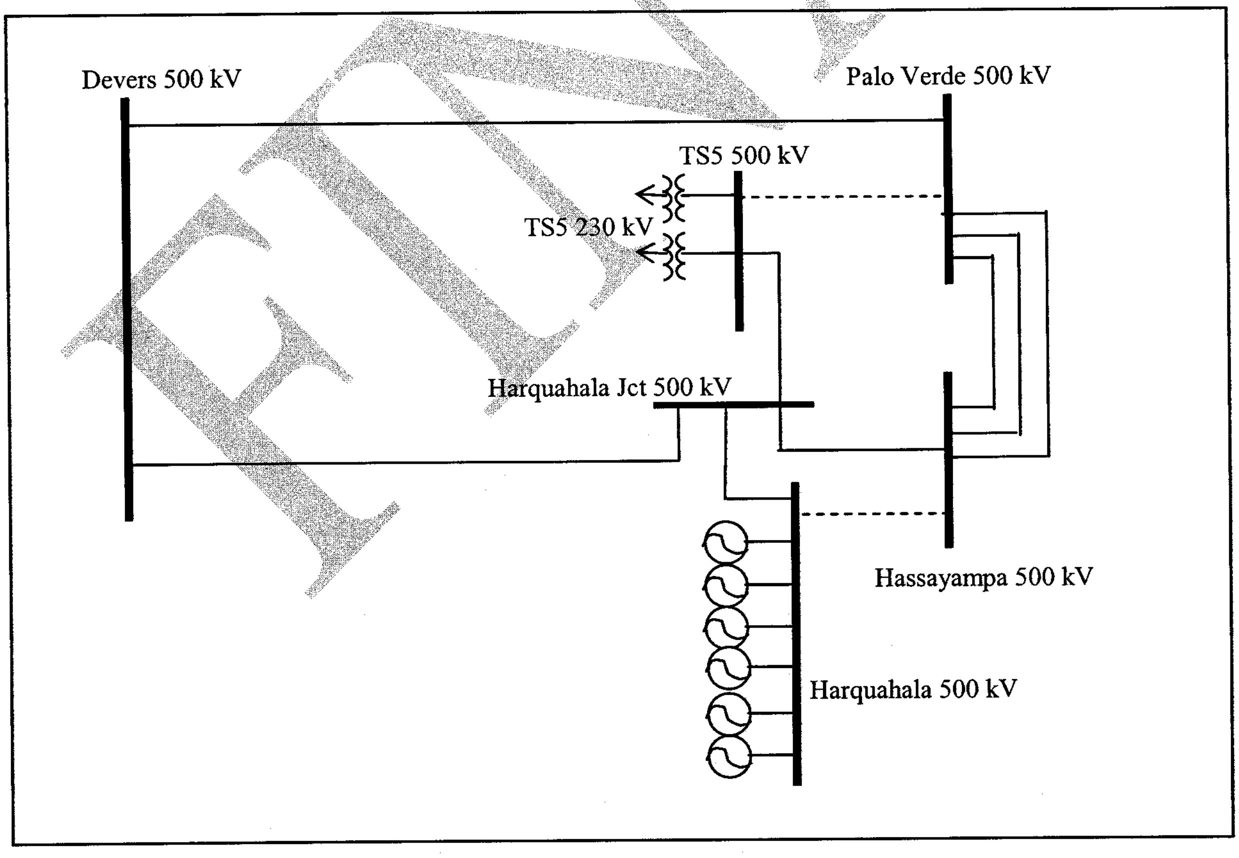
3.1. System Modeling

A series of base cases were developed with the DPV2/EOR9300 Combination Project included to construct operating Nomogram(s) to ensure loss of the DPV12 lines meet the NERC/WECC reliability criteria. In addition, EOR flow was increased to 10,500 MW, which is consistent with inclusion of both the EOR9300 Project and the DPV2 line. The following parameters were varied in developing the Nomogram(s):

- Mohave Generation was modeled on and off-line.
- East of River flow.
- West of River flow.
- Aggregate Southern Load ("ASL") was varied to determine minimum data points of the Nomogram. The ASL is defined in Section 3.4.1.
  - The heavy autumn base case was used for studying minimum and intermediate load levels.
  - The heavy summer base case was used for studying data points with higher load levels.

The Harquahala Junction 500 kV bus was modeled in all DPV2/EOR9300 Combination base cases. **Figure 5** illustrates the configuration with the Harquahala Junction bus included.

Firgure 5. One-line diagram of the Harquahala Junction.



Results identified that the post-transient voltage dip results were affected by different SCIT levels. Hence, when developing the series of base cases, consistent SCIT component flows were maintained for each data point. WOR flows for each case with Mohave on-line were fixed at 11,300 MW and with Mohave off-line, the WOR flow was fixed at 11,000 MW. Path 26 flows were the only component that was not fixed at a predetermined flow. To determine impacts of each path within the SCIT definition, a sensitivity for each component is analyzed in the sensitivity section of this study.

Key attributes of the Metropolitan Water District of Southern California ("Metropolitan") Thermal Protection Schemes were screened for both the pre-contingency and post-contingency base cases. Base cases with high SCE load triggered the Metropolitan "Mirage Overpower and Undervoltage Julian Hinds" relay protection scheme. There were no conditions that triggered the "Thermal Overload Protection – Eagle Mountain Thermal" relay scheme.

3.2. Loss of DPV12 Nomogram(s)

Post-contingency results identified that when the MWD scheme 1 SPS does not meet its thermal and voltage thresholds to operate, the Blythe-Eagle Mountain 161 kV line ("Path 59") exceeds its emergency thermal rating. However, the Blythe SPS will be triggered and the Buck Blvd generation will be manually reduced to half of its output within 30 minutes to alleviate the overloaded elements. The Buck Blvd generation has 519 MW modeled in all base cases; therefore, the worst case is represented. Power flow on the Blythe-Eagle Mountain 161 kV line would be decreased with lower Buck Blvd generation levels. Activation of the Blythe SPS for the highest loaded element was verified to ensure that it properly mitigates the overloaded elements.

Similar to the load drop requirements identified without the EOR9300 Project, the post-transient voltage dip was primarily located in the Imperial Irrigation District ("IID") system. As a result, the Devers 500 kV post-transient voltage level was critical in determining the SCE load drop requirement. Based on this factor, shunt capacitors at both the Devers and Valley 500 kV substations were switched to maintain a post-contingency voltage less than 540 kV (1.08 per unit).

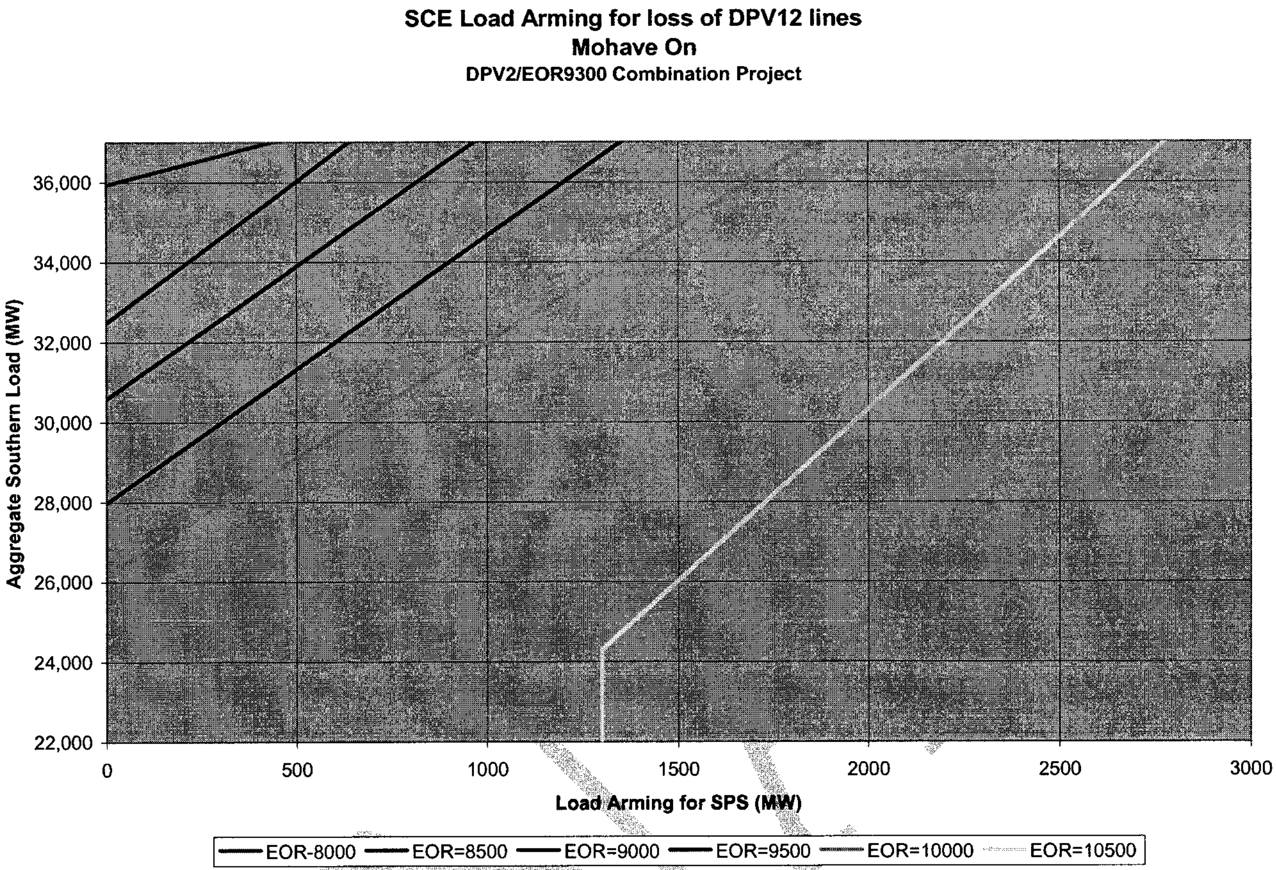
IID is in the process of proposing significant future projects that will upgrade their system. These upgrades should reduce SCE load arming requirements. However, based on the present IID system, the developed Nomogram(s) will meet the NERC/WECC reliability criteria.

Nomogram data points were determined by studying the minimum and maximum aggregate southern load level for each EOR flow. The minimum aggregate southern load level was developed by decreasing aggregate southern load until no NERC/WECC reliability criteria violations were observed. The maximum aggregate southern load level was determined based on dropping SCE load until no NERC/WECC reliability criteria violations were observed for the 2009 heavy summer one-in-ten forecast.

3.2.1. Mohave On-line

Based on WOR sensitivity results, SPS load arming for the curve with an EOR flow of 10,500 MW is increased by 1,300 MW to protect the Perkins-Mead 500 kV line from thermal overload. Results identified that the combination of high EOR flow and lower WOR flow increases loading on the Perkins-Mead 500 kV line for loss of the DPV12 lines. To reduce the complexity of the SPS load arming, a load drop requirement based on historical flow deviations was determined and applied to the EOR curve of 10,500. In addition, it is believed that the Perkins-Mead 500 kV line does not require additional load arming for EOR flow less than 10,000 MW. Data points graphed in **Figure 6** illustrate the Nomogram with the Mohave on-line.

Figure 6. DPV2/EOR9300 Project: Loss of DPV12 Nomogram – Mohave On-line.



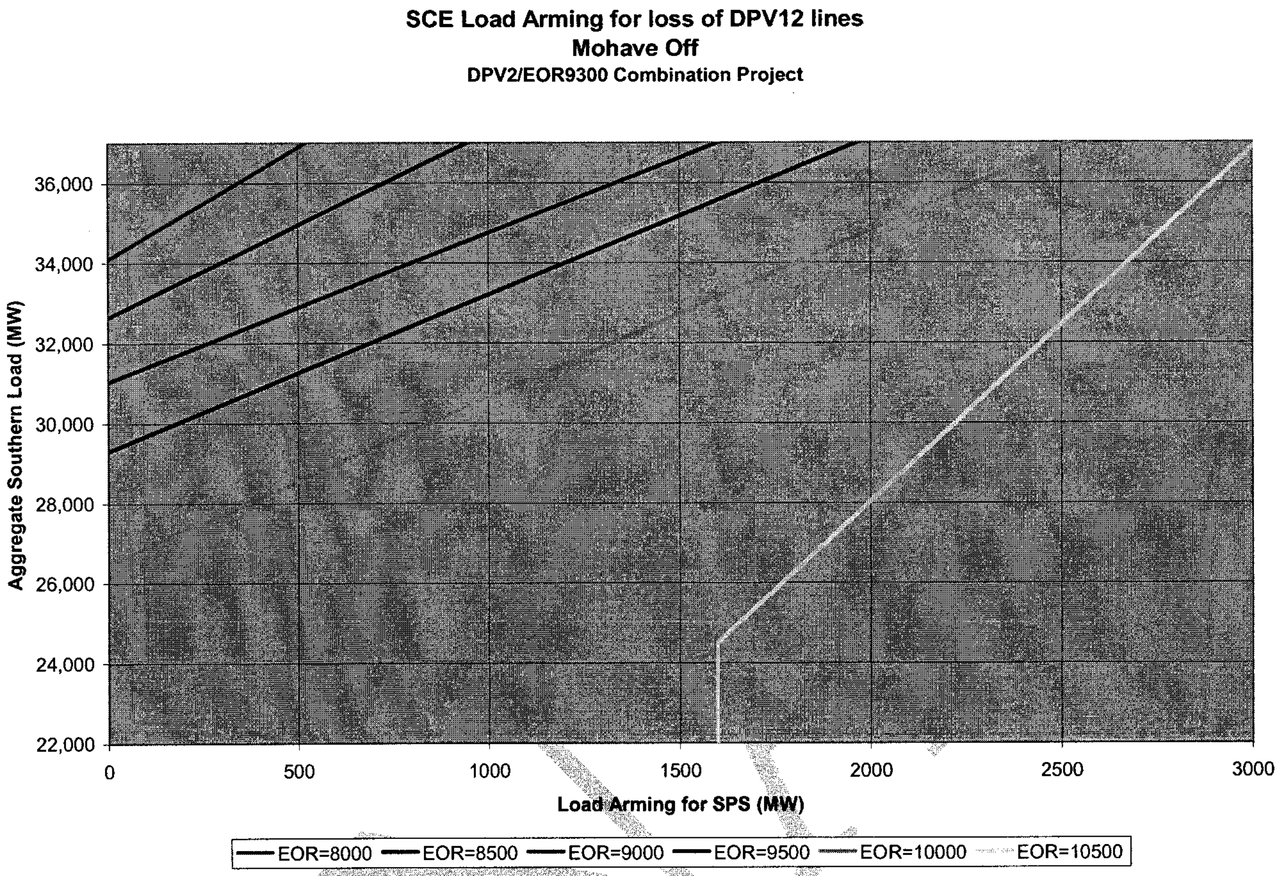
The zero load arming point does not exist for the EOR 10,500 curve because the reduction of aggregate southern load does not reduce power flow levels to the Perkins-Mead 500 kV line. The curve with an EOR flow of 8,000 MW does not have the same slope as the other curves; since, only a large load block increment is available. The load arming value would be smaller if a higher resolution of load drop was available.

3.2.2. Mohave Off-line

Based on the WOR sensitivity results, SPS load arming for the curve with an EOR flow of 10,500 MW is increased by 1,600 MW to protect the Perkins-Mead 500 kV line from thermal overload. Results identified that the combination of high EOR flow and lower WOR flow increases loading on the Perkins-Mead 500 kV line for loss of the DPV12 lines. To reduce the complexity of the SPS load arming, a load drop requirement based on historical flow deviations was determined and applied to the EOR curve of 10,500. In addition, it is believed that the Perkins-Mead 500 kV line does not require additional load arming for EOR flow less than 10,000 MW.

It should also be noted that with Mohave off-line, post-contingency results for the Mead-Marketplace 500 kV line rating of 2598/2858 MVA normal/emergency was the limiting element for EOR flows less than 8,500 MW. Therefore, WOR flows of 11,000 MW were unable to be held constant for all data points. Data points graphed in **Figure 7** illustrate the Nomogram with the Mohave off-line.

Figure 7. **DPV2/EOR9300 Project: Loss of DPV12 Nomogram – Mohave Off-line.**



Transient stability analysis was completed for all EOR flow level data points with both Mohave on and off-line. There were no NERC/WECC performance criteria violations with Mohave on or off-line when load drop requirements were modeled.

3.3. SPS Load Arming Operational Diagrams

The operational diagrams illustrated in **Figures 8 and 9** identify the SPS load requirements based on the aggregate southern load and EOR flow levels. Results identified that SPS load arming requirements differ depending on Mohave being on or off-line.

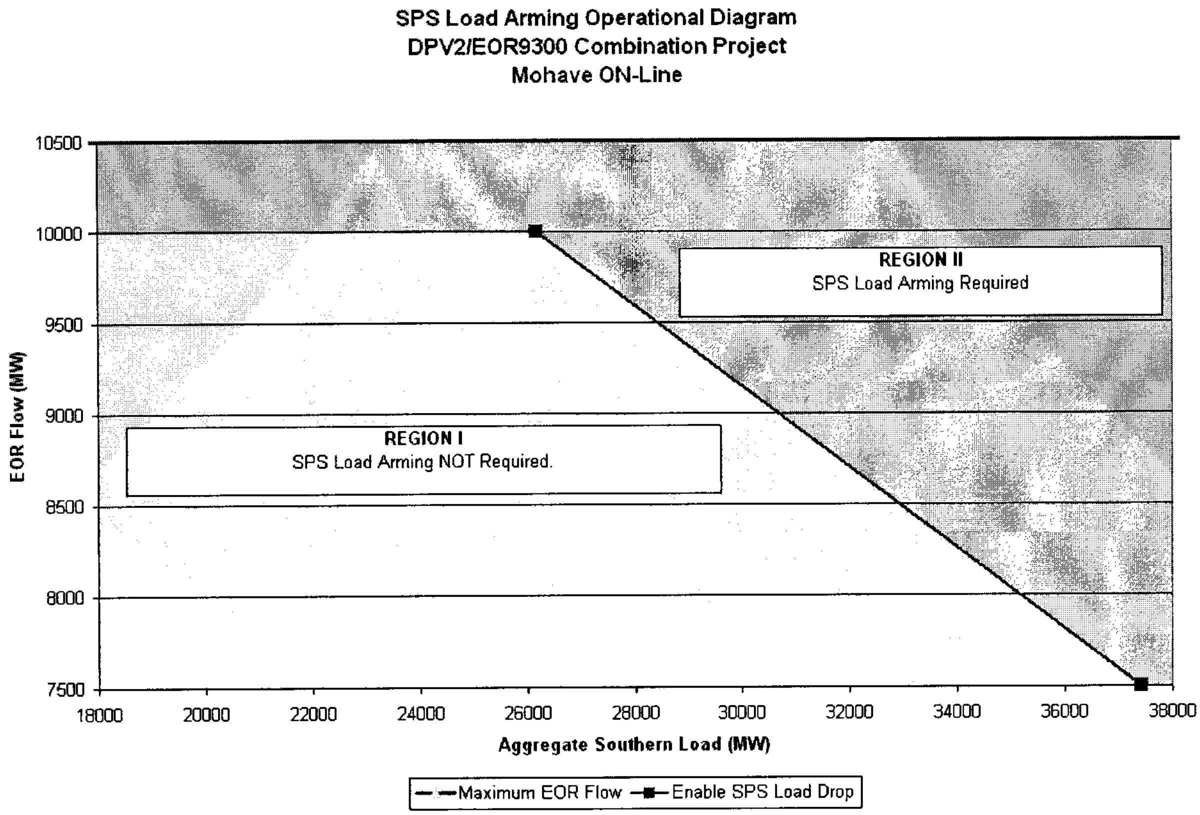
3.3.1. Mohave On-Line

With the DPV2/EOR9300 Combination Project modeled the WOR sensitivity results identified that the DPV12 SPS load arming requirement would be increased by 1,300 MW for EOR flow greater than 10,000 MW. This will ensure that the Perkins-Mead 500 kV and Hassayampa-N.Gila 500 kV lines will not exceed their emergency thermal rating for loss of the DPV12 lines. Therefore, the SPS load arming will be enabled for EOR flow greater than 10,000 MW regardless of aggregate southern load levels.

With an EOR flow of 10,000 MW, the loss of DPV12 lines with zero load dropping was simulated to determine the aggregate southern load ("ASL") level at which the post-transient voltage dip was within the 10%. Results determined that with an EOR flow of 10,000 MW, the post-transient voltage dip was observed at an ASL of 26,200 MW. This identifies the breakpoint in the operational diagram.

Region I in **Figure 8** identifies the operating region where no SPS load arming is required for loss of the DPV12 lines. Region II identifies the operating region where the SPS load must be armed. **Figure 8** is simply an illustration to view the regions of operation.

Figure 8. DPV2/EOR9300 Project: SPS Load arming – Mohave On-line.



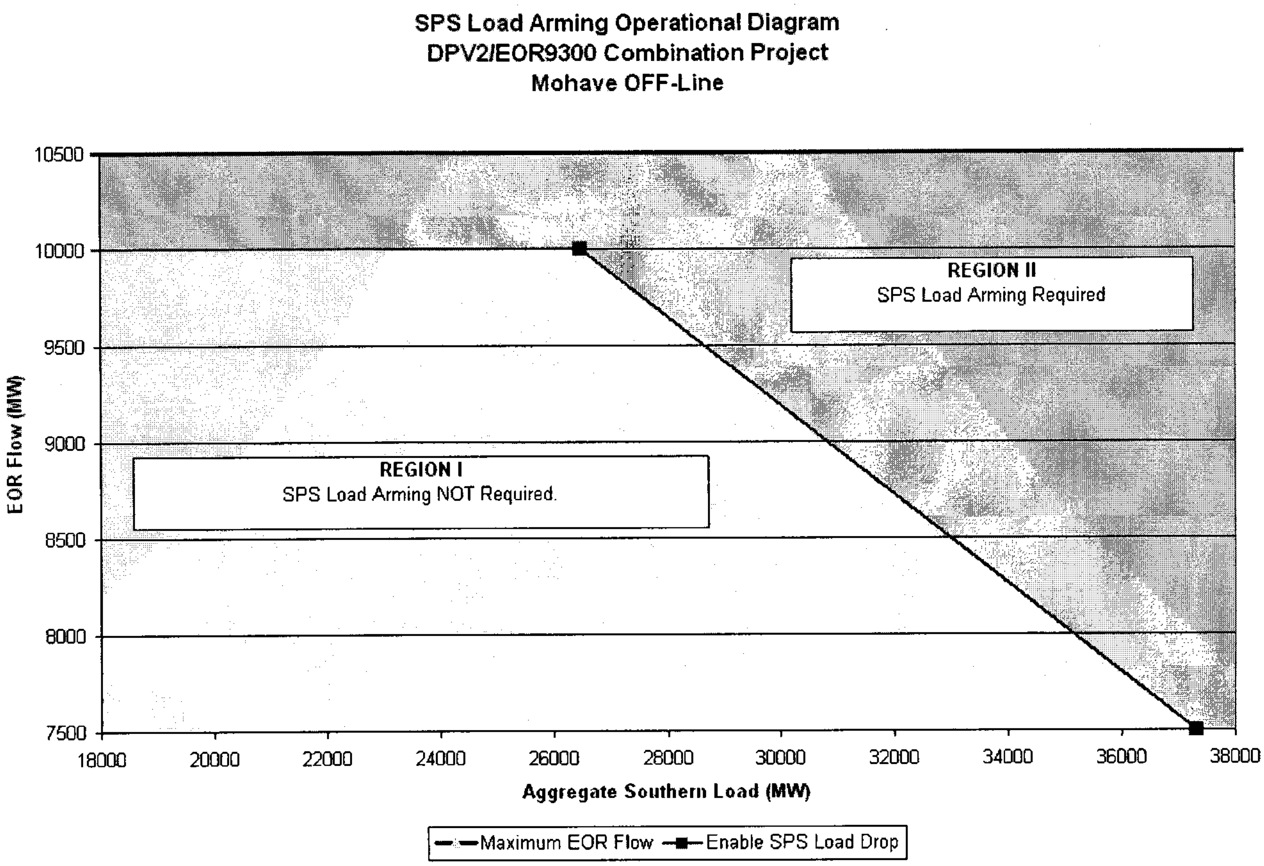
3.3.2. Mohave Off-Line

With the DPV2/EOR9300 Combination Project modeled the WOR sensitivity results identified that the DPV12 SPS load arming requirement would be increased by 1,600 MW for EOR flow greater than 10,000 MW. This will ensure that the Perkins-Mead 500 kV and Hassayampa-N.Gila 500 kV lines will not exceed their emergency thermal rating for loss of the DPV12 lines. Therefore, the SPS load arming will be enabled for EOR flow greater than 10,000 MW regardless of aggregate southern load levels.

With an EOR flow of 10,000 MW, the loss of DPV12 lines with zero load dropping was simulated to determine the aggregate southern load ("ASL") level at which the post-transient voltage dip was within the 10%. Results determined that with an EOR flow of 10,000 MW, the post-transient voltage dip was observed at an ASL of 26,500 MW. This identifies the breakpoint in the operational diagram.

Region I in **Figure 9** identifies the operating region where no SPS load arming is required for loss of the DPV12 lines. Region II identifies the operating region where the SPS load must be armed. **Figure 9** is simply an illustration to view the regions of operation.

Figure 9. DPV2/EOR9300 Project: SPS Load arming – Mohave Off-line.



3.4. Sensitivity Analysis

3.4.1. Southern California Load Sensitivity

Based on DPV12 Nomogram results, the SCE system load has an effect on the amount of SCE load arming required for loss of the DPV12 lines. Study results identified that differences in Southern California load other than SCE load also effect post-transient voltage dip results. In addition, since each Southern system load affects the DPV12 Nomogram, the aggregate Southern California load would yield a more accurate variable for monitoring system reliability. Therefore, all study results and Nomograms were developed with use of the Aggregate Southern Load ("ASL").

The CAISO EMS system currently has a data value that calculates load plus losses for the aggregate southern system, which is defined by the following areas:

7. Anaheim load;
8. LADWP load;
9. Pasadena load;
10. Riverside load;
11. SDG&E load;
12. SCE load; which also includes,
    a. CDWR pump load

b. MWD pump load

The study base cases have all of the above loads modeled; however, some of the system loads in the SCE system are incorporated into the SCE system load model (i.e., Anaheim, Pasadena and Riverside). In addition, the CDWR and MWD pump loads are modeled as negative generation. Therefore, the pump load will be summed to the aggregate southern system load. The aggregate southern system load will be calculated and used throughout all studies.

3.4.2. SCIT Sensitivity

The SCIT sensitivity analysis determined impacts from path flows that represent the SCIT flow for loss of the DPV12 lines. The DPV12 Nomogram effects were identified by increasing or decreasing path flow to the IPPDC, PDCI, Path 26, North of Lugo and WOR path flows by 250 MW. Two DPV12 Nomogram curves were selected for this sensitivity: 1) EOR flow of 10,500 MW and, 2) EOR flow of 10,000 MW.

Study results identified that negligible impacts were observed for changes in the PDCI, path 26 and North of Lugo flows; however, impacts were identified for the WOR and the IPPDC path flows. The IPPDC flow only impacted Nomogram data points when Mohave was off-line; however, the WOR flow impacted Nomogram data points for both Mohave on and off-line. An adjustment to each Nomogram curve was developed based on the sensitivity results. The adjustment shifts the Nomogram curve to the left or right depending on the determined adjustment factor.

3.4.2.1. Mohave On-line

3.4.2.1.1. Adjustments to Nomogram curves with an EOR flow > 10,000 MW

Nomogram data points with an EOR flow of 10,500 MW requires additional SPS load arming in order to mitigate thermal overloads to the Hassayampa-N.Gila 500 kV and Perkins-Mead 500 kV transmission lines depending on the level of WOR flow.

The low aggregate southern load case with an EOR flow of 10,500 MW required additional load arming in order to reduce power flow to the Perkins-Mead 500 kV line for loss of the DPV12 lines. By increasing the WOR flow by 250 MW, the required load drop requirement increased by 200 MW. By decreasing the WOR flow by 250 MW, the load drop requirement increased by 400 MW to mitigate the thermal overload to the Perkins-Mead 500 kV line. The increased load arming requirement can be attributed to the low effectiveness of SCE load drop in mitigating thermal overloads to the Perkins-Mead 500 kV line. SCE load dropping is more effective in mitigating post-transient voltage dips; therefore, the load arming requirements are lower. Results identified that the Perkins-Mead 500 kV line loading increased by 0.3% for every 100 MW WOR flow reduction and line loading decreased by 1.7% for every 100 MW EOR reduction of flow.

These results identify that with WOR flows less than the studied value of 11,300 MW, the Perkins-Mead 500 kV line could exceed its emergency thermal rating with high EOR flow. Conversely, lower EOR flows will unload the Perkins-Mead 500 kV line. A difference flow between the EOR and WOR flow was calculated with use of 2006 historical data. The standard deviation of the difference flow was calculated to determine an approximate confidence interval. The confidence interval is used to determine a reasonable flow difference between the EOR and WOR path flows. Finally, a general SPS load arming requirement can be obtained from this data and applied to the EOR 10,500 curve, which removes the complexity of adjustments during real-time operations.

A standard deviation of 543 MW was calculated with use of the 2006 historical data. In addition, since the data distribution is mound shaped, Chebyshev's Theorem states that approximately 95% of observations are within two (2) standard deviations. Therefore, 95% of WOR flow deviations relative to the EOR flow will be within 1,086 MW.

A test equation to determine thermal limits to the Perkins-Mead 500 kV line as a function of EOR and WOR flow was developed. Results in **Table 1** were computed with use of the test equation. It can be seen that the WOR flow level is beyond two standard deviations with an EOR flow of 10,000 MW. **Table 1** illustrates that with an EOR flow of 10,000 MW, the point at which an adjustment to the SPS would be required when WOR flows are less than 8,650 MW is more than two standard deviations. Therefore, lower EOR flow levels further increase the difference between the EOR and WOR flows at which load adjustments are required and the WOR adjustment should only apply to EOR flow levels greater than 10,000 MW.

Table 1. Calculated WOR flow Thresholds for discrete EOR flow levels.

EOR (MW)	Calculated WOR Thresholds (MW)	Difference (MW)
10,470	< 11,300	0
10,000	< 8,650	1,350
9,500	< 5,800	3,700

To simplify the DPV12 Nomogram during real-time operations, the load arming requirement for the curve with an EOR flow of 10,500 MW was increased by 1,300 MW for the minimum data point based on the amount of SPS load required to mitigate a flow difference of two standard deviations.

Results for the maximum data point indicate that WOR flow will not impact the Nomogram data point due to flows being lower than two standard deviations; hence, the maximum data point will remain unchanged.

3.4.2.1.2. Adjustments to Nomogram curves with an EOR flow < 10,000 MW

Sensitivity results of base cases with an EOR flow of 10,000 MW determined that only WOR flow had a significant impact to Nomogram data points with Mohave on-line. The load arming requirement is limited by the post-transient voltage dip at the RTP3ANZA 92 kV bus for all data points. Based on these results, the load arming requirement could be adjusted by 1.1 MW (547 MW load arming change/ 500 MW WOR flow change) for every WOR power flow decrease relative to the DPV12 Nomogram WOR flow value, which was 11,300 MW.

Based on the WOR sensitivity results with Mohave on-line, it is recommended that the following adjustments be applied:

- Adjust all Nomogram curves by a factor of 1.1 MW relative to the studied WOR flow of 11,300 MW, with exception of the EOR curve with a flow of 10,500 MW. For example, using the EOR curve of 10,000 MW, a WOR flow of 10,500 MW would result in a load arming adjustment of -880 MW ([10,500 - 11,300]*1.1). Therefore, all curves, with exception of the EOR 10,500 MW curve, would be shifted to the left by 880 MW.

These adjustments would either increase or decrease the load arming requirement based on the WOR power flow.

3.4.2.2. Mohave Off-line

3.4.2.2.1. IPPDC

Results identified that the IPPDC flow only affected Nomogram results with Mohave off-line. Furthermore, post-transient voltage dip results were increased at the Needles 69 kV bus. A sensitivity to determine IPPDC impacts to Nomogram data points was simulated through development of two base cases: 1) IPPDC flow was increased by 250 MW and 2) IPPDC flow was decreased by 250 MW. Results indicate that the IPPDC flow impacts the DPV12 SPS Nomogram data point results by a 3 to 1 ratio. This means that for a 3 MW IPPDC flow increase above the studied value of 1,400 MW, the DPV12 SPS load arming requirement should be increased by 1 MW. The adjustment is not as sizeable as the WOR flow increase; however, it should be included in the DPV2 SPS calculation.

3.4.2.2.2. Adjustments to Nomogram curves with an EOR flow > 10,000 MW

Nomogram data points with an EOR flow of 10,500 MW requires additional SPS load arming in order to mitigate thermal overloads to the Hassayampa-N.Gila 500 kV or Perkins-Mead 500 kV transmission lines depending on the level of WOR flow.

The low aggregate southern load case with an EOR flow of 10,500 MW and a WOR flow decrease of 250 MW allowed the aggregate southern load level for the Nomogram curve to increase by 235 MW. This indicates that for lower WOR flow levels, the post-transient voltage dip at the Eagle Mountain 161 kV bus decreases. However, with the reduction of WOR flow, the Perkins-Mead 500 kV line flow increases. Study results identified that for WOR flow less than 10,750 MW and an EOR flow of 10,500 MW, the Perkins-Mead 500 kV line flow would be at its emergency limit for loss of the DPV12 lines. Results identified that the Perkins-Mead 500 kV line loading increased by 0.3% for every 100 MW WOR flow reduction and line loading decreased by 1.7% for every 100 MW EOR reduction of flow.

Similar to the Mohave on-line analysis, a test equation to determine thermal limits to the Perkins-Mead 500 kV line as a function of EOR and WOR flow was developed. **Table 2** illustrates that with an EOR flow of 10,000 MW, the point at which an adjustment to the SPS would be required when WOR flows are less than 7,900 MW is more than two standard deviations. Therefore, lower EOR flow levels further increase the difference between the EOR and WOR flows at which load adjustments are required and the WOR adjustment should only apply to EOR flow levels greater than 10,000 MW.

Table 2. Calculated WOR flow Thresholds for discrete EOR flow levels.

EOR (MW)	Calculated WOR Thresholds (MW)	Difference (MW)
10,500	< 10,750	0
10,000	< 7,900	2,100
9,500	< 5,100	4,400

For WOR flow greater than 11,000 MW, the Hassayampa – N.Gila 500 kV line becomes thermally overloaded for loss of the DPV12 lines. The reduction of aggregate southern load does not mitigate the thermally overloaded element; hence, additional SPS load arming is required. The thermally overloaded element is only observed with EOR flows of 10,500 MW. As EOR flow is reduced, the thermal overload recedes by 0.5% per 100 MW EOR flow reduction. Thermal overloads to the Perkins-Mead 500 kV line will be mitigated by the increased load arming.

To simplify the DPV12 Nomogram during real-time operations, the load arming requirement for the curve with an EOR flow of 10,500 MW was increased by 1,600 MW for the minimum data point based on the amount of SPS load required to mitigate a flow difference of two standard deviations.

Results for the maximum data point indicate that WOR flow will not impact the Nomogram data point due to flows being lower than two standard deviations; hence, the maximum data point will remain unchanged.

3.4.2.2.3. Adjustments to Nomogram curves with an EOR flow < 10,000 MW

Sensitivity results of base cases with an EOR flow of 10,000 MW determined that both WOR and IPPDC flow impacts the DPV12 SPS Nomogram data points with Mohave on-line. The load arming requirement is limited by the post-transient voltage dip at the RTP3ANZA 92 kV bus for all data points. Based on these results, the load arming requirement could be adjusted by 1.1 MW (583 MW load arming change/ 500 MW WOR flow change) for every WOR power flow decrease relative to the DPV12 Nomogram WOR flow value, which was 11,000 MW.

Based on the WOR sensitivity results with Mohave off-line, it is recommended that the following adjustments be applied:

- Adjust all Nomogram curves by a factor of 1.1 MW relative to the studied WOR flow of 11,000 MW, with exception of the EOR curve with a flow of 10,500 MW. For example, using the EOR curve of 10,000 MW, a WOR flow of 10,500 MW would result in a load arming adjustment of -550 MW ([10,500 - 11,000]*1.1). Therefore, all curves, with exception of the EOR 10,500 MW curve, would be shifted to the left by 550 MW.

These adjustments would either increase or decrease the load arming requirement based on the WOR power flow.

3.4.3. MWD Pump Load Sensitivity

The MWD Pump sensitivity analyzed impacts to the DPV12 Nomogram(s) with lower MWD pump load levels. In determining the DPV12 Nomogram data points, all base cases modeled an eight (8) pump flow level. For the MWD sensitivity, the DPV12 Nomogram curve with an EOR flow of 10,000 MW was analyzed with pump flow levels of two, four, six and all pumps off-line. Rarely will all MWD pumps be off-line; however, MWD has stated that this operating condition is in the realm of possibilities. Consistent with all studies, the MWD pump sensitivity was studied with both Mohave on and off-line.

Study results identified that the reduction of MWD pump load made no difference in the net results with Mohave on or off-line. The minimum point increases were consistent whether Mohave was on or off-line. And, the maximum data points did not have additional load arming requirements. Therefore, the following observations are the same regardless of the Mohave generation status.

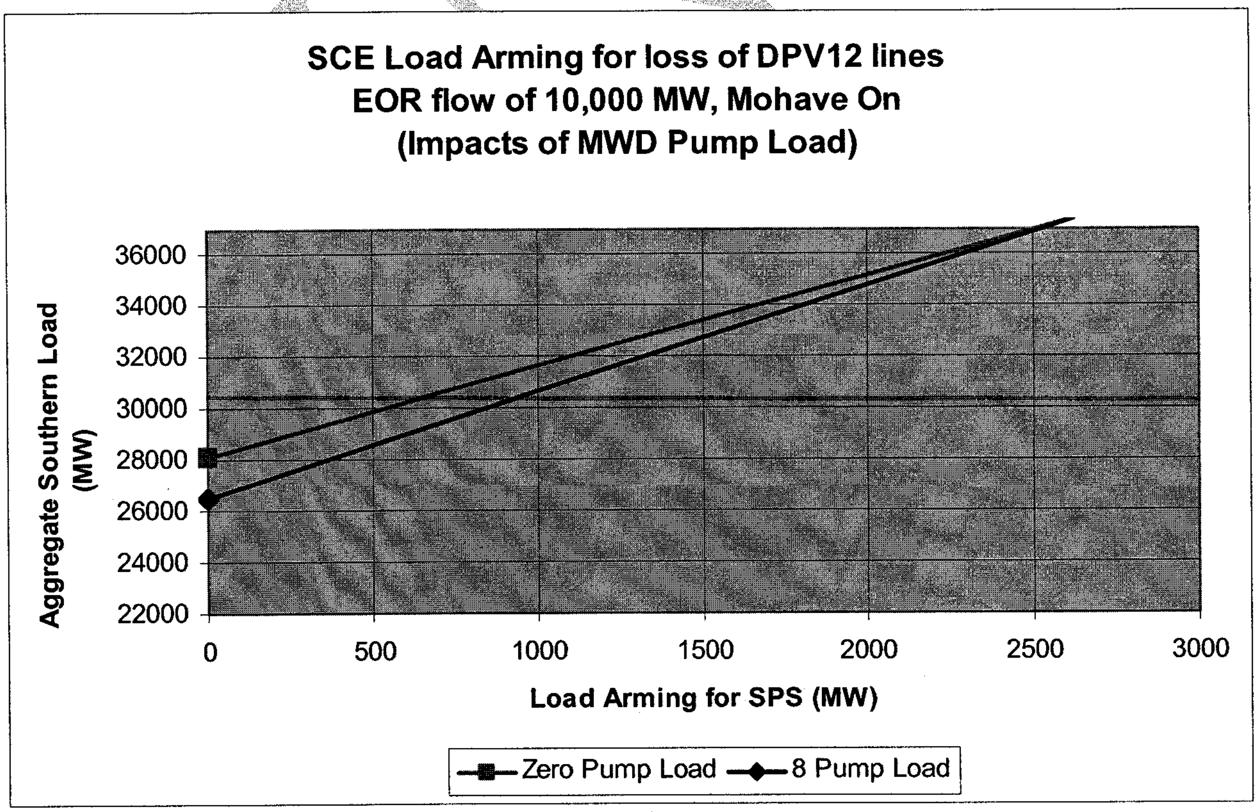
Only minimum Nomogram data points were impacted by the reduction of MWD pump flow levels. Study results are tabulated in **Appendix B**. The reduction of MWD pump load resulted in systematic increases to the aggregate southern load level for the minimum data points. Therefore, the data point is shifted upward in the Nomogram and the point at which the SPS arms load is increased by a 6 to 1 ratio. For example, a MWD pump load decrease of 70 MW increased the enable point at which the SPS load arming is required by 430 MW. Results identified that lower MWD pump load results in lower power flow on the Blythe-Eagle Mountain 161 kV line. Therefore, the aggregate southern load level can be increased.

The maximum data point load arming requirements did not change; however, 161 kV voltage levels surrounding the Eagle Mountain 161 kV bus did change as the MWD pump load levels decreased. As the MWD pump load decreased, voltage levels at the Julian Hinds 230 kV bus increased, in effect, disabling the MWD SPS scheme 1 ("Mirage Overpower and Undervoltage J. Hinds") of opening the Julian Hinds – Mirage 230 kV line. For MWD pump flow less than six (6), the MWD SPS did not operate due to post-contingency voltage levels that exceeded the 206 kV level at the Julian Hinds 230 kV bus. Therefore, the Blythe SPS acts as an important safeguard in mitigating thermal overloads to the 161 kV system for loss of the DPV12 lines.

It is believed that exposure to the Blythe SPS would be reduced; since, the Blythe SPS now requires loss of the DPV12 lines to trigger the Blythe SPS instead of just a loss of the DPV1 line. Furthermore, an N-2 contingency typically has a smaller chance of occurring; hence, a reduced exposure to the Blythe SPS.

Based on the MWD sensitivity results, the minimum data points for each Nomogram curve can be increased by 200 MW for each MWD pump flow decrement from the benchmark case. However, the maximum data point would remain unchanged. Increasing only the minimum data point would result in the slope of the line to change. From an operational standpoint, this may add more complexity than is required. For example, with zero MWD pump load results, the minimum data point would increase by 1,400 MW – 6% of the aggregate southern load. **Figure 10** graphs the Nomogram curve with maximum MWD pump load (8 pump flow) and with all MWD pump load off-line. By not changing the curves based on MWD pump load, it can be seen that lower aggregate southern load levels would have additional exposure to load arming. However, as the aggregate southern load increases, the realized exposure is reduced. Furthermore, ignoring the aggregate southern load increase as a result of decreased MWD pump load for the SPS would result in a more conservative SPS load arming requirement.

Figure 10. DPV2/EOR9300 Project: MWD Pump Sensitivity – Mohave On-line.



3.4.4. Palo Verde Hub Reactive Margin Sensitivity

The Palo Verde Hub Reactive Margin sensitivity is a test of the simultaneous Palo Verde Transmission System ("PVTS") operating limit for heavy summer conditions. Transient stability results determined that the prescribed DPV12 SPS load drop requirements are adequate in maintaining system stability during adverse conditions in the PVTS system. Nomogram base cases were analyzed by modeling a reactive power consumption of 800 MVAr from the Palo Verde cut-plane, which includes the sum of reactive power for each transmission line surrounding the Palo Verde and Hassayampa 500 kV Substations. In addition, a voltage of 530 kV at the Palo Verde 500 kV Substation was modeled. Sensitivities for EOR flows of 9,000 MW, 10,000 MW and 10,500 MW were analyzed for both Mohave on and off-line conditions.

The maximum data point base case for the specified EOR flows were modified to achieve the reactive VAR consumption of 800 MVAr. The Palo Verde Hub Reactive Margin sensitivity cases were modeled in accordance with the "2005 Heavy Summer Palo Verde Transmission System Operating Study Report". Generation dispatch of the Palo Verde nuclear units and the combined-cycle units of the PVTS Interconnectors were revised to match the 2005 Operating Study. More specifically, the PVTS generation includes three Palo Verde units generating 4,227 MW and the net PVTS Interconnector generation of 6,038 MW, which includes one Arlington unit (600 MW), two Red Hawk units (1,000 MW), two Mesquite units (1,278 MW), three Harquahala units (1,080 MW) and four Gila River units (2,080 MW).

In order to make the Palo Verde/Hassayampa 500 kV common bus buck, several 500/230 kV variable transformer tap settings in the AZ system were changed. In addition, generator voltage schedules were increased, which resulted in the PV/Hassayampa 500 kV common bus to buck. **Table 3** tabulates the reactive power for each base case studied. System voltage levels surrounding the PV/Hassayampa 500 kV common bus were high with a reactive power consumption of 800 MVAr.

Table 3. Reactive Power Flow of the Palo Verde/Hassayampa 500 kV common bus.

Base Case	Reactive Power Prior to Adjustments (MVAr)	Reactive Power After Adjustments (MVAr)
2141HS-9000-rev6.sav	+284	-800
2141HS-10000-rev6.sav	+657	-800
2141HS-10500-rev6.sav	+835	-800
5041HS-9000-rev6.sav	+185	-800
5041HS-10000-rev6.sav	+526	-800
5041HS-10500-rev6.sav	+804	-800

There were no emergency overloads or excessive voltage deviation problems for the following contingencies:

1. Devers – Palo Verde 500 kV line outage
2. Hassayampa – N.Gila 500 kV line outage
3. Devers – Palo Verde 500 kV and Devers – Harquahala Jct 500 kV double line outage with prescribed load drop requirement.

No transmission lines emanating from the PV/Hassayampa 500 kV common bus triggered thermal loading greater than 95%.

There were no transient stability criteria violations by modeling the PVHub with 800 MVAr reactive power consumption when load drop requirements were modeled. Transient stability plots were damped for modeled three phase faults.

Based on these results, loss of the DPV12 lines is not impacted by modeling 800 MVAr of reactive power consumption at the PVHub. In addition, transient stability voltage deviations are reduced with the reactive power consumption modeling.

3.5. Path 61 Nomogram Development

The DPV12 SPS Conceptual Nomogram Planning Study identified that a subset of EOR-WOR transmission lines would be used for the Path 61 Nomogram. The EOR-WOR subset of lines is as follows:

1. Devers - Palo Verde 500 kV line.
2. Devers - Harquahala 500 kV line.
3. El Dorado - Lugo 500 kV line.
4. Lugo - Mohave 500 kV line.
5. Hassayampa - North Gila 500 kV line.

To determine the maximum EOR-WOR subset, the base case used to develop the DPV12 Nomogram data points with an EOR flow of 10,500 MW was used as the starting point. The WOR flow was increased to its maximum flow level of 11,823 MW.

The Path 61 Nomograms were developed based on the following contingencies:

1. Loss of DPV12 lines.
2. El Dorado-Lugo 500 kV line.
3. Mohave-Lugo 500 kV line.

For loss of the DPV12 lines, load arming requirements from the DPV12 Nomogram were used based on the EOR flow. In addition, adjustments for the WOR flow deviations were utilized as well. However, only data points with high EOR-WOR subset flows had DPV12 SPS load arming requirements.

The Path 61 Nomogram is separated into three regions. Region I identifies the region where no load arming is required. Region II identifies the operating region where the SPS load arming must be armed. To simplify the Nomogram, the load arming requirement in Region II will be either 1,700 MW with Mohave on-line or 2,000 MW with Mohave off-line. Load arming requirements were determined based on the cases with maximum EOR-WOR subset flow. Finally, Region III identifies the region of no operation. Operating in this region would result in thermally overloading the Lugo-Victorville 500 kV line.

To ensure adequate SPS load arming, the higher load arming requirement between the Path 61 Nomogram and DPV12 SPS Nomogram will be used. For example, assuming that the system has an EOR flow of 6,000 MW and a Path 61 flow of 2,300 MW, both Nomograms would yield different load arming requirements. The Path 61 Nomogram would have a load arming requirement of 1,700 MW (or 2,000 MW with Mohave off-line) and the DPV12 Nomogram would have a load arming requirement of zero (0) MW. Therefore, the SPS will be armed with the 1,700 MW requirement identified by the Path 61 Nomogram.

Development of the Path 61 Nomogram was identified by five (5) Nomogram data points. For ease of discussion, each Nomogram data point will be referred to by a number, which is listed in the Nomogram. For example, the data point with maximum EOR-WOR subset flow and a Path 61 flow of 1,730 MW has a one (1) next to it in **Figure 11**. Results for each data point are discussed in the following sections.

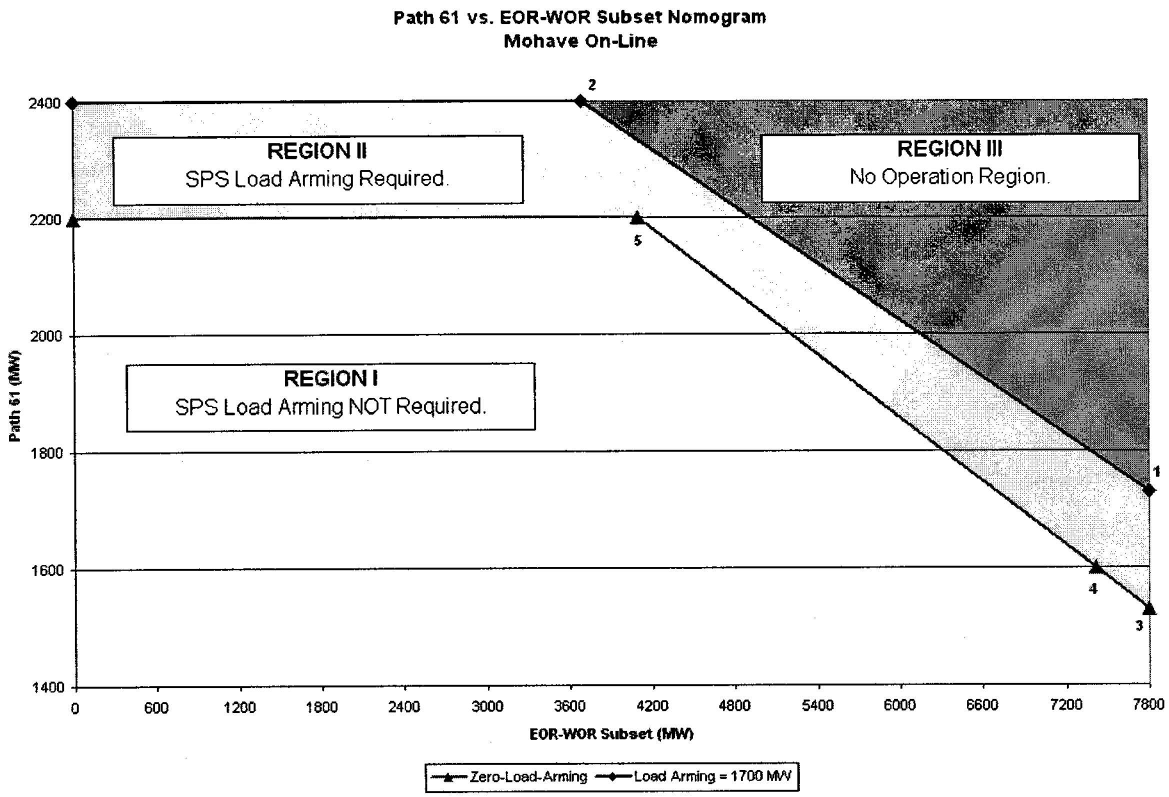
3.5.1. Mohave On-Line

The SPS load arming requirement for data points 1 and 3 were determined based on the DPV12 Nomogram. The SPS load arming requirement mitigates a thermal overload to the Hassayampa-N.Gila 500 kV line. The Path 61 flow was increased until the Lugo-Victorville 500 kV line was at its maximum emergency rating for loss of the DPV12 lines.

Data point 2 was developed by increasing Path 61 flow to its maximum level of 2,400 MW. In addition, the EOR-WOR subset flow was decreased to a point where Path 61 was at its maximum flow level for loss of the DPV12 lines with 1,700 MW of load arming. It was observed that the Mohave-Lugo 500 kV single line contingency was more restrictive for this data point. Therefore, the EOR-WOR subset flow was reduced until Path 61 was at its maximum flow level. This curve is the border between Region II and III. Next, the region with zero load arming requirements was developed.

Path 61 flow for data point 2 was reduced to 2,200 MW in order to develop data point 5. Loss of the DPV12 lines with zero SPS load arming was simulated. Since the modeled case has very low EOR flow, the DPV12 Nomogram would also have a zero SPS load arming requirement. This curve is the border between Region I and II.

Figure 11. Path 61 vs. EOR-WOR Subset Nomogram – Mohave On-line.



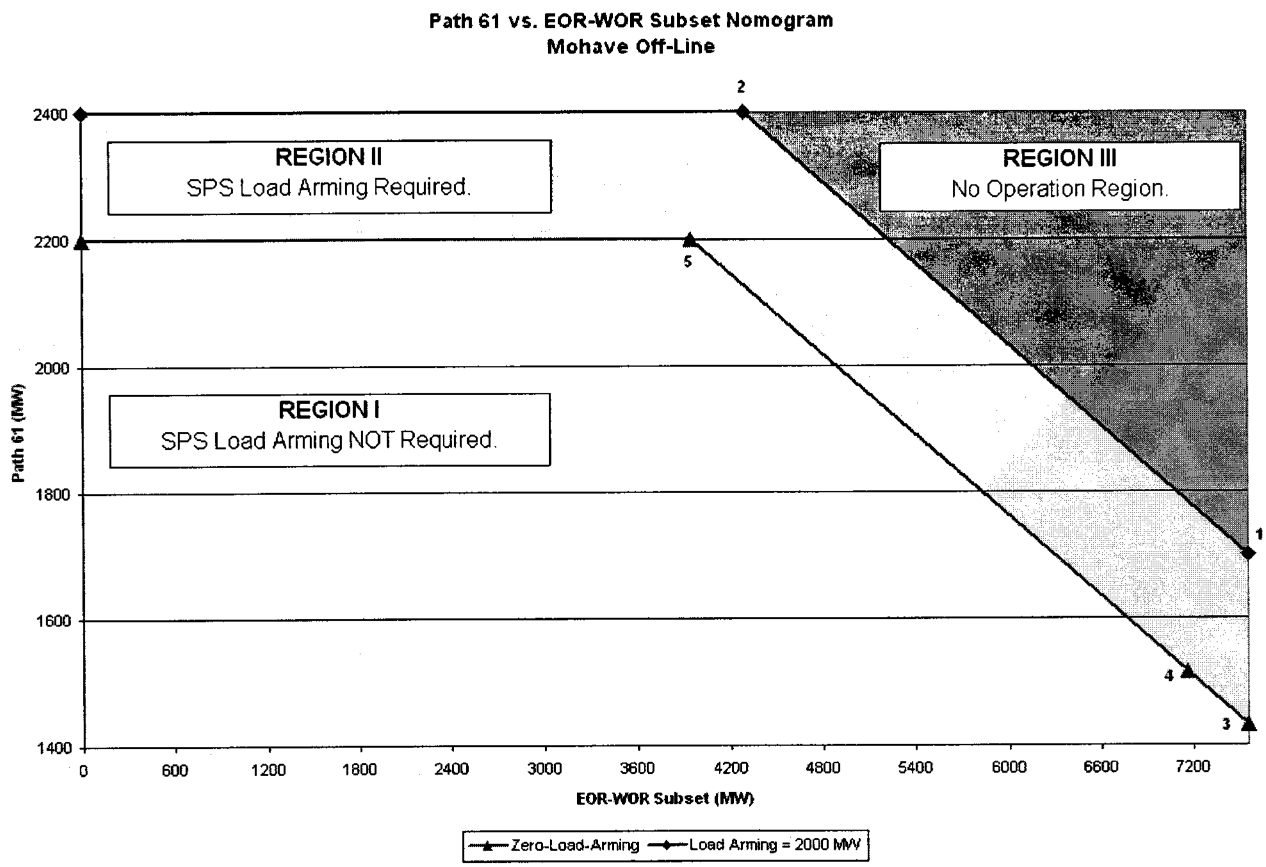
The line segment between data points 3 and 4 indicates that the DPV12 SPS load arming requirement would have load armed in this region of the Nomogram as a result of high EOR and WOR flow levels. Therefore, the Path 61 Nomogram would have SPS load arming requirements as a result of the DPV12 Nomogram to mitigate thermal overloads to the Hassayampa-N.Gila 500 kV line. Data point 3 is an extension of the zero load requirement line. DPV12 SPS load arming would be enabled between data points 3 and 4.

3.5.2. Mohave Off-Line

The SPS load arming requirement for data points 1 and 3 were determined based on the DPV12 Nomogram. The SPS load arming requirement mitigates a thermal overload to the Hassayampa-N.Gila 500 kV line. The Path 61 flow was increased until the Lugo-Victorville 500 kV line was at its maximum emergency rating for loss of the DPV12 lines.

Data point 2 was developed by increasing Path 61 flow to its maximum level of 2,400 MW. In addition, the EOR-WOR subset flow was decreased to a point where Path 61 was at its maximum flow level for loss of the DPV12 lines with 1,700 MW of load arming. The Mohave-Lugo 500 kV single line contingency was not as restrictive for this data point with Mohave off-line. Loss of the DPV12 lines restricted this data point. This curve is the border between Region II and III. Next, the region with zero load arming requirements was developed.

Figure 12. Path 61 vs. EOR-WOR Subset Nomogram – Mohave Off-line.



Path 61 flow for data point 2 was reduced to 2,200 MW in order to develop data point 5. Loss of the DPV12 lines with zero SPS load arming was simulated. Since the modeled case has very low EOR flow, the DPV12 Nomogram would also have a zero SPS load arming requirement. This curve is the border between Region I and II.

The line segment between data points 3 and 4 indicates that the DPV12 SPS load arming requirement would have load armed in this region of the Nomogram as a result of high EOR and WOR flow levels. Therefore, the Path 61 Nomogram would have SPS load arming requirements as a result of the DPV12 Nomogram to mitigate thermal overloads to the Hassayampa-N.Gila 500 kV line. Data point 3 is an extension of the zero load requirement line. DPV12 SPS load arming would be enabled between data points 3 and 4.

3.6. Conclusions

The DPV2/EOR9300 Combination Project can achieve a 1,200 MW rating increase to WECC Path 49 ("EOR"), Path 46 ("WOR") and the Southern California Import Transmission ("SCIT") paths. However, the developed DPV12 SPS Nomograms will be required to ensure system reliability.

Presently, there are a number of transmission projects being proposed and studied in and around the WATS system that may be beneficial in reducing the DPV12 SPS load arming requirements. Therefore, as the DPV2 project gets closer to its in-service date, the DPV12 SPS Arming Study will need to be restudied with the most current transmission system modeled. In addition, it is believed that all Nomograms will need to be revised annually to account for system changes.

To account for differences between real-time system conditions and the transmission base case modeling, the studied DPV12 SPS load arming requirement should include a margin of error by increasing the load requirement for each Nomogram data point. Sources of error may be attributed to modeling and operational differences. For example, operational differences include effects of flow distribution, voltage schedule differences due to generation output and capacitor switching. A margin of error of approximately 50 MW should be sufficient in accounting for these differences.

The developed DPV12 SPS arming scheme has been fully explored and will ensure that no adverse system conditions result from loss of the DPV12 lines.

4. ADDENDUM

4.1. **ADDENDUM I** – **DPV2-DPV12_SPS-Arming-Report**

4.2. **ADDENDUM II** – **DPV2_EOR9300 Project-DPV12_SPS-Arming-Report**