



“EAST OF THE RIVER” (EOR)  
PATH 49 RATING UPGRADE

*2005 – 2006*

***Series Capacitor Upgrade Proposal***

Presentation to STEP on May 8, 2003  
Kishore Patel



# INTRODUCTION

- ◆ Objectives
- ◆ History, Key Assumptions, Acknowledgements
- ◆ Team Members & Contributors
- ◆ Original Objective
- ◆ Generator Scheduled, Path Summary and List of Upgrades
- ◆ WECC Peer Review Group Objectives
- ◆ Request to WECC Members
- ◆ Comments Received To Date from following WECC Members
- ◆ Closing Remarks



# History, Key Assumptions, Acknowledgement

- ◆ **Started the project study development, June 2001**
- ◆ **Study plan review by WATS, Oct. to Dec. 2001**
- ◆ **Joint study plan finalized, Dec. 2001 to March 2002**
- ◆ **Developed base cases, Jan. 2002 to May 2002 (29 versions).**
- ◆ **Started the study work ~June 2002**
- ◆ **Draft Study Report to WATS - Oct 2002**
- ◆ **WATS Presentations, Oct. 31, 2002 and Feb 12, 2003**
- ◆ **Report Issued on March 7, 2003**
- ◆ **Request for WECC Path 49 Expedited Process - March 28, 2003**
- ◆ **Request for Regional Planning input - May 7, 2003**
- ◆ **WECC First Peer Review Group Meeting - May 16, 2003**



# Team Members and Contributors

- ◆ SER - Leslie Padilla / Dick Palmer
- ◆ SCE - Ying He / Dana Cabbell
- ◆ SDG&E - Kishore Patel / Dave Korinek
- ◆ ABB - Bill Quaintance / Willie Wong
- ◆ NPC - Rahn Sornesen
- ◆ LADWP - John Hu
- ◆ SRP - James Hsu/Brian Keel
- ◆ WAPA - Nick Saber
- ◆ CAISO - Nam Nguyen / Chuck Yan Wu
- ◆ IID - David Barajas / Jorge Barrientos
- ◆ APS - Peter Kzykos / Rex Stulting / Tom Isham



# Original Objective

Determine how much the East-Of-River Path (EOR, Path 49) can be uprated if:

- Increase thermal ratings of Hassayampa – North Gila – Imperial Valley 500 kV series capacitors
  - from (1400/1890 and 1400/2000) to 1800/2400 amps
- Increase thermal ratings of Palo Verde – Devers 500 kV series capacitors
  - from 1900/2430 to 2300/3000 amps



# Modeled Gen Schedule Shift of 850 MW from AZ to CA

- Arizona: increase 850 MW at Red Hawk
- SCE: decrease 467 MW at Alamitos and Redondo
- LADWP: decrease 255 MW at Castaic
- SDGE: decrease 128 MW at South Bay

**Table 5. Generation that changed (MW)**

BUS	NAME	KV	ID	AR	Base	+850	DIFF
14970	RED-CT1	18	1	14	0	162	162
14971	RED-CT2	18	1	14	0	162	162
14972	RED-ST1	18	1	14	0	200	200
14973	RED-CT3	18	1	14	0	163	163
14974	RED-CT4	18	1	14	0	163	163
15903	AGU AFR 3	18	1	14	100	114	14
				14 Total			854
19023	HOOVER A3	16.5	1	19	57	54	-3
				19 Total			-3
21030	ELSTM 4	13.8	1	21	78	86	8
				21 Total			8
22784	SOUTH BY2	15	1	22	110	0	-110
22788	SOUTH BY3	20	1	22	77	65	-12
22792	SOUTH BY4	20	1	22	192	196	4
				22 Total			-118
24003	ALAMT3 G	18	3	24	200	0	-200
24004	ALAMT4 G	18	4	24	145	177	32
24121	REDON5 G	18	5	24	150	0	-150
24122	REDON6 G	18	6	24	150	108	-42
24715	ALTA 2G	13.8	2	24	81	0	-81
				24 Total			-441
26004	CASTAI1G	18	1	26	3	-106	-109
26005	CASTAI2G	18	1	26	15	-100	-115
				26 Total			-224
				Grand Total			86

□

# Path Summary (Metered flows)

- NUM-	-----NAME-----	7550	+760	Diff
26	NORTHERN - SOUTHERN CALIFORNIA	-578	-510	68
27	IPP DC LINE	1,802	1,802	0
46	WEST OF COLORADO RIVER (WOR)	8826	9565	739
49	EAST OF COLORADO RIVER (EOR)	7,550	8,310	760
65	PACIFIC DC INTERTIE (PDCI)	703	703	0
66	California-Oregon Interface (COI)	2,911	2,966	55
81	North of Lugo	1,608	1,549	-59
99	Southern California Import (SCIT)	12,207	13,075	868

**Table 6. Line Flows – East of Colorado River (EOR) – Path 49**

FROM	FR	BKV	TO	TO	BKV	CK	lface	pfac	Base	+850	Diff
14003	NAVAJO	500	26123	CRYSTAL	500	1	49	1	1440	1580	140
15021	PALOVRDE	500	24801	DEVERS	500	1	49	1	1662	1879	217
15034	PERKINS	500	19038	MEAD	500	1	49	1	1295	1294	-1
15090	HASSYAMP	500	22536	N.GILA	500	1	49	1	1248	1506	258
19053	LIBERTY	345	19315	PEACOCK	345	1	49	1	493	495	2
24042	ELDORADO	500	14002	MOENKOPI	500	1	49	-1	1412	1555	143
	<b>Total</b>								7550	8310	760

**Table 7. Line Flows – West of Colorado River (WOR) – Path 46**


FROM	FR	BKV	TO	TO	BKV	CK	lface	pfac	Base	+850	Diff
22356	IMPRLVLY	230	21025	ELCENTRO	230	1	46	-1	-42	-153	-111
22536	N.GILA	500	22360	IMPRLVLY	500	1	46	1	1220	1484	264
24041	ELDORADO	230	24219	PISGAH	230	2	46	1	73	82	9
24041	ELDORADO	230	24627	CIMA	230	1	46	1	74	83	9
24042	ELDORADO	500	24086	LUGO	500	1	46	1	1091	1154	63
24097	MOHAVE	500	24086	LUGO	500	1	46	1	941	988	47
24801	DEVERS	500	15021	PALOVRDE	500	1	46	-1	1603	1800	197
24804	DEVERS	230	21007	COACHELV	230	1	46	-1	172	193	21
24806	MIRAGE	230	21076	MIRIID	230	1	46	-1	155	187	32
24806	MIRAGE	230	25406	J.HINDS	230	1	46	-1	117	118	1
26044	MARKETPL	500	26003	ADELANTO	500	1	46	1	1109	1178	69
26048	MCCULLGH	500	26105	VICTORVL	500	1	46	1	1063	1127	64
26048	MCCULLGH	500	26105	VICTORVL	500	2	46	1	1053	1117	64
26104	VICTORVL	287	26051	MEAD	287	1	46	-1	197	207	10
	<b>Total</b>								8826	9565	739

# Total List of Upgrades for 760 MW Path Rating Increase

- Upgrade Palo Verde - Devers 500kV series capacitor thermal ratings from 1900/2430 amps to 2300/3000 amps normal/emergency
- Upgrade Hassayampa - North Gila 500kV & North Gila - Imperial Valley 500kV series capacitor thermal ratings from 1400/1890 amps to 1800/2400 amps normal/emergency.
- Upgrade Navajo - Crystal 500kV series capacitor thermal ratings to 1899/2749 amps normal/emergency.
- Add Devers 500/230kV transformer #2 (1120 MVA)
- Add a 300 MVA phase-shifting transformer in series with the Imperial Valley - El Centro 230kV line (or another suitable solution).
- Add static/dynamic VAR support at Devers & Valley (SCE) & Ave 58 (IID) or another suitable solution



# WECC PEER REVIEW GROUP OBJECTIVES



Perform path rating technical studies to determine the transfer capability increase on Path 49, in the East to West direction, to be achieved by upgrading the series capacitors on the Palo Verde-Devers 500 kV line and on Palo Verde/Hassayampa – N. Gila and N. Gila – Imperial Valley 500 kV lines and Navajo-Crystal – McCullgh 500 kV lines. The technical studies will include power flow, transient stability and voltage stability analysis as determined to be appropriate by the WECC Review Group

In addition to completing the WECC reporting requirements for Phase 3 accepted rating status, it is intended that this study report will also address all path rating requirements of the Western Arizona Transmission System (WATS) Task Force regarding transmission ratings for the ANPP, Mead - Phoenix and Navajo System projects.



# Request to WECC Members

- ◆ **Any potential parallel (concurrent) transmission projects in the proximity of the EOR System**
- ◆ **Any feasible alternatives/competing projects**
- ◆ **Any proposed changes to the project plan or service as described in objectives**
- ◆ **Blank Form for Regional Planning Feedback is available**
- ◆ **Please reply by May 21, 2003**



# Comments Received To Date from following WECC Members

- ◆ APS – **Barrie Kokanos**
- ◆ CAISO – **Meng Shen**
- ◆ SRP - **James Hsu**
- ◆ NVP- **Rahn Sorensen**
- ◆ LADWP- **Tim Wu**
- ◆ SCE - **Dana Cabbell**
- ◆ WAPA - **Milt Percival**
- ◆ USBR - **Ron Connelly**

**LOOKING FORWARD TO YOUR COMMENTS**

**THANKS.....THANKS.....THANKS.....THANKS**



# Closing Remarks

- Next step(s)
- Send comments to:

**Kishore Patel P.E.**

San Diego Gas & Electric

8316 Century Park Court, CP-52A

San Diego, CA 92123-1582

Phone: (858) 654-8231

e-mail: [kpatel@semprautilities.com](mailto:kpatel@semprautilities.com)