

EOR 9000+ UPGRADE PROJECT

STEP MEETING

February 9, 2005

San Diego, California

James Hsu, Salt River Project



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ACHIEVING INCREASE IN TRANSFER CAPABILITY

1. Non-Simultaneous EOR Transfer Study

- A. Without Mohave Generation
- B. With Mohave Generation
- C. Combined with the DPV#2 Project (1,200 MW)

2. Simultaneous SCIT/EOR Impact Study

- A. Without Mohave Generation
- B. With Mohave Generation
- C. With the WOR/SCIT Increase of 645 MW vs. 1,245 MW
- D. Palo Verde 500 kV Switchyard Operating Voltage



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Part 1: Non-Simultaneous EOR Transfer Study

Preliminary Results:

- **Pre-Project Benchmark with EOR at 8,055 MW**
 - a. The Perkins – Mead series capacitors were limited by a PV-Devers line outage.
 - b. No stability limits or voltage violations were found (with plan of service modeled).

- **Post–Project with EOR at 9,300 MW**
 - a. Perkins phase shifters by-pass
 - b. Mead-Perkins series capacitors thermal capacity increase

	<u>Existing</u>	<u>Upgrade</u>
Continuous	1430A	2200A
Emergency	1930A	2970A



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c. Navajo – Crystal line series capacitors thermal capacity increase

	<u>Existing</u>	<u>Upgrade</u>
Continuous	1630A	2087A

d. Power flow limiting condition

The Moenkopi-El Dorado line series capacitors were reached 99.9% of the emergency rating (2750 A) for a Navajo-Crystal line outage.

e. No impact with the Mohave generation put back in-service.

f. No stability limits or voltage violations were discovered.



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- **Combined with DPV#2 Project and EOR at 10,500 MW**
 - a. **No significant impact with the addition of DPV#2 (1,200 MW) Project.**
 - b. **The power flow distributions and limiting conditions were about the same.**
 - c. **No stability limits or voltage dip violations were found.**

Preliminary Observations:

- **The non-simultaneous EOR path rating can be increased by 1,245 MW with the thermal upgrade of the Perkins-Mead and Navajo-Crystal lines series capacitors along with the by-pass of the two Perkins phase shifters.**
- **The DPV #2 Project (1,200 MW) will not have a significant impact on the EOR 9000+ Upgrade Project.**



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Part 2: Simultaneous SCIT/EOR Impact Study

- Pre-Project, Benchmark with EOR = 8,055 MW

- The shunt capacitors of 300 Mvars at the two Valley SCE 500 kV buses and SVC of 400 Mvars at the Devers 500 kV bus were modeled in the pre-project system.
- The Palo Verde switchyard operating voltage was controlled @ 530 kV.

(A) Mohave Off

S. California Inertia = 80,208 MW-Sec

WOR

9,133 MW

SCIT

15,111 MW

(B) Mohave On

S. California Inertia = 77,795 MW-Sec

9,719 MW

15,132 MW

Preliminary Results:

- a. The Eagle Mountain 230 kV bus was at the post-transient voltage limit for an outage of the Palo Verde–Devers 500 kV line.
- b. No transient voltage dip limits were detected for any single critical outages.



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- Post-Project, With EOR = 9,300 MW (EOR=+1,245 MW)

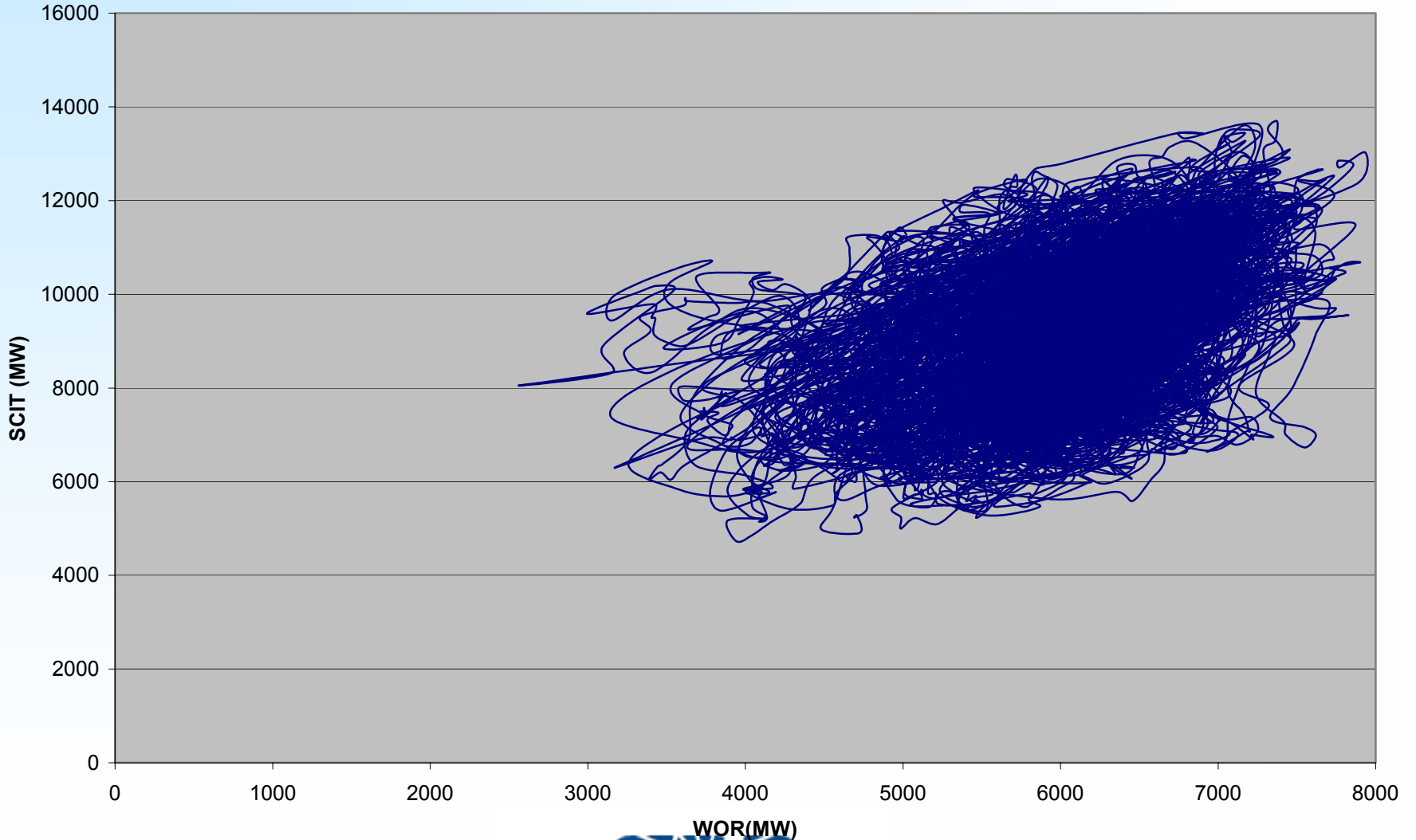
Preliminary Assessments:

- The transient voltage dip limit in the Devers area for a three-phase fault on the Hassayampa-North Gila 500 kV line is a key factor to determine the SVC need.**
- The amount of SVC in a wide range from a minimum to a maximum is required for the post-project depending upon the major system variables.**
- The major system variables in determining SVC size are listed below:**
 - a. the desired amount of the simultaneous WOR/SCIT increase**
 - b. the generation levels in the southern California power system**
 - c the Mohave Plant status and**
 - d. the Palo Verde transmission operating voltage control**
- The primary SVC location will be in the Devers area. The desired locations for SVC beyond certain size will be at the Adelanto and Marketplace Stations.**
- The building stage can be developed in different phases according to the needs.**



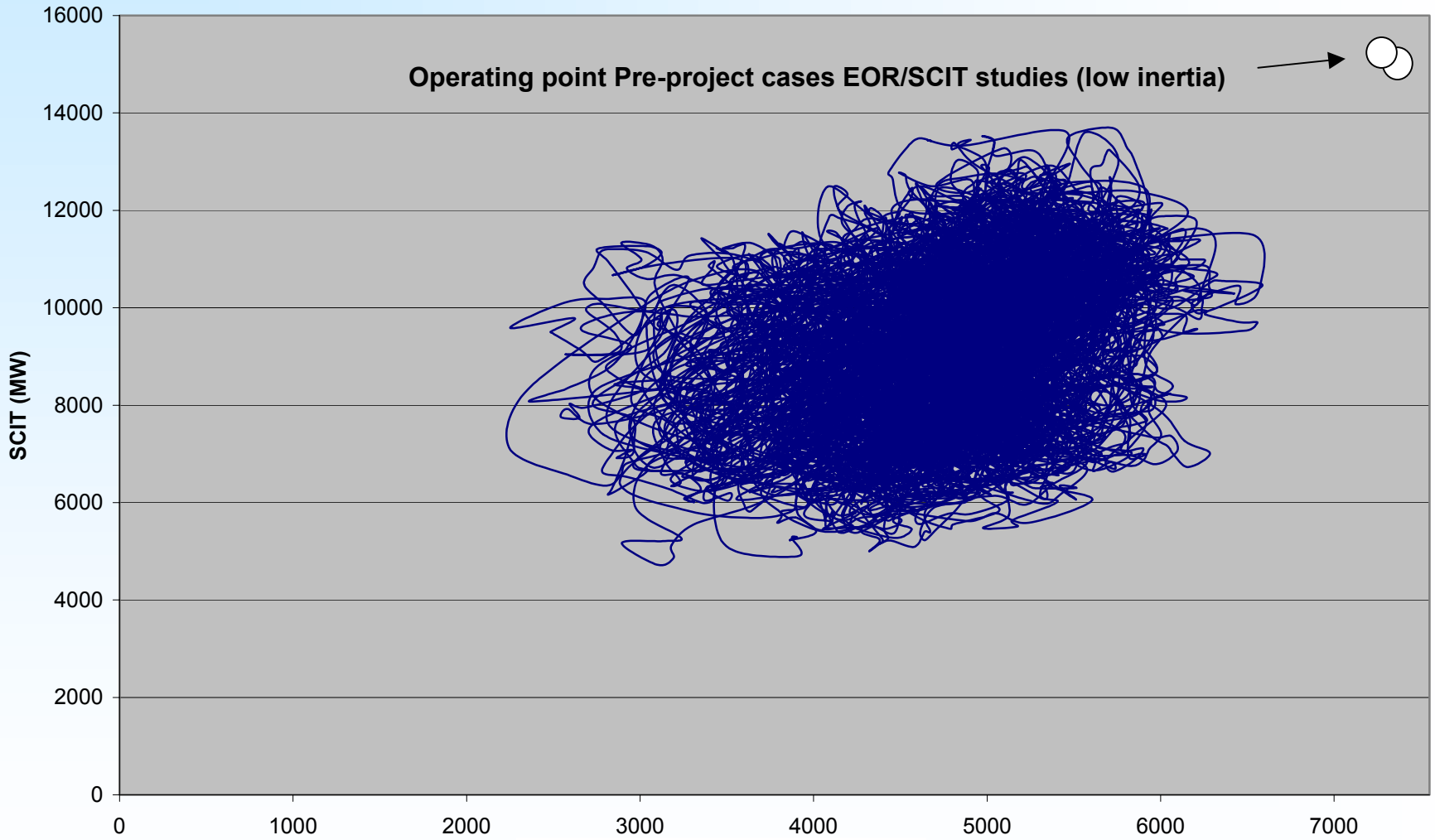
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SCIT plotted against WOR - actual data Oct.1 2003 - Oct.1 2004



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SCIT plotted against EOR - actual data Oct.1 2003 - Oct.1 2004



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