



**CALIFORNIA ISO**

California Independent  
System Operator

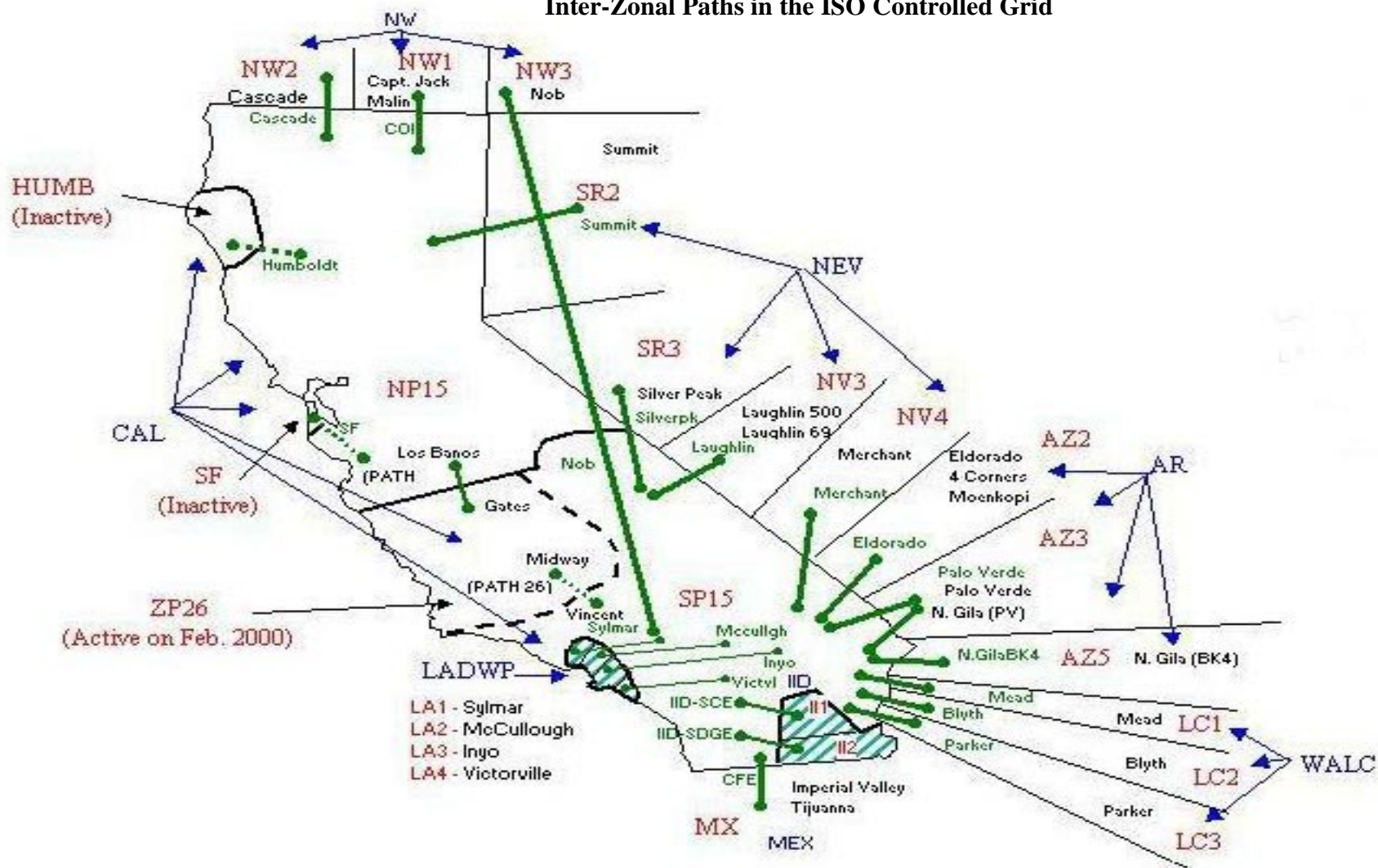
# **PATH 26 UPGRADE STUDY**

## **Phase A - Short-Term Implementation**

April 11, 2001

First Stakeholders Meeting

### Inter-Zonal Paths in the ISO Controlled Grid



**Bold black lines identify Zone boundaries**  
**Green lines identify transmission paths between zones (may include one or more lines)**  
**Red letters denote Zone names**  
**Black letters denote "abbreviated" scheduling point names**  
**Green letters denote Path names**  
**Blue letters denote abbreviated "geographic" location names**



## EXISTING PATH 26 RATING

- On 8/24/2000, the WSCC Operating Transfer Capability (OTC) Policy Group approved an increase in the summer OTC for Path 26 from 2,800 MW to 3,000 MW.
- The rating is bi-directional.
- 3,000 MW was the original WSCC-approved path rating.



## EXISTING PATH 26 RATING (cont'd)

- On 8/29/2000, the Cal-ISO approved SCE-proposed 500 kV wave trap replacement project at Vincent Substation. The Cal-ISO also approved similar PG&E-proposed project at Midway Substation on 8/14/2000.
- This will restore permanent rating on Path 26 at 3,000 MW. Wave trap's thermal rating is the limiting factor on Path 26's existing rating with DLO of Midway-Vincent 500 kV #1 and 2 lines.



## Day-Ahead Congestion Costs

<b>BRANCH_GRP</b>	<b>1999 Day Ahead Congestion Costs (\$Millions)</b>	<b>January-June 2000 Day Ahead Congestion Costs (\$Millions)</b>	<b>Flow Direction</b>
PATH15 _BG	\$30.74	\$16.44	S-N
PATH26 _BG	N/A	\$10.24	N-S

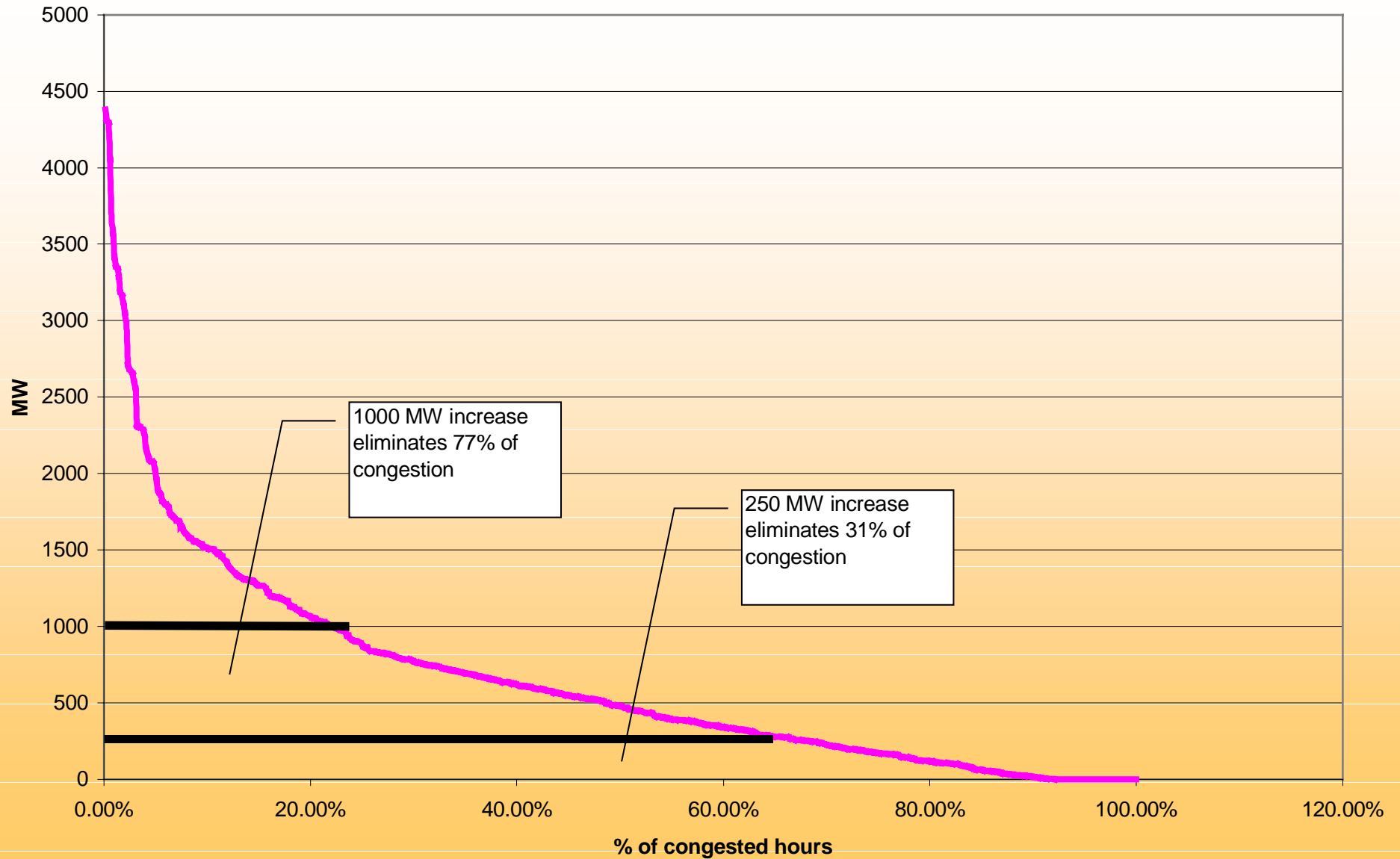
Day-Ahead Congestion Costs are obtained from the Appendix G of the 2000 ISO Control Area Expansion Plan Study Report.



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Feb 00-July 00 Initial-Final DA Schedules on Path 26





## NEW GENERATION DEVELOPMENTS CONNECTING TO MIDWAY SUBSTATION

- La Paloma Generating Project
  - Planned Operating Date: December 2001 \*
  - Ultimate Amount of Generation Output: 1,040 MW
- Sunrise Power Project
  - Planned Operating Date: Late Summer 2001 \*
  - Ultimate Amount of Generation Output: 320 MW
- Elk Hills Power Project
  - Planned Operating Date: First Quarter 2003 \*
  - Ultimate Amount of Generation Output: 500 MW
- Western Midway Sunset Cogeneration Company
  - Planned Operating Date: Second Quarter 2003 \*
  - Ultimate Amount of Generation Output: 500 MW

*\* These dates are approximate and may subject to change.*

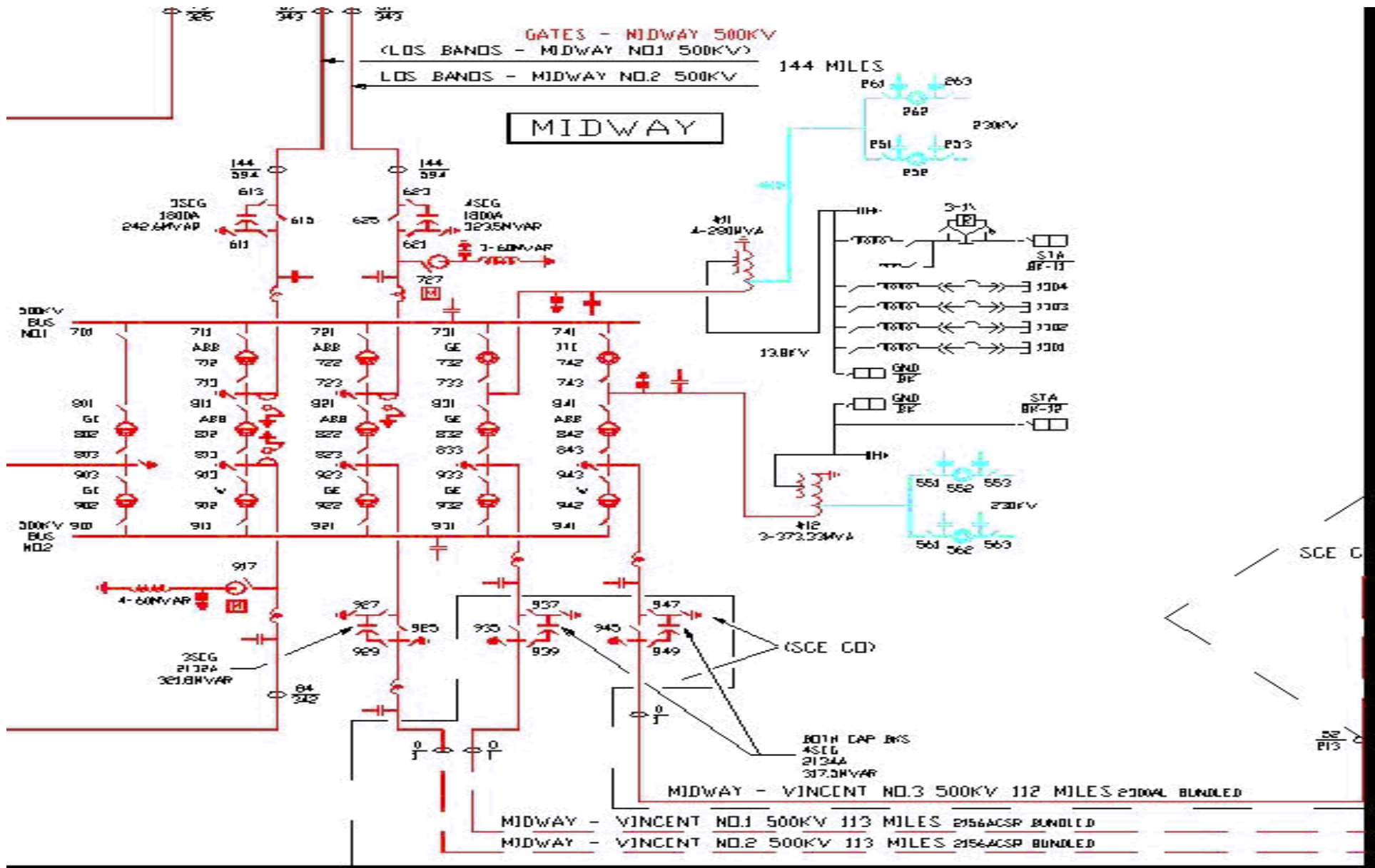




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## Single Line Diagram of the Midway Area 500 kV Facilities

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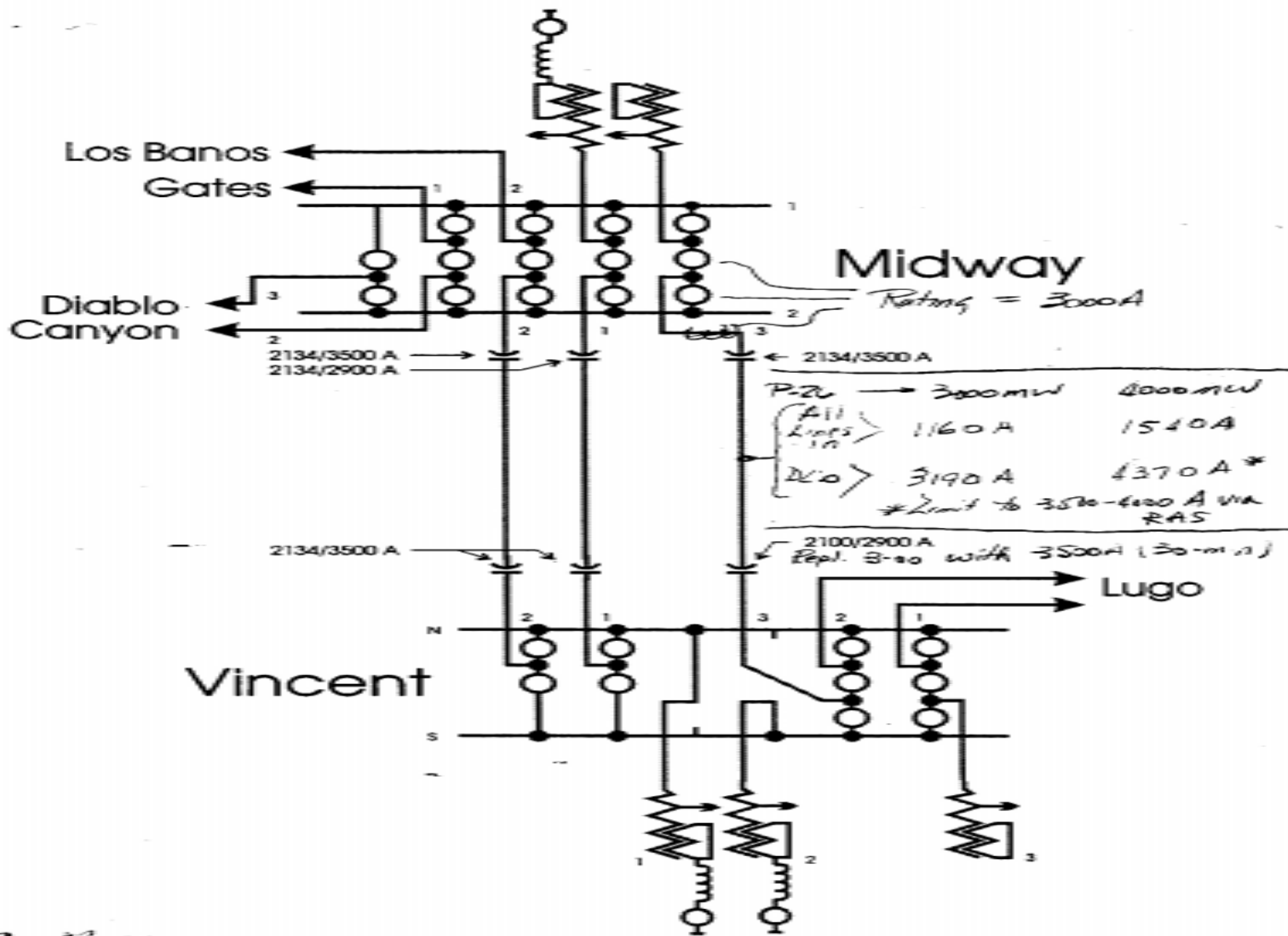
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<b>Equipment</b>	<b>Normal Rating</b>	<b>Emergency Rating</b>
<b><u>2-Conductor Bundle</u></b>		
#3 Line (53 mile portion)	2478 A. (Summer)	2964 A. (Summer – Static)
	3962 A. (Winter)	3200 A. (Summer – 30 min)
		4254 A. (Winter – Static)
<b><u>Wave Traps at Midway</u></b>		
# 1 Line	3000 A.	3000 A.
# 2 Line	3000 A.	3000 A.
# 3 Line	3000 A. *	3200 A. *
<b><u>Breakers at Midway</u></b>		
SW 932, 832 # 1 Line	3000 A. (ea breaker)	3000 A. (ea breaker)
SW 922, 822 # 2 Line	3000 A. (ea breaker)	3000 A. (ea breaker)
SW 942, 842 # 3 Line	3000 A. (ea breaker)	3000 A. (ea breaker)
<b><u>Bypass Switch at Midway</u></b>		
Switch #925 on Series Capacitor in #2 line	3000 A.	3000 A.
<b><u>Series Capacitors at Midway</u></b>		
#2 line	2132 A.	2400 A. (24 hr) 3500 A. (30 minute)
<b><u>Current Transformers at Midway</u></b>		
#1 Line	3000/5	3000/5
#2 Line	3000/5	3000/5
#3 Line	3000/5	3200/5.3

\* Scheduled to be replaced with 4000-Ampere equipment

Information obtained from PG&E's Response to CPUC Data Request 00-10-001



Ben Morris  
1-4-00

Figure 2. Midway-Vincent One-Line Diagram



## **PERTINENT INFORMATION ON M-V #3 500KV LINE COMPONENT RATINGS (AT VINCENT SUBSTATION)**

- Wave Trap (To Be Replaced With 4,000-A Equipment)
  - Summer Normal = 3,000 A
  - Emergency (30-min.) = 3,300 A
  - Emergency (10-min.) = 3,500 A
- Series Capacitors
  - Summer Normal = 2,400 A
  - Emergency (30-min.) = 3,500 A
- Bypass Switch (Series Capacitors)
  - Continuous Rating = 3,000 A
- SCE-owned Transmission Lines (2-2156 MCM)
  - Summer Normal = 3,950 A
  - Emergency (Continuous Rating) = 4,540 A (Likely Contingency)
  - Emergency (Continuous Rating) = 5,330 A (Unlikely Contingency)



## SCE'S PRELIMINARY TRANSMISSION ALTERNATIVES FOR UPGRADING PATH 26

(SCE TRANSMISSION EXPANSION PLAN 2001-2005)

Transmission Projects to Increase Path 26 Transfer Capability	Path 26 Transfer Capability (Bi-directional) (MW)	
	Total	Increase
Replace Wave Trap at Midway Substation on Midway-Vincent No. 3 500-kV line	3000	200
Add Fourth 500-230-kV Transformer Bank 230-kV Transformer Bank at Vincent Substation Replace Wave Trap at Vincent Substation	3250	250
<b>Alternative 1:</b> Replace Series Capacitors on Midway-Vincent No.3 500-kV line	4000	750
<b>Alternative 2:</b> Install RAS	4000	750



## STUDY PLAN FOR UPGRADING PATH 26

### Short-Term Plan

- Implementation in late 2001 or early 2002 for achieving higher Path 26 rating in the ***N-S direction***
- Subject to WSCC's TSS and PCC Approval (Will seek expedited approval process)
- If RAS is recommended, RAS system would also need to be submitted to WSCC RAS Task Force and approved by WSCC JGC

### Long-Term Plan

- To commence after submittal of the Short-Term Plan's Comprehensive Progress Report to TSS for review and comments
- Will develop transmission alternatives, including reinforcements, with Path 15 upgrade modeled in the analysis
- Will have detailed Path 26 congestion cost analysis available for economic evaluation
- Will look at bi-directional rating



## SHORT-TERM PLAN

### Study Scenarios and Base Cases

- Available on the following Cal-ISO Website link for comments,  
<http://www1.caiso.com/docs/2001/04/10/2001041014470417058.html>

or,

Cal-ISO Website ([www.caiso.com](http://www.caiso.com))

The Grid

Planning Information Exchange

Long-Term Transmission Expansion Plans

Path 26 Upgrade Study

Path 26 Upgrade Study For Year 2002 Implementation

- Developed from the 2000 ISO Control Area Transmission Expansion Plan's 2002 Heavy Summer and 2002 Spring base cases
  - The 2002 heavy summer peak case developed from 2003 HS3 WSCC base case
  - The 2002 spring peak case developed from 2001 HSP1 WSCC case



## SHORT-TERM PLAN (cont'd)

### Study Scenarios and Base Cases (cont'd)

- **Scenario 1** - 2002 Heavy Summer with High Midway Area Generation
  - M-V flow at 4,500 MW
  - M-V flow at 4,000 MW
  - M-V flow at 3,500 MW (if cannot obtain 4,000 or 4,500 MW path rating)
- **Scenario 2** - 2002 Spring Peak
  - M-V flow at 4,500 MW
  - M-V flow at 4,000 MW
  - M-V flow at 3,500 MW (if cannot obtain 4,000 or 4,500 MW path rating)





## SHORT-TERM PLAN (cont'd)

### Study Scenarios and Base Cases (cont'd)

- See base case summaries available on hard copies



## CONTINGENCY ANALYSIS

- Refer to Study Plan for list of contingencies
- Contingency Screening
  - Refer to Study Plan



## SENSITIVITY STUDIES

The following sensitivity studies are to be performed to evaluate the newly determined Path 26 rating on the following **existing** nomogram:

- AC/DC/Northern California Hydro Nomogram
- SCIT Nomogram

The studies are needed to determine if there any adverse impacts of having a higher Path 26 flow on these existing nomograms.



## STUDY METHODOLOGY

The following analyses will be studied:

- Power flow analysis
- Post-transient power flow analysis
  - Test for positive reactive margin at various 500 kV and 230 kV critical buses in PG&E, SCE, SDG&E and LADWP systems
- Transient stability analysis



## POTENTIAL TRANSMISSION ALTERNATIVES

### 1) Remedial Action Schemes (RAS):

- Generation RAS: curtailing generation connected to Midway Substation in the event of critical contingencies which limit the flow of M-V beyond its 3,000 MW rating (for example, M-V #1 and #2 DLO)
- Load RAS: curtailing load (determine the amount of load curtailment as needed). Potential use of the proposed load curtailment for the IOOS RAS under consideration for Path 26

### 2) Combination of RAS and Transmission Reinforcements:

- Up-rate the conductor rating for the M-V #3 500 kV line
- Potential replacement of M-V #3 500 kV line series capacitors
- This up-rate will help lowering the amount of generation and load RAS



## COSTS AND FEASIBILITY

- Not-to-exceed cost estimates (due to short study time frame)
- In addition to the above, a thorough analysis of the Los Banos - Midway, Midway - Vincent and Vincent - Lugo 500 kV line ratings on a component level.
  - To determine if there are any other constraints in achieving a higher Path rating



## CONGESTION COST ANALYSIS

- A detailed congestion cost analysis will need to be completed for an economic evaluation for developing and implementing the long-term plan.





## STUDY SCHEDULE

- Refer to the Study Plan



## STUDY GROUP MEMBERS

- Cal-ISO
- PG&E
- SCE
- PG&E National Energy Group
- Midway Sunset Co-generation Company
- Northern California Power Agency (NCPA)
- Williams Energy
- FPL Energy
- Calpine
- CDWR
- CPUC
- Power Industry Consultants