

## **Short Term Upgrades (8000 MW EOR FLOW)**

*(Miguel 500/230 kV transformer No. 2, Imperial Valley – Miguel 500 kV series capacitor upgrade and Miguel – Mission No. 2 230 kV line assumed be in service)*

### ***Needed Upgrades:***

#### ***Transformers:***

- Second Devers 500/230 kV transformer

#### ***Existing series capacitors upgraded:***

- Hassayampa – North Gila 500 kV series capacitors
- North Gila-Imperial Valley 500 kV series capacitors
- Imperial Valley-Miguel 500 kV series capacitors
- Navajo - Crystal 500 kV series capacitors
- Palo Verde–Devers 500 kV series capacitors
- Moenkopi –Eldorado 500 kV series capacitors

#### ***West of Devers Upgrade:***

- 12.5 ohm series reactor on Devers-San Bernardino #1 230 kV line for the outage of Devers – Valley 500 kV line

### ***VAR support:***

The following voltage support equipment was added:

Dynamic voltage support (for instance SVC):  
+388 Mvar at Devers 500 kV  
+388 Mvar at Valley 500 kV

It should be noted that the amount and location of additional voltage support equipment would depend upon a number of variables; mitigation of identified criteria violations (see below), dispatch of generation, various path flows etc.

**Normal overloads:**

No normal Over loads

**Single contingency load flow results (off-peak conditions)**

<b>Worst Contingency (N-1)</b>	<b>Overloaded Element</b>	<b>Area</b>	<b>N-1 rating</b>	<b>Phase 1 EOR 8000 Loading (%)</b>	<b>Sub-Area</b>
Miguel #1 500/230 kV transformer	Miguel #2 500/230 kV transformer	22	1329 MVA	132	Miguel
Miguel #2 500/230 kV transformer	Miguel #1 500/230 kV transformer	22	1329 MVA	132	
*Imperial Valley-Miguel 500 kV	La Rosita – HRD 230 kV line	20	974 A	197	CFE
	La Rosita - Rumerosa 230 kV line	20	974 A	213	
	HRD – Rumerosa 230 kV line	20	974 A	191	
	TJI- Otay Mesa 230 kV line	22	2289 A	121	
	MTP-HRD #1 & 2 230 kV line	20	1238 A	114	
Four Corner – Moenkopi 500 kV	Ship Rock 345/230 kV transformer	19	300 MVA	137	Shiprock

\* The existing SPS to trip generation connected to Imperial Valley 230 kV substation, in addition to tripping the Imperial Valley- La Rosita 230 kV line is needed for this outage

**Post transient study results**

No Post transient voltage violations

**Double contingency load flow results (off-peak Conditions)**

<b>Worst Contingency (N-2)</b>	<b>Overloaded Element</b>	<b>Area</b>	<b>N-2 rating</b>	<b>Phase 1 Loading (%)</b>	<b>Sub-Area</b>
Miguel-Mission #1& 2 230 kV lines	Miguel-Procter Valley 138 kV line	22	2000 A	113	Miguel
	Procter Valley- Telegraph Canyon 138 kV line	22	2000 A	109	
	Miguel 230/138 kV transformer	22	468 MVA	112	
	South Bay - Telegraph Canyon 138 kV line	22	1708 A	115	

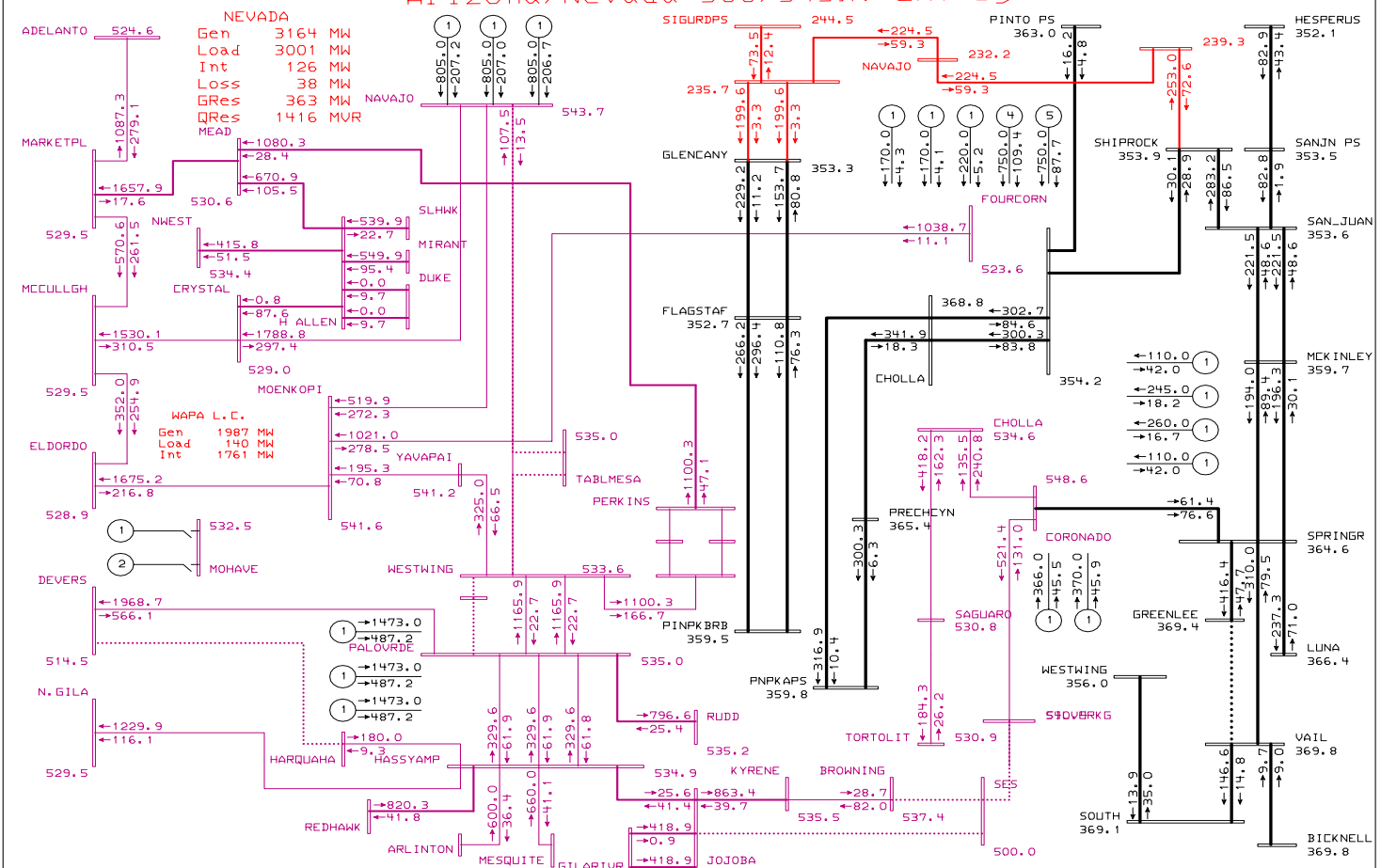
# **Power flow Diagrams**

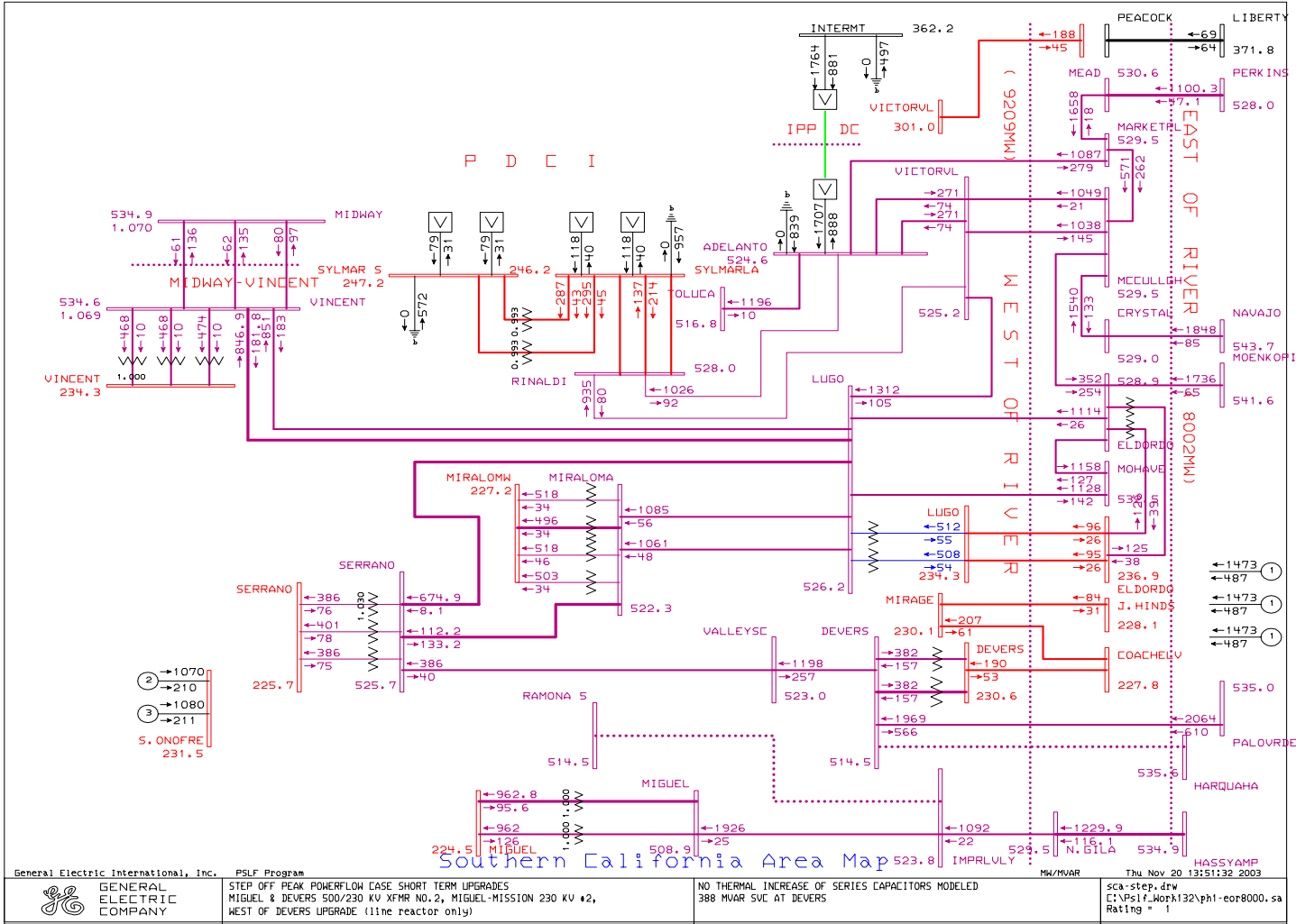
**Phase One 8000 MW EOR FLOW (Off-peak)**

**(All lines in Service)**



# Arizona/Nevada 500/345kV EHV System





General Electric International, Inc. PSLF Program  
**GENERAL ELECTRIC COMPANY**

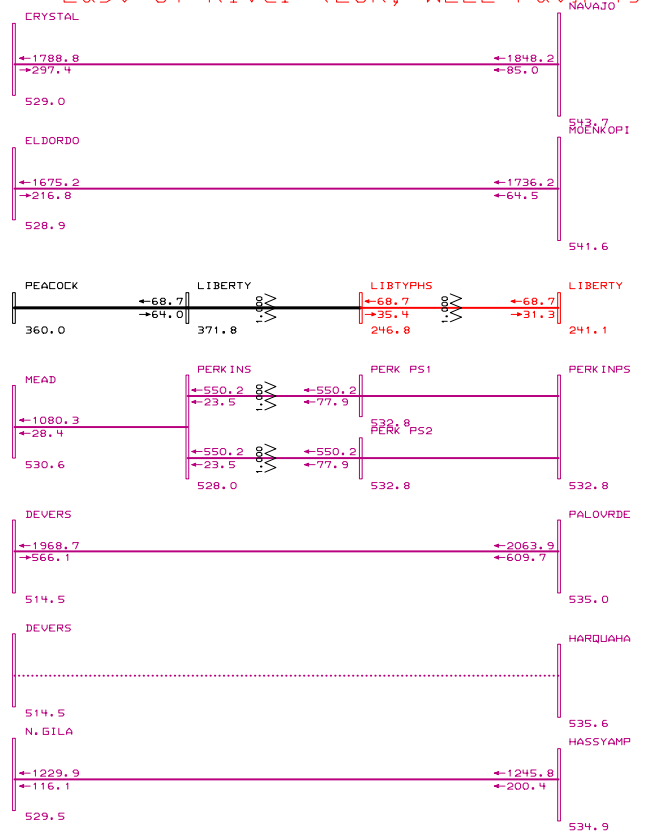
STEP OFF PEAK POWERFLOW CASE SHORT TERM UPGRADES  
 MIGUEL & DEVERS 500/230 KV XFMR NO.2, MIGUEL-MISSION 230 KV #2,  
 WEST OF DEVERS UPGRADE (line reactor only)

NO THERMAL INCREASE OF SERIES CAPACITORS MODELED  
 388 MVAR SVC AT DEVERS

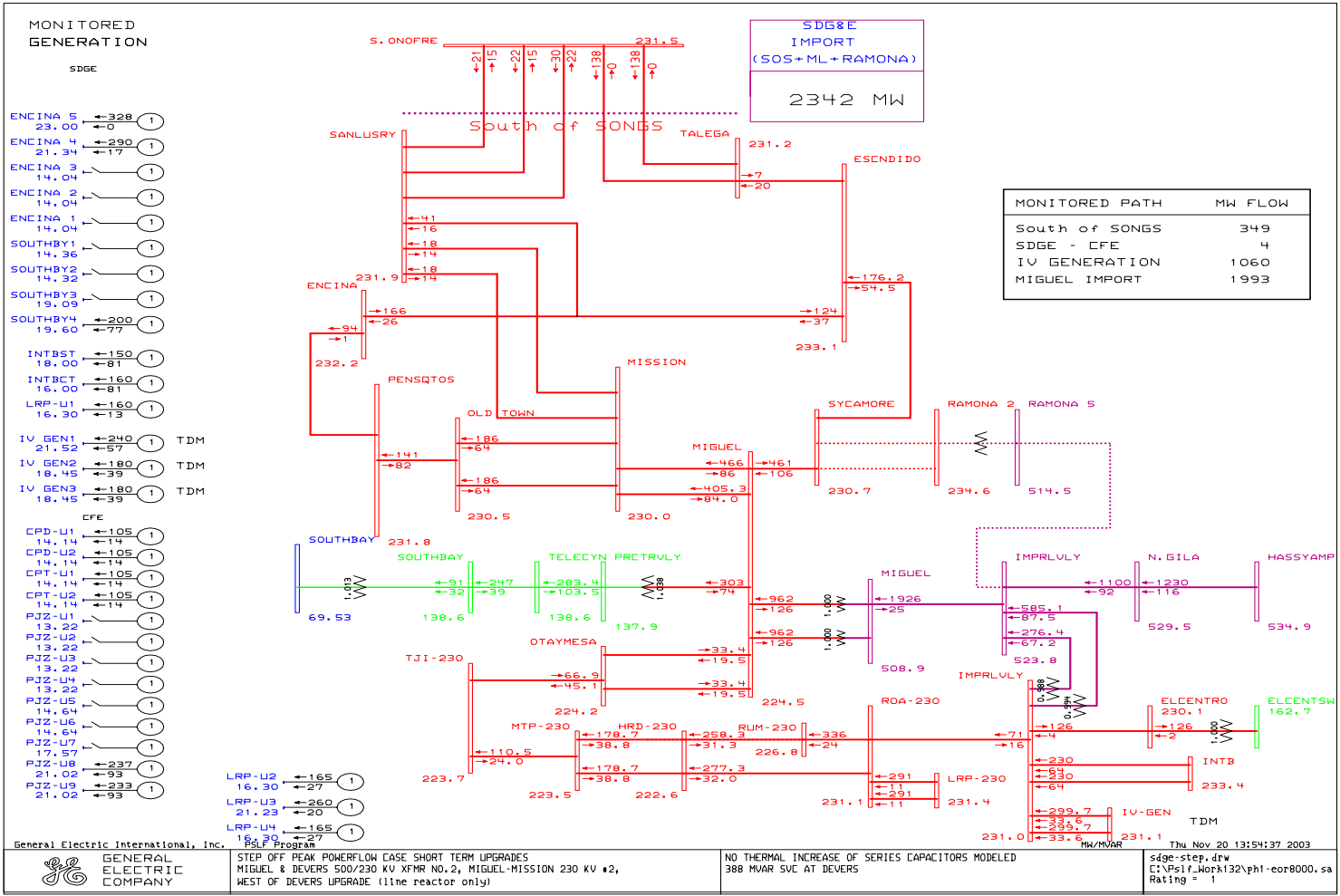
MW/MVAR Thu Nov 20 13:51:32 2003  
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 Rating = 1

East of River (EOR, WECC Path 49)

Total EOR Flow:  
8002MW







**MONITORED GENERATION**

- SDGE**
- ENCINA 5 ←328 (1) 23.00 ←0
  - ENCINA 4 ←290 (1) 21.34 ←17
  - ENCINA 3 (1) 14.04
  - ENCINA 2 (1) 14.04
  - ENCINA 1 (1) 14.04
  - SOUTHBAY1 (1) 14.36
  - SOUTHBAY2 (1) 14.32
  - SOUTHBAY3 (1) 19.09
  - SOUTHBAY4 ←200 (1) 19.60 ←77
  - INTBST ←150 (1) 18.00 ←81
  - INTBCT ←160 (1) 16.00 ←81
  - LRP-U1 ←160 (1) 16.30 ←13
  - IV GENERATION**
  - IV GEN1 ←240 (1) TDM 21.52 ←57
  - IV GEN2 ←180 (1) TDM 18.45 ←39
  - IV GEN3 ←180 (1) TDM 18.45 ←39
  - CFE**
  - CPD-U1 ←105 (1) 14.14 ←14
  - CPD-U2 ←105 (1) 14.14 ←14
  - CPT-U1 ←105 (1) 14.14 ←14
  - CPT-U2 ←105 (1) 14.14 ←14
  - PJZ-U1 (1) 13.22
  - PJZ-U2 (1) 13.22
  - PJZ-U3 (1) 13.22
  - PJZ-U4 (1) 13.22
  - PJZ-U5 (1) 14.64
  - PJZ-U6 (1) 14.64
  - PJZ-U7 (1) 17.57
  - PJZ-U8 ←237 (1) 21.02 ←93
  - PJZ-U9 ←233 (1) 21.02 ←93
  - LRP-U2 ←165 (1) 16.30 ←27
  - LRP-U3 ←260 (1) 21.23 ←20
  - LRP-U4 ←165 (1) 16.30 ←27

**SDG&E IMPORT  
(SOS+ML+RAMONA)**  
  
2342 MW

MONITORED PATH	MW FLOW
South of SONGS	349
SDGE - CFE	4
IV GENERATION	1060
MIGUEL IMPORT	1993

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