San Onofre Offsite Power

May 3, 2005

Purpose of Meeting

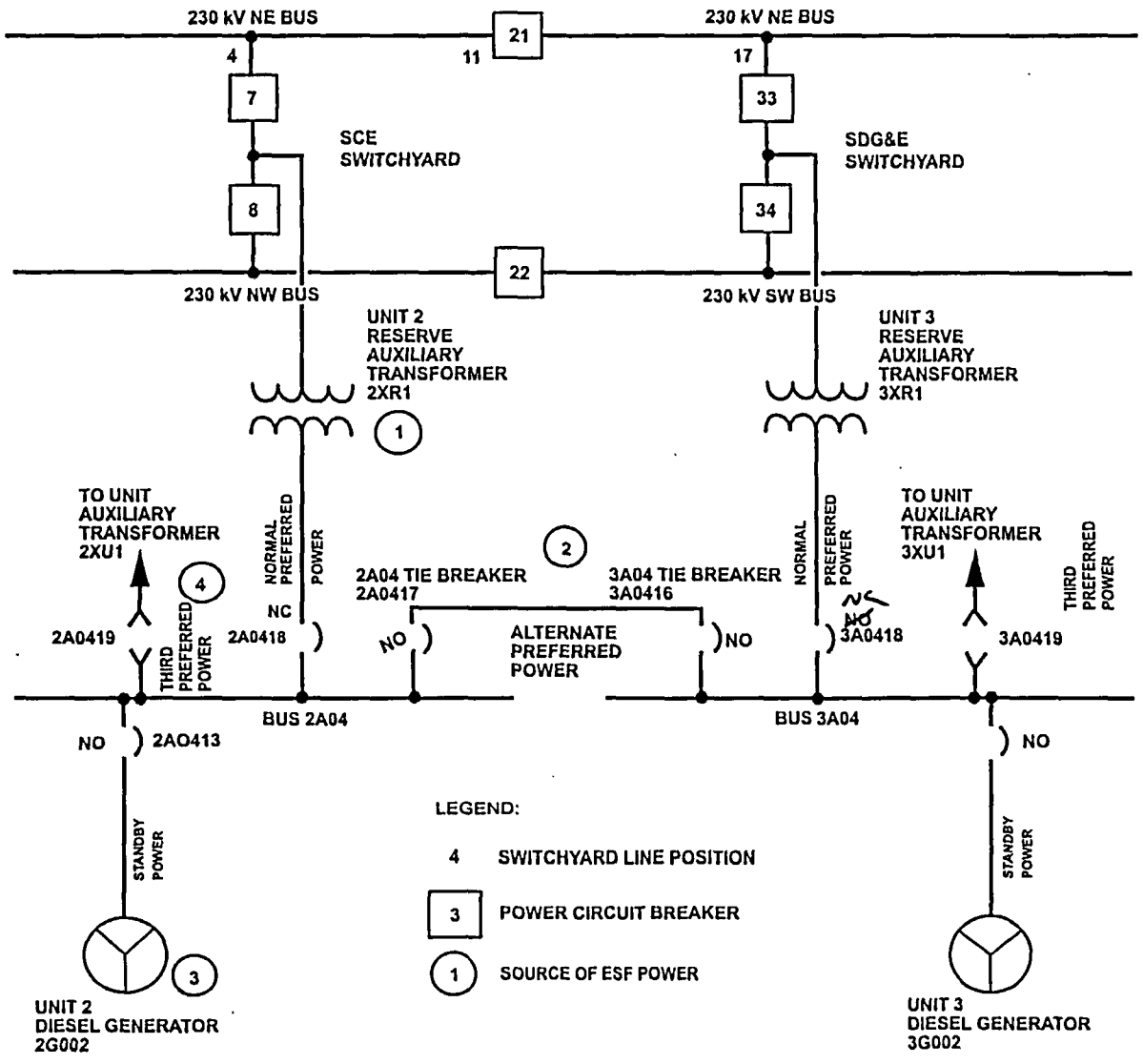
- Describe current condition
- Describe actions being taken by SCE
- Identify support needed from NRC

Background of SONGS Design

- Original design
  - Inverse time relay for loss of voltage and degraded voltage protection
- 1993 design changes
  - Inverse time relay loss of voltage
  - Sustained Degraded Voltage protection
  - Degraded Voltage with SIAS protection
- Transmission Control Agreement with CAISO

SONGS Degraded Grid Functional Overview

- Voltage sensed by PT at 4160 V 1E buses
- ABB-27N solid state relay for voltage setting detection
- SIAS versus non-SIAS
- Timing window and long term detection
- 2 out of 4 logic


230 kV NE BUS
230 kV NE BUS
21
4
11
17
7
33
SCE
SWITCHYARD
SDG&E
SWITCHYARD
8
34
22
230 kV NW BUS
230 kV SW BUS
UNIT 2
RESERVE
AUXILIARY
TRANSFORMER
2XR1
UNIT 3
RESERVE
AUXILIARY
TRANSFORMER
3XR1
1
TO UNIT
AUXILIARY
TRANSFORMER
2XU1
NORMAL
PREFERRED
POWER
2
TO UNIT
AUXILIARY
TRANSFORMER
3XU1
THIRD
PREFERRED
POWER
4
2A04 TIE BREAKER
2A0417
3A04 TIE BREAKER
3A0416
NC
2A0419
2A0418
NO
ALTERNATE
PREFERRED
POWER
NO
3A0418
3A0419
BUS 2A04
BUS 3A04
NO
2AO413
NO
STANDBY
POWER
STANDBY
POWER
LEGEND:
4 SWITCHYARD LINE POSITION
3 POWER CIRCUIT BREAKER
1 SOURCE OF ESF POWER
3
UNIT 2
DIESEL GENERATOR
2G002
UNIT 3
DIESEL GENERATOR
3G002

DGVSS RELAY (ABB 27N) CURRENT SETTINGS

<table>
<tr><th></th><th>SR 4 KV Bus</th><th colspan="2">TLU & dropout setting tolerance</th></tr>
<tr><td>Relay reset (design max.)</td><td>4296.25 V</td><td rowspan="2">TLU + Eng. Margin = 1.112% (47.25 V)</td><td rowspan="2"></td></tr>
<tr><td>TECH. SPEC. RESET</td><td>≤ 4281 V</td></tr>
<tr><td>Relay reset (nominal)</td><td>4249.00 V</td><td rowspan="3">0.5% (21 V)</td></tr>
<tr><td>Relay dropout (nominal)</td><td>4228.00 V</td><td rowspan="3">TLU + Eng. Margin = 1.112% (47.25 V)</td></tr>
<tr><td>TECH. SPEC. DROPOUT</td><td>≥ 4196 V</td><td rowspan="2"></td></tr>
<tr><td>Relay dropout (design minimum based on 218 KV switchyard voltage)</td><td>4180.75 V</td></tr>
</table>

TLU = 0.737%
Engineering margin = 0.375%

Current Offsite Power Issue

- 1E equipment analyzed for 218 kV in switchyard
- DGV relays may not reset until 222.2 kV
- DGV relays may transfer operating unit 1E buses to the diesel generators even though offsite power may be available to perform its design function

Immediate Compensatory Action

- As an interim measure, with one unit shutdown, offsite power will be declared inoperable if the grid can not maintain 222.2 kV or greater after the operating unit trips

Basis for Acceptability of Immediate Compensatory Action

- 1E equipment is analyzed for 218 kV in switchyard
- DGV relays reset not assured < 222.2 kV
- Offsite power (immediate access preferred circuit) may be lost following postulated accident
- CAISO provides notification if post N-1 event would be <222.2 kV
- Complies with UFSAR and GDC-17

Impacts of Grid Restraint

- One SONGS unit "must run" for Southern California grid VAR support during heavy load demand and high power import
- CAISO may not be able to operate grid to assure >222.2 kV during summer peak with one unit shutdown
- Forced outage of one unit could result in second unit shutdown and may impact grid reliability

Short Term (May) SONGS Action

- DGV Setpoint Changes
  - Lower upper pickup range to < ~221.3 kV
  - Control administratively
  - No Tech Spec change required in accordance with Administrative Letter 98-10

Near Term (July 1) SONGS and NRC Action

- DGV Setpoint Changes – Requires License Amendment
  - Interim setpoints with minimal plant modifications allows ~219.5 kV as minimum grid voltage
  - Interim setpoints significantly reduce potential for dual unit forced outage
  - Final setpoints with a number of modifications restores 218 kV as minimum grid voltage

License Amendment Scope

- Change to Tech Spec 3.3.7 SR 3.3.7.3.a
- Reanalysis of offsite voltage requirements
  - Analysis for equipment operation at 215 kV
  - Minimum grid voltage requirement restored to 218 kV
  - Degraded grid protection and reset ensure all voltage requirements are met
- Basis for reanalysis of relay setting and accuracy
  - Improved M&TE accuracy
  - Improved drift, temperature effects, PT accuracy
  - Consistent with overall accuracy at other plants

License Amendment Schedule

- SCE plans to submit to NRC by May 27, 2005
- NRC approval will be requested by July 1, 2005
- SCE implement interim setpoints – within a few days after NRC approval
- SCE implement final setpoints – after completion of required plant modifications

Plant Modifications

- Design changes needed to achieve voltage reduction
  - 4160 Volt level – none
  - 480 Volt level – replace control power transformers (est. 10)
  - 120 Volt level – increase feeder cable sizing (est. 15)
  - MOV's – none

Calculation of the TLU and AVT for Undervoltage Protection Relays				
Item	Parameter	OLD (±Percent)	Best Est. (±Percent)	Notes
A	Potential Transformer Accuracy	0.3	0.150	Improved accuracy by calculating the actual burden and applying IEEE Standard formula. The original calc used the standard accuracy.
B	Basic Accuracy (Repeatability)	0.1	N/A	Not part of the TLU per SONGS Standard. Included in the setting tolerance (ST).
C	Miscellaneous Allowance	N/A	0.1	Required by SONGS Standard. (Design Margin)
D	Temperature Effect	0.4	0.304	Improvement based on taking credit for a temperature range of 54 to 95 deg F, as calculated by the HVAC group. See note 4.
E	Power Supply Effect	0.1	0.1	No Change
F	Drift	0.36	0.1	Improvement based on assuming drift equivalent to the manufacturer's accuracy over the calibration interval.
G	M&TE	0.369	0.033	Improvement by purchasing more Accurate Test Equipment
H	Setting Tolerance	0.083	0.085	No change still 0.1 volts but % changes due to new trip setting from ~120 to ~118.
	TLU	**0.737**	**0.391**	**SRSS (A-H)**
I	Readability of M&TE	0.01	0.000001	Test Equipment Least Significant Digit
	AV Tolerence (Note 5)	**0.370**	**0.131**	**SRSS(F, H, I)- Relay Test Purposes.**

	NOTES:
1	Assumed Trip Point of - 118 Vac (Used for calculation of percentages only)
2	SRSS = Square Root of the Sum of Squares
3	M&TE = Measuring and Test Equipment. (In this case an Agilent 3548A multimeter.)
4	Original calc used a temperature range of 50 to 105 deg F.
5	The Allowable Value tolerance is used to determine if the relay is functioning within specifications

DGVSS RELAY (ABB 27N) SETTINGS

<table>
<tr><th></th><th>Switchyard</th><th>Safety related 4 KV Bus</th><th colspan="2">TLU & dropout setting tolerance</th></tr>
<tr><td>Min. anticipated voltage (Analytical limit)</td><td>219.5 KV</td><td>4195 V</td><td rowspan="2"></td><td rowspan="4"></td></tr>
<tr><td>Margin for future load growth</td><td rowspan="8">-</td><td>0.12%
(5.0 V)</td></tr>
<tr><td>Relay reset (design max.)</td><td>4190.0 V</td><td rowspan="3">TLU =
0.391%
(16.32 V)</td></tr>
<tr><td>TECH. SPEC. RESET</td><td>≤ 4179 V</td></tr>
<tr><td>Relay reset (nominal)</td><td>4173.68 V</td><td rowspan="3">0.25%
(10.5 V)</td></tr>
<tr><td>Relay dropout (nominal)</td><td>4163.18 V</td><td rowspan="3">TLU =
0.391%
(16.32 V)</td></tr>
<tr><td>TECH. SPEC. DROPOUT</td><td>≥ 4158 V</td><td rowspan="3"></td></tr>
<tr><td>Relay dropout (design min.)</td><td>4146.86 V</td></tr>
<tr><td>Design margin to analytical limit</td><td>0.17%
(6.86V)</td><td rowspan="2"></td></tr>
<tr><td>Min. voltage to protect equipment (Analytical limit)</td><td>216.7 KV</td><td>4140 V</td></tr>
</table>

DGVSS RELAY (ABB 27N) SETTINGS

	Switchyard	Safety related 4 KV Bus	TLU & dropout setting tolerance	
Min. anticipated voltage (Analytical limit)	218 KV	**4161 V**		
Margin for future load growth		0.14% (6.0 V)		
Relay reset (design max.)		4155.0 V	TLU = 0.391% (16 V)	
TECH. SPEC. RESET		**≤ 4144 V**		
Relay reset (nominal)		4138.9 V		0.25% (10.5 V)
Relay dropout (nominal)		4128.4 V		
TECH. SPEC. DROPOUT		**≥ 4122 V**	TLU = 0.391% (16 V)	
Relay dropout (design min.)		4112.13 V		
Design margin to analytical limit		0.15% (6.4 V)		
Min. voltage to protect equipment (Analytical limit)	214.77 KV	**4106.0 V**		

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.7.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.7.2	Perform CHANNEL FUNCTIONAL TEST.	24 months
SR 3.3.7.3	Perform CHANNEL CALIBRATION with setpoint Allowable Values as follows: a. Degraded Voltage Function: i. Dropout ≥ ~~4196~~4122 V* ii. Pickup ≤ ~~4281~~4144 V* SDVS (Sustained Degraded Grid Voltage Signal): Time delay: i. 127D ≤ 2.17 seconds. ii. 162D ≥ 78 seconds and ≤ 128 seconds. DGVSS (Degraded Grid Voltage with SIAS Signal): Time delay: i. 127D ≥ 1.83 seconds and ≤ 2.17 seconds. ii. 162S ≥ 4.16 seconds and ≤ 4.44 seconds. iii. 162T ≥ 0.88 seconds and ≤ 1.62 seconds. b. Loss of Voltage Function ≥ 3554 V and ≤ 3796 V Time delay: ≥ 0.75 seconds and ≤ 1.0 seconds at 0 V.	24 months

* Dropout and pickup values will be set to 4158 V and 4179 V, respectively, until modifications identified in SCE letter dated xx/xx/xx are completed.

Long Term Actions

- Desired to restore margins and allow for future load additions
- Conceptually, SONGS is looking at
  - Additional 1E 480 V transformers
  - Regulating transformers

Conclusion

- Immediate action (222.2 kV grid support) complies with license and assures safety
- Changes to DGV setpoints needed to reduce potential for dual unit forced outage during the high summer load
- SCE requests NRC priority for expedited review in order to support grid margins