U. S. NUCLEAR REGULATORY COMMISSION

REGION V

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Reports Nos:	50-361/88-18, 50-362/88-19
Docket Nos.	50-361, 50-362
License Nos.	NPF-10, NPF-15
Licensee:	Southern California Edison Company P. O. Box 800 2244 Walnut Grove Avenue Rosemead, California, 91770
Facility Name:	San Onofre Units 2 and 3
Inspection at:	San Onofre Nuclear Generating Station Units 2 and 3.
Inspection Conducte	d: June 27 - July 1, 1988
Inspectors:	Melfi, Reactor Inspector Date Signed

M. W. Yost, NRC Contractor, INEL J. P. Joyce, Inspector, ICSB, NRR

Approved By:

Engineering Section Richards, Ch

Summary:

Inspection on June 27, 1988 - July 1, 1988 (Report 50-361/88-18, 50-529/88-19)

Areas Inspected: A special announced inspection of representative subsystems of the post-accident monitoring system at the San Onofre Nuclear Generating Station (SONGS), Units 2 and 3. This inspection assessed the conformance of the SONGS with Regulatory Guide 1.97, Revision 2. Inspection procedures 30703 and 25587 were used during this inspection. This inspection addresses Safety Issue Management System (SIMS) item number 67.3.3.

Results: Of the area inspected, 1 violation was identified dealing with the separation of electrical cables in a control room cabinet.

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DETAILS

1. Persons Contacted

San Onofre Nuclear Generating Station

*D. Mercurio, Sr. Licensing Engineer *D. Schone, QA Director *C. Couser, Compliance Engineer *K. O'Connor, Retrofit Manager *J. Ibarra, Nuclear Systems Engineer *M. Zenker, Compliance Engineer *T. Vogt, Asst. Plant Operations Superintendent *C. Hays, Retrofit Engineer *D. Daek, QA Engineer *R. Reiss, QA Supervisor *S. McMahan, Assistant Maintenance Manager *R. Plappert, Compliance Engineer *R. L. Baker, Unit 2/3 Project Engineer *R. Baker, Compliance Engineer R. Waldo, Engineer E. Bennet, OA Engineer B. Bas, Engineer

Other NRC Personnel

*C. Trammel, NRC Project Manager

*Attended Exit Meeting, July 1, 1988.

The inspectors also held discussions with other licensee and contractor personnel during the inspection. This included plant staff engineers, technicians, administrative and clerical assistants.

2. Introduction

The purpose of this inspection was to compare the installed plant instrumentation with the commitments contained in correspondence related to Post-Accident Instrumentation as described in the Safety Evaluation Report (SER). This inspection also assessed if the instrumentation meets the criteria specified in Regulatory Guide 1.97. Some of the references used to assess the licensee conformance to Regulatory Guide 1.97 were:

- Regulatory Guide 1.97, Revision 2, "Instrumentation for Light Water-Cooled Nuclear Power Plants to Assess Project and Environs Conditions During and Following an Accident."
 - San Onofre Nuclear Generating Station (SONGS) Final Safety Analysis Report (FSAR), Chapters 3 and 7.

Safety Evaluation Report, as discussed in memorandum from R. W. Houston to T. M. Novak, February 13, 1985, with Technical Evaluation Report (TER) prepared for the NRC by EG&G Idaho Inc., "Conformance to Regulatory Guide 1.97, San Onofre Nuclear Generating Station, Unit Nos. 2 and 3", October 1984, EGG-EA-6525.

Generic Letter 82-33 issued supplement 1 to NUREG-0737, which specified those requirements regarding emergency response capability that had been approved by the NRC. This supplement also discussed in part the application of Regulatory Guide (RG) 1.97 to the emergency response facilities, including the Control Room (CR), Technical Support Center (TSC) and Emergency Operations Facility (EOF) at power plants. The response by the licensee to RG 1.97 was provided in letters to the NRC dated May 13 1982, and July 26, 1984.

The inspectors verified that the licensee had documentation available onsite that showed the redundancy, physical and electrical separation, power sources and interfaces for the instrumentation. The Q and EQ master equipment lists showed that for the instruments selected, they had been evaluated and tested to the appropriate environmental, quality assurance and seismic qualification requirements. The Environmental Qualification (EQ) tests are labled with either a statement affirming that the instrument is EQ qualified, or gives the environment that the component is located in. A mild environment does not need any special qualification. The seismic listing also notes if the instrument is appropriately qualified. The QA procurement of these instruments was also reviewed. No problems were identified with their procurement.

Regulatory Guide 1.97 divides Post-Accident instrumentation into three categories and five types. The three categories are noted as 1, 2, and 3. Category 1 has the most stringent requirements and category 3 the least stringent. The five types of instrumentation identified in the Regulatory Guide are types A, B, C, D, and E. Type A are plant specific and classified by the licensee; type B variables provide information to indicate that plant safety functions are being accomplished; type C variables provide information on the breach of barriers for fission product release; type D variables indicate the operation of individual safety systems; and type E variables are those that indicate and determine the magnitude of the release of radioactive materials. Each variable type can be of any category, except for type A, which can only be Category 1.

The specific information on the instrumentation inspected is discussed in paragraph 3. Except as noted, the requirements for the Category 1 and 2 instruments were met.

3. Inspection Details

The inspectors held discussions with various members of the licensee's staff, examined drawings, and valked through the control room to assess the implementation of the requirements delineated in Regulatory Guide 1.97, Revision 2. The Control Rooms for Units 2 and 3 are common, and were inspected. Both of these units employ the same design and similar instrument numbers. For Category 1 instrumentation, the power is supplied

by Class-1E instrument buses. The licensee has installed a Qualified Safety Parameter Display System (QSPDS) which is a fully qualified data acquisition, display, and recording system. Several of the instruments inspected had recordings of the QSPDS, instead of on separate, qualified recorders. The use of the QSPDS is an acceptable means for recording of the variables.

The following variables and instrumentation were examined.

3.1 Neutron Flux

Regulatory Guide 1.97 classifies this as a Category 1 variable. In addition, the licensee classifies this as a Type A variable. The currently documented range is 1 E-8 percent to 125 percent of full power. The actual range displayed goes up to 200 percent of full power. This is displayed on log-scale indicators, recorded on a Category 2 two-pen recorder (one pen per neutron flux channel), and recorded on the Qualified Safety Parameter Display System (QSPDS). The non-seismically qualified recorder is optically isolated from both Category 1 instrument loops by fully qualified Foxboro isolators. Information on the neutron flux instrumentation is as follows.

Tag	Function	EQ	Seismic	Power	Instrument
Number		Listed	Listed	Division	Range
JE-0006-1 JI-00582 JR-0006 JE-0605-2 JI-00681 JR-0005	Detector Indicator Recorder Detector Indicator Recorder	Yes Mild Mild Yes Mild Mild	Yes Yes Yes Yes Yes Yes	A/MCC2BY B/MCC2BZ	10 ⁻⁸ to 200% 10 ⁻⁸ to 200% 10 ⁻⁸ to 200% 10 ⁻⁸ to 200%

Note: JR-0005 and 0006 are two scales within a common recorder.

Inspection Findings

The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.2 Reactor Coolant System Hot and Cold Leg Water Temperature

The licensee has determined that these variables are Type A. This Category 1 instrumentation is used, in part, to ensure the proper cooldown rate and to monitor system temperature. Each of the two hot legs and four cold legs of the reactor is monitored by a 200-ohm resistance temperature detectors (RTDs). Category 2 two-pen recorders (one pen per channel) are used. The recorder is optically isolated from both Category 1 instrument loops by fully qualified Foxboro isolators. Information on the cold leg water temperature instrumentation was typical of all four loops. Information on the Reactor Coolant System (RCS) hot and cold leg water temperature instrumentation was as follows:

Tag Number	Function	EQ Listed	Seismic Listed	Power Division	Instrument Range
Hot Leg Wa	ter Temperatu	re			
TE-911-1	Detector	Yes	Yes	A/Y01	
TE-921-2	Detector	Yes	Yes	B/Y02	
TR-911-1	Recorder	Mild	Yes	A/Y01	0-710°F
Cold Leg W	ater Temperat	ure			
TE-925-1	Detector	Yes	Yes	A/Y01	
TE-915-2	Detector	Yes	Yes	B/Y02	
TR-915-2	Recorder	Mild	Yes	B/Y02	0-710°F

The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97. However, the SONGS Unit 2/3 FSAR states that the range of the cold leg water temperature instrumentation is $0-600^{\circ}$ F. The installed instrumentation has a greater range of $0-710^{\circ}$ F. The licensee agreed to modify their FSAR to show the correct range.

3.3 RCS Pressure

The licensee has determined that this is a Type A variable. This Category 1 instrumentation is used, in part, to verify the correct relation between system pressure and temperature. Regulatory Guide 1.97 recommends a range of 0-4000 psig for these Combustion Engineering units. Information on the RCS pressure transmitters and recorders were as follows:

Tag Number	Function	EQ Listed	Seismic Listed	Pow Divis	er ion_			Ins	Range	ent e
PT-0102-1	Detector	Yes	Yes	A/Vital	Bus	1				
PT-0102-2	Detector	Yes	Yes	B/Vital	Bus	2		6.		
PT-0102-3	Detector	Yes	Yes	C/Vital	Bus	3				
PT-0102-4	Detector	Yes	Yes	D/Vital	Bus	4				
PR-0102-1	Recorder	Mild	Yes	A/Vital	Bus	1	0	-	3000	psig
PI-D102-A1	Indicator	Mild	Yes	A			0	*	3000	psig
PI-0102-A2	Indicator	Mild	Yes	В			0		3000	psig
PI-0102-B1	Indicator	Mild	Yes	С			0	-	3000	psig
PI-0102-B2	Indicator	Mild	Yes	D			0	-	3000	psig

Inspection Findings

The SER for Regulatory Guide 1.97 accepted the O - 3000 psig range pending the resolution of the Anticipated Transient Without Scram (ATWS) issue. An SCE letter (M. O. Medford) to the NRC (G. W. Knighton), dated June 6, 1986, proposed resolving the ATWS issue with the addition of a diverse scram system at Units 2&3. As NRR has not resolved the ATWS issue for San Onofre-2/-3, the inspectors conclude that the O - 3000 psig range is still acceptable in the interim pending NRR completing action on the ATWS issue for San Onofre-2/-3. The inspectors found the RCS pressure instrumentation to meet Regulatory Guide 1.97 requirements.

3.4 Refueling Water Storage Tank Level

The licensee has defined this as a Type A variable. The Refueling Water Storage Tank (RWST) provides a supply of borated water during normal plant operation. It also supplies water to the safety injection pumps following an accident. Type A variables impose Category 1 recommendations. All instrumentation for this variable is located in a mild post-accident environment. Information on the RWST level transmitters and recorders were as follows:

Tag Number	Function	EQ Listed	Seismic Listed	Power Division	Instrument Range		
LT-305-1 LT-305-2 LT-305-3 LT-305-4 LR-305-1	Transmitter Transmitter Transmitter Transmitter Recorder	Mild Mild Mild Mild Mild Mild	Yes Yes Yes Yes Yes	A/Vital Bus 1 B/Vital Bus 2 C/Vital Bus 3 D/Vital Bus 4 A/Vital Bus 1	 0 to 100%		
LI-305-1 LI-305-2 LI-305-3 LI-305-4	Indicator Indicator Indicator Indicator	Mild Mild Mild Mild Mild	Yes Yes Yes Yes	A B C D	(0 to 384.5 in.) 0 - 100% 0 - 100% 0 - 100%		

Inspection Findings

The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.5 Containment Pressure

The licensee has determined that this is a Type A variable. This Category I instrumentation is used to monitor post-accident containment conditions and the performance of those engineered safety features designed to control the post-accident containment environment. There are four channels of wide range (-4 psig to 85 psig) instrumentation and two channels of wide-wide range instrumentation. Information on this instrumentation were as follows:

Tag Number	Function	EQ Listed	Seismic Listed	Power Division		Ir	Ra	rume	ent e	
PT-0352-1	Transmitter	Yes	Yes	A/Vital	Bus	1				
PR-0352-1	Recorder	Mild	Yes	A/Vital	Bus	1	-4	to	85	psig
PI-0352-1	Indicator	Mild	Yes				-4	to	85	psig
PT-0352-2	Transmitter	Yes	Yes	B/Vital	Bus	2				
PI-0352-2	Indicator	Mild	Yes				-4	to	85	psig
PT-0352-3	Transmitter	Yes	Yes	C/Vital	Bus	3				16.2
PI-0352-3	Indicator	Mild	Yes				-4	to	85	psig
PPT-0352-4	Transmitter	Yes	Yes	D/Vital	Bus	4				
PI-0352-4	Indicator	Mild	Yes				-4	to	85	psig
PT-0353-1	Transmitter	Yes	Yes	A/Vital	Bus	1				

Tag Number	Function	EQ Listed	Seismic Listed	Power Division		I	R	rume	ent e
PR-0353-1 PI-0353-1	Recorder	Mild Mild	Yes Yes	A/Vital Bus	1	0	to	180 200	psig
PT-0354-2 PI-0354-2	Transmitter Indicator	Yes Mild	Yes Yes	B/Vital Bus	2	0	to	200	psig

The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.6 Containment Sump Water Level

The licensee has determined that this is a Type A variable. The instrumentation for this variable consists of three sets of two channels. The ranges of these three sets of instrumentation overlap to cover a total range of from 11 feet, 11 inches, to 30 feet, 2 inches. This instrumentation is used, in part, to assess containment conditions prior to switching to the recirculation mode, and to monitor the water level in containment. Each set of instrumentation uses a separate dual-pen recorder. Each channel of instrumentation is optically isolated from the recorder by fully qualified Foxboro isolators. Information on the containment sump water level transmitters and recorders were as follows:

Tag Number	Function	EQ Listed	Seismic Listed	Power Division			Ins	Ran	men ige	t
Normal Ran	ge									
LT-5853-1	Transmitter	Yes	Yes	A/Vital	Bus 1					
LT-5853-2	Transmitter	Yes	Yes	B/Vital	Bus 2					
LR-5853-2	Recorder	Mild	Yes	B/Vital	Bus 2	2 11	11'	to	16	6"
Emergency	Range									
LT-9386-1	Transmitter	Yes	Yes	A/Vital	Bus 1					
LT-9386-2	Transmitter	Yes	Yes	B/Vital	Bus 2					
LR-9386-1	Recorder	Mild	Yes	B/Vital	Bus 2	12	to	19'	9"	
Wide Range										
LT-9387-1	Transmitter	Yes	Yes	A/Vital	Bus 1					
LT-9388-2	Transmitter	Yes	Yes	B/Vital	Bus 2					
LR-9387-1	Recorder	Mild	Yes	A/Vitaï	Bus 1	18	2"	to	30'	2"

Inspection Findings

The range on these instruments is greater than the range specified in the Regulatory Guide (0 to 600,000 gallons). The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.7 Containment Hydrogen Concentration

The licensee has determined that this is a Type A variable. Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. Some of the uses for this instrumentation include long-term surveillance of the containment for potentially explosive concentrations of hydrogen, and to determine that accident mitigation is being successfully accomplished. Information on the containment hydrogen concentration instrumentation were as follows:

Tag Number	Function	EQ Liste	Seismic d Listed	Pi Di	ower vision	-	Instrument Range
AET-8100-1 AI-8108A AET-8111-2 AI-8118A2 AR-8118A2	Sensor/Tr Indicator Sensor/Tr Indicator Recorder	rans. rans.	Yes Mild Yes Mild Mild	Yes Yes Yes Yes Yes	A/MCC A/MCC B/MCC B/MCC B/MCC	BY BY BZ BZ BZ	0 to 10% 0 to 10% 0 to 10%

Inspection Findings

The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.8 Coolant Level in Reactor

The licensee has classified this as a Type A variable. Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. The instrumentation is a dual channel heated-junction thermocouple system. Each thermocouple probe assembly consists of eight discrete thermocouples that are surrounded by resistance heating wire and eight nearby unheated thermocouples. The thermocouples are shielded from splaring, flow changes, and turbulence. The eight thermocouple pairs are distributed along the length of the probe. The presence of liquid coolant is indicated by the same temperature at each thermocouple of the pair. Vapor is indicated at a pair location by a temperature differential being observed (by computer and by the QSPDS) between the two thermocouples cf the pair. The probe assembly, seals, and electrical connections are environmentally qualified. Other components of the system are located in a mild environment. All portions of this system are seismically qualified. Each channel is supplied with divisionally independent vital bus power.

Inspections Findings

The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.9 High Pressure Safety Injection Flow

The licensee has defined the High Pressure Safety Injection (HPSI) flow as a Type A variable. This instrumentation should therefore be Category 1. The flow orifices and transmitters are located in a harsh post-accident environment. The square root extractors are located in a mild environment and otherwise meet the same design requirements. Recording is provided by the Critical Function Monitoring System (CFMS). The CFMS is not Category 1; however, fully qualified Foxboro optical isolators isolate the CFMS from both the Category 1 instrumentation and the QSPDS. Information on the HPSI flow transmitters were as follows:

Tag Number	Function	EQ Listed	Seismic Listed	Power Division		n	Instrument Range
FT-311-2 FI-311-2 FT-321-1 FI-321-1 FT-331-1 FI-331-1 FT-341-2 FI-341-2 FI-9435-2	Transmitter Indicator Transmitter Indicator Transmitter Indicator Transmitter Indicator Transmitter	Yes Mild Yes Mild Yes Mild Yes Mild Yes	Yes Yes Yes Yes Yes Yes Yes Yes	B/Vital A/Vital A/Vital B/Vital	Bus Bus Bus Bus	2 1 1 2 2	Header Flow 0 - 500 gpm Header Flow 0 - 500 gpm Header Flow 0 - 500 gpm Header Flow 0 - 500 gpm Header to Hot Leg
FI-9435-2 FT-9421-1 FI-9421-1	Indicator Transmitter Indicator	Mild Yes Mild	Yes Yes Yes	A/Vital	Bus	1	Flow 0 - 500 gpm Header to Hot Leg Flow 0 - 500 gpm

Inspection Findings

The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.10 Core Exit Temperature

The licensee has classified this variable as Type A. Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable. The core exit temperature instrumentation consists of two channels composed of 28 chromel-alumel thermocouples each. The thermocouple wires use guide tubes and seal assemblies to penetrate the reactor vessel head. These thermocouples have divisional reference junctions that provide the signal to the QSPDS. The QSPDS displays and records the temperature of all thermocouple locations. The average core exit temperature is also displayed on demand. Information on typical thermocouples were as follows:

Tag	Function	EQ	Seismic	Power	Instrument
Number		Listed	Listed	Division	Range
NOZZ95-1TC	Ch A TC	Yes	Yes	A/Y01	32 to 2300°F
NOZZ100-1TC	Ch B TC	Yes	Yes	B/Y02	32 to 2300°F

Inspection Findings

The inspectors found that the all of the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.11 Steam Generator Level

The licensee has classified this as a Type A variable. The instrumentation is used, in part, to detect steam generator tube ruptures, to monitor the steam generator level following a feedwater line break, and to ensure a usable reactor heat sink. Regulatory Guide 1.97 recommends that this instrumentation be Category 1 with a range from the tube sheet to the separators. There are two steam generator at each unit (2&3) at San Onofre. The transmitters are located in a harsh post-accident environment. Information on the steam generator wide range level transmitters and recorders were as follows:

Tag Number	Function	EQ Listed	Seismic Listed	Power D	ivision/SG
LT-1115-1	Transmitter	Yes	Yes	A/Vital	Bus 1/SG89
LT-1115-2	Transmitter	Yes	Yes	B/Vital	Bus 2/SG89
LR-1115-1	Recorder	Mild	Yes	A/Vital	Bus 1/SG89
LT-1125-1	Transmitter	Yes	Yes	A/Vital	Bus 1/SG88
LT-1125-2	Transmitter	Yes	Yes	B/Vital	Bus 2/SG88
LR-1125-2	Recorder	Mild	Yes	B/Vital	Bus 2/SG88

Inspection Findings

The Regulatory Guide 1.97 range for this variable is from the tube sheet to the separator. The range on the instruments is 0 to 100%. The inspectors had questioned the range of this variable. The information provided by the licensee showed that the tube sheet is located at 135.25 inches and the bottom of the seperator is at 631.375 inches. The taps for the wide range level are shown at 148.25 and 786 inches. The licensee's instrumentation is 13 inches above the tube sheet. At 13 inches above the tube sheet, the steam generator is essentially empty. The upper tap is 156.625 inches more than what is specified in the Regulatory Guide. Therefore, this range would be adequate to monitor this variable during accident and post-accident conditions. The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified for this variable.

3.12 Steam Generator Pressure

The licensee classifies this as a Type A variable; as such, the instrumentation supplied should be Category 1. Each steam generator has four associated pressure channels. This instrumentation is used to monitor the secondary steam pressure following a steam generator tube rupture or steamline break. The transmitters are located in a harsh post-accident environment. Information on the steam generator pressure instrumentation were as follows:

Tag Number	Function	EQ Listed	Seismic Listed	Power Instrument Division Range		
PT-1013-1 PI-1013-1 PR-1013-1	Transmitter Indicator Recorder	Yes Mild Mild	Yes Yes Yes	A/Vital Bus 1 Ā/Vital Bus 1	0 to 1.2K psia 0 to 1.2K psia	
PT-1013-2 PT-1013-2	Transmitter Indicator	Yes Mild	Yes Yes	B/Vital Bus 2	0 to 1.2K psia	
PT-1013-3 PI-1013-3	Transmitter Indicator	Yes Mild	Yes Yes	C/Vital Bus 3	0 to 1.2K psia	
PT-1013-4 PI-1013-4	Transmitter Indicator	Yes Mild	Yes Yes	D/Vital Bus 4	0 to 1.2K psia	
PT-1023-1 PI-1023-1 PR-1023-1	Transmitter Indicator Recorder	Yes Mild Mild	Yes Yes Yes	A/Vital Bus 1 Ā/Vital Bus 1	0 to 1.2K psia 0 to 1.2K psia	
PT-1023-2 PI-1023-2	Transmitter Indicator	Yes Mild	Yes Yes	B/Vital Bus 2	0 to 1.2K psia	
PT-1023-3 PI-1023-3	Transmitter Indicator	Yes Mild	Yes Yes	C/Vital Bus 3	0 to 1.2K psia	
PT-1023-4 PI-1023-4	Transmitter Indicator	Yes Mild	Yes Yes	D/Vital Bus 4	0 to 1.2K psia	

The inspectors found that this instrumentation meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.13 Pressurizer Heater Current

Regulatory Guide 1.97 recommends that the current used by the pressurizer heaters be monitored by Category 2 instrumentation. The licensee has provided current monitoring for the two pressurizer heater banks that are backed by diesel generator Class 1E power. All heaters are provided by 480 VAC. All instrumentation is located in a mild environment. Information on this instrumentation were as follows:

Tag	Function	EQ	Seismic	Power	Instrument	
Number		Listed	Listed	Division	Range	
IT-0100A	Transmitter	Mild	Yes	A	0 to 300A	
II-0100A	Indicator	Mild	Yes	A		
IT-0100D	Transmitter	Mild	Yes	B		
II-0100D	Indicator	Mild	Yes	B		

Inspection Findings

The inspectors found that the instrumentation for this variable meets the Category 2 recommendations specified in Regulatory Guide 1.97.

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3.14 Status of Standby Power

Regulatory Guide 1.97 recommends plant specific Category 2 instrumentation for this variable. The licensee has instrumentation to monitor the standby power sources for availability and usage. All of this instrumentation is located in a mild environment with readouts in the control room. Instrumentation observed in the control room is marked in that column. The licensee committed to provide the following instrumentation for this variable:

Power Source	Observed Ranges
4K VAC Buses Volts Current Frequency	0 to 5.25 KV 0 to 3 KA 55 to 65 HZ
480 VAC Buses Volts	0 to 600V
125 VDC Buses Volts Current	0 to 150V 0 to 1200A
120 VAC Inverter Voltage Alarm Power Source	Yes Observed Ranges
Emergency Diesel Generator Volts Current	0 to 5.25KV 0 to 1KA
Non-Class lE uninterruptable pow	ver system
Voltage Alarm	Yes
Main Steam to Auxiliary Feedwate Steam Generator Pressure Isolation Valve Position HV 8200/HV 8201	r Turbine See Section 3.12 Yes/Yes

Inspection Findings

The inspectors found that the instrumentation for this variable meets the Category 2 recommendations specified in Regulatory Guide 1.97.

3.15 Pressurizer Level

Regulatory Guide 1.97 recommends Category 1 instrumentation for this variable with a range from the bottom to the top of the pressurizer vessel. The pressurizer level instrumentation is an aid to the operator in the proper operation of the pressurizer and the reactor coolant system. Information on the pressurizer level transmitters, indicators, and recorder were as follows:

Tag	Function	EQ	Seismic	Power	Instrument
Number		Listed	Listed	Division	Range
LT-0110-1 LI-0110-1 LR-0110-1	Transmitter Indicato: Recorder	Yes Mild Mild	Yes Yes Yes	A/Vital Bus 1 Ā/Vital Bus 1	0 to 100% 0 to 100%
LT-0110-2	Transmitter	Yes	Yes	B/Vital Bus 2	0 to 100%
LI-0110-2	Indicator	Mild	Yes		

The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

3.16 Containment Atmosphere Temperature

Regulatory Guide 1.97 recommends Category 2 instrumentation for the variable to indicate the accomplishment of containment cooling. Information on the containment atmosphere temperature instrumentation were as follows:

Equipment Number	Function	EQ Listed	Seismic Listed	Pow	er		Display
TE-9903-1 TI-9903-1 TR-9903-1	Element Indicator Recorder	Yes Mild Mild	Yes Yes Yes	A/Vital Ā/Vital	Bus Bus	1 1	0 - 400°F 0 - 400°F
TE-9911-2	Element	Yes	Yes	B/Vital	Bus	2	Computer Display Only

Inspection Findings

The inspectors found that the instrumentation for this variable meets the Category 2 recommendations specified in Regulatory Guide 1.97.

3.17 Condensate Storage Tank Water Level

Regulatory Guide 1.97 recommends Catagory 1 instrumentation to ensure the availability of the primary water supply for auxiliary feedwater. The licensee identified tank T-121 as the primary source of auxiliary feedwater. Thus, level instrumentation for this tank should be Category 1. Instrumentation for backup sources of auxiliary feedwater (identified as tank T-120) are specifically allowed to be Category 3 by the regulatory guide. Instrumentation for T-120 therefore, was not examined as part of this audit. Isolation between the Category 1 instrumentation for T-121 and the non-Category 1 computer display is provided by fully qualified Foxboro optical isolators. Call up displays is a computer are specifically allowed for Category 1 instrumentation by Revision 3 of Regulatory Guide 1.97. Information on the level instrumentation for T-121 were as follows:

Equipment Number	Function	EQ Listed	Seismic Listed Yes Yes Yes	Power			_Display
LT-3204-1 LR-3204-1 LT-3204-2	Detector Recorder Detector	Yes Mild Yes		A/Vital A/Vital B/Vital	Bus Bus Bus	1 1 2	0 to 100%* Computer

*100% is equal to 144,000 gallons

Inspection Findings

The inspectors found that the instrumentation for this variable meets the Category 1 recommendations specified in Regulatory Guide 1.97.

4. Surveillance, Testing, and Calibration

The licensee uses a computerized data base, the San Onofre Maintenance Management System (SOMMS). Part of the function of this system is to generate the maintenance orders for recalibration of instruments as a repetitive maintenance task and provide a historical record of instrument calibrations.

The inspectors asked for the calibration records for the instruments inspected, the frequency of calibration, and the next due date for recalibration. The licensee was maintaining all of the instruments inspected in calibration.

There were several variables for which the surveillance, testing, and calibration data was not verified. These variables are Pressurizer Heater Current, Core Exit Thermocouples, and Status of Standby Power. The surveillance, testing, and calibration data will be followed up at a later inspection (50-361/88-18-01).

5. Inspector Observations

During the course of the inspection, the inspectors made the following observations:

A. The licensee does not have official instrument loop drawings. The tracing of the instrument wiring from transmitter to recorder using the licensee's official electrical drawings was a time consuming and laborious process. At several times during the inspection, the inspectors felt that the inspection would not be completed at the end of the week, since it was even difficult for licensee personnel to trace the wiring path. The inspectors then determined that the station Instrumentation and Control (1&C) personnel had unofficial loop diagrams. The inspectors used these unofficial loop drawings made by the I&C technicians as a guide to help trace the instrument loop. The licensee stated that they have a program to eventually update these drawings to loop diagrams.

- B. The inspectors noted some discrepancies with the FSAR listing of these variables. These discrepancies did not involve any safety significant concerns. The licensee committed to make updates to the FSAR to correctly reflect installed plant equipment as noted in tables 7.5-1 and 7.5-2.
- C. On 6/29/88, during the tour of the control room, the inspectors viewed the back of control room panel 59 for Unit 2. This panel has both trains of many of the post-accident monitoring variables. The inspectors noted that these instruments were separated by barriers where the recorders and indicators are placed in the panel. The inspectors also noted that the wiring for the train A and train B wires were in coils, and that the train A and train B wires were in coils, and that the train A and train B wires were in coils, where the cabinet. There was also a non-associated (X train) wire with the A train, which was in contact with the B train.

The separation criteria for safety related wiring is described in IEEE 384-1974, "IEEE Trial-Use Standard Criteria for Separation of Class IF Equipment and Circuits", which requires 6 inches of air or a barrier between wires of different Class IE trains. The licensee's program for separating wires is described in Chapter 8 of the FSAR and in Construction Specification (CS) E03 "Safety Related and Non-Safety Related Electrical Construction Specification for Cable Splicing, Termination and Supports". As described in the FSAR and CS E03, the licensee has certain exceptions to the separation criteria of 6 inches. For example, the wires can touch each other if both trains of wires are low energy. The non-associated train is allowed by the licensee's program to touch 1 train, but is not allowed to touch two trains. However, the recorders in this panel were running off of class IE power, which was not low energy. Additionally, Train A had a non-associated train (X) wire associated with it, which was in proximity to both trains at that time. The failure to maintain these wires separate is an apparent violation of the construction specification (50-361/88-18-02).

The licensee evaluated this situation and declared the panel inoperable several hours later, entered a 48 hour action statement and generated Nonconformance Report (NCR) 2-2245. The licensee separated the wires under Maintenance Order 88062608000, which was completed 6/30/88.

After this lack of separation was initially discovered, the licensee realized the possible generic concerns with separation of wiring in other panels. The licensee then trained several groups of people to inspect and verify that the wiring was in accordance with their construction specification for different panels.

On 7/1/88, after the exit meeting, the inspector talked to the groups of people verifying the separation in the other panels. The licensee had started examining the cabinets for Unit 3, which was shut down. The licensee informed the inspector that they would do an evaluation after their Unit 3 inspection, to determine if the problem was significant enough to do an immediate inspection of the Unit 2 cabinets. At that time, the inspector verified the separation of the wiring in the post-accident monitoring panel and noted an unattached wire in the bottom of the cabinet around the train B wiring. The licensee stated that this was not acceptable and it was removed by the licensee. The licensee was inspecting other cabinets at this time and stated that they would also evaluate the cleanliness concurrently when verifying the separation. The licensee also stated that they would inform the inspector of any NCR's issued and problems found. During the next week, the inspector was informed of the problems found. These are noted below and the licensee informed the inspector that the Unit 2 cabinets would be inspected when the plant comes down to mode 5 for more than several days.

The inspector was informed that the licensee additionally issued NCR 2-2426, and NCR's 3-2067 through 3-2088. The problems described by these NCR's are similar to the problem found with the post-accident monitoring cabinet. These problems include X train wires that touch or come within 6 inches of different trains, different class 1 trains of wires within 6 inches of each other, and some problems with cables and their barriers. Some of the more significant NCR's involve potential separation problems with the Engineered Safety Features (ESF), the Core Protection Calculator and the Plant Protection System (PPS) cabinets. These NCR's are 2-2426, 3-2069, 3-2072, 3-2073, 3-2074, 3-2077, 3-2083 and 3-2085. The inspector was informed by the licensee that this purchased equipment from Combustion Engineering was certified, and they believed that an analysis had been done to show that the separation was in accordance with IEEE 384. The licensee was following up on the qualification of the panels. All of the Unit 3 NCR's will be followed up at later date (50-362/88-19-01). The results of the inspection of Unit 2 cabinets and any NCR's generated will also be followed up in a future inspection report (50-361/88-18-03).

Exit Interview

The inspectors met with the licensee representatives identified in paragraph 1 on July 1, 1988. The scope of the inspection and the findings up to that date were discussed. The inspectors identified that some additional information was requested, and that this information would be reviewed in Region V, and the findings identified in this report.