San Onofre
Nuclear Generating Station
Unit 1
Regulatory Guide 1.97 Review

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Prepared by: Chris Cotton Date 12/12/85
Chris Cotton

Reviewed by: R. W. Hess Date 12/13/85
Robert W. Hess

Approved by: Craig D. Sellers Date 12/13/85
Craig D. Sellers

Cygna Energy Services
101 California Street Suite 1000
San Francisco, California 94111

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1.0 INTRODUCTION

This report describes the review performed to identify and evaluate the instrumentation necessary for San Onofre Nuclear Generating Station Unit 1 (SONGS 1) to assess plant and environs conditions during and following an accident. The SONGS 1 Emergency Operating Instructions (EOIs) [1], and SONGS Emergency Plan (EP) [2], were reviewed to determine the specific variables that provide operators with the information required to safely shut down the plant and monitor radioactive releases that may pose a threat to the public. Plant design documents were used as the basis for selecting instrumentation installed at SONGS 1 that provides the means of monitoring the critical variables.

The degree of compliance of the available instrumentation that monitors the critical plant variables was evaluated against the design and qualification requirements of Regulatory Guide 1.97 Rev. 2 (RG 1.97) [3]. Supporting justifications are provided for instrumentation that meets the intent of the Regulatory Guide but deviates from the specific design or qualification criteria. Modifications are proposed in cases where the available instrumentation does not meet the intent of the Regulatory Guide design and qualification requirements.

2.0 METHOD OF REVIEW

In the event of an accident at a nuclear power plant, it is essential that operating personnel be provided information about the plant systems and releases that allow them to safely shut down the plant and take steps necessary to protect the public. RG 1.97 provides guidance on this subject in terms of a list of "variables" to be monitored during and following an accident. These "variables" are temperatures, pressures, levels, dose rates, etc., that the Regulatory Guide recommends monitoring on control room (or accessible) instruments during and following an accident. RG 1.97 specifies certain design and qualification requirements for these monitoring instruments based on their importance to safety.

It is recognized that full compliance with the guidance provided in RG 1.97 is not necessary for safe plant shutdown and monitoring following an accident. Consistent with this philosophy, this review was conducted on a "plant-specific" basis, wherein the variables specifically required for post-accident operations at SONGS 1 were identified and reviewed to determine design and qualification status.

Four separate tasks were performed in conducting the Regulatory Guide 1.97 Review:

- Define the SONGS 1 Variables
- Identify the SONGS 1 Instruments
- Compare SONGS 1 Variables with RG 1.97 design and qualification requirements
- Justify Discrepancies/Provide Recommendations

2.1 SONGS 1 Variables

The list of SONGS 1 variables specifically required for the operators to respond to an accident was developed based on review of the SONGS 1 Emergency Operating Instructions (EOIs) and the SONGS Emergency Plan (EP). The EOIs are based primarily on the Westinghouse Owner's Group Emergency Response Guidelines [4] which identify the variables and systems that are used to bring the plant to a safe shutdown condition following an accident.

The variables were broken down into three types based on their role in accident monitoring and control of plant systems. Type I variables are those that provide information needed by the operators to take preplanned manual actions in carrying out the applicable EOIs and bringing the plant to a safe shutdown condition. Type II variables are those which provide the information needed to determine whether plant systems and/or operator actions are accomplishing the EOI specified "critical safety functions." Type III variables are those monitoring release of radioactive materials and required for implementation of radiological dose assessment actions of the offsite emergency plan. Further discussion of these variables and the basis for their selection is provided in Section 3.0.

2.2 SONGS 1 Instruments

Once the SONGS 1 variables were selected, a review of the instrumentation presently installed in the plant was performed to determine the adequacy of this instrumentation to monitor the desired variables. SONGS 1 design documents, including piping and instrumentation diagrams, electrical single lines, and control

logics were used as a basis for identifying the SONGS 1 instruments. Detailed data was collected for each of the instruments to ensure that instrumentation was designed and qualified in a manner commensurate with the safety significance of the measured variable. Further discussion of the instruments is provided in Section 4.0.

2.3 Comparison with RG 1.97 Requirements

RG 1.97 specifies design and qualification requirements for monitoring instruments based on the safety significance of the monitored variable. The current design and qualification data for the SONGS 1 instruments were reviewed against the criteria specified in RG 1.97 for instruments monitoring each corresponding variable. Further discussion is provided in Section 5.0.

2.4 Justifications/Recommendations

Some discrepancies were identified as a result of the review of variables and instruments against the design and qualification requirements of RG 1.97. In many cases, the available plant instrumentation can be expected to adequately and dependably provide the required information to plant operators, meeting the intent of the RG 1.97 design and qualification requirements, even though the instrumentation deviates from one or more of the specific requirements. In these cases, justification is provided for use of existing instruments to meet post-accident monitoring requirements for SONGS 1.

In cases where the existing instrumentation does not provide the capability to monitor a variable included in the SONGS 1 list, or design and qualification status does not ensure proper monitoring

capability will be available to the operators, appropriate recommendations are provided to upgrade monitoring capability.

The deviations between the design and qualification of instruments and RG 1.97 requirements for design and qualification, and associated justifications or recommended modifications, are discussed in Section 6.0.

3.0 SONGS 1 VARIABLES

The SONGS 1 variables are plant specific variables that must be monitored by the control room personnel during and following accident conditions. These variables are used by the control room personnel to perform their role in the Emergency Operating Instructions in evaluating, assessing, monitoring, and executing control room functions. The variables identified for the list are those that provide information allowing the operators to (I) take the necessary preplanned actions to accomplish safe shutdown of the plant, (II) ensure accomplishment of critical plant safety functions, and (III) monitor release of radioactive materials and implement the radiological dose assessment actions of the offsite Emergency Plan. The selection of variables for each of these purposes is discussed in detail below.

3.1 TYPE I: Variables Monitored to Initiate Preplanned Manual Actions

The variables included in the list as Type I are those providing information allowing the control room operator to take specific manually controlled actions for which no automatic control is provided and that are required for plant safety systems to accomplish their safety functions for design basis accident events. The SONGS 1 EOIs were used as the basis for the selection of variables providing this primary information. The EOI entry instruction identifies actions to be taken by the control room personnel to verify the proper response of the automatic protection systems following a reactor trip, safety injection, or loss of AC power (in certain operating modes). The entry instruction then leads the operator through a series of diagnostic checks and directs transition to an applicable Optimal Recovery Instruction (ORI) or Function Restoration Instruction (FRI). Variables providing the

information necessary for the operators to take specific manual actions to complete the ORIs and FRIs and bring the plant to a safe shutdown condition comprise the Type I list. The Type I variables and the required operator actions based on one or more of these variables are given in Table 3-1.

3.2 TYPE II: Variables Monitored to Ensure Accomplishment of Plant Safety Functions

The variables included in the list as Type II are those given in the EOIs that provide information to indicate whether the plant "critical safety functions" are being accomplished. The EOIs define plant "critical safety functions" as the following:

- Subcriticality
- Core Cooling
- Secondary Heat Sink
- RCS Integrity
- Containment Integrity
- RCS Inventory

The variables providing the means of determining if the plant engineered-safety-features and/or operator actions are accomplishing these "safety functions" make up the Type II variable list. The Type II variables and the primary critical safety function that they monitor are given in Table 3-2.

3.3 TYPE III: Variables Monitoring Radioactive Releases

The variables included in the list as Type III are those that allow implementation of the radiological dose assessment actions of the offsite Emergency Plan on the basis of in-plant direct radiation

levels and release of radioactive materials from the plant. The EP was reviewed to determine the plant radiation and release-related variables that must be monitored to direct implementation of the plan and allow estimates of the magnitude of any threat to the public from radioactivity releases. The variables included as Type III are limited to SONGS 1 specific variables. The remaining variables required to be monitored for implementation of the EP, including meteorological variables, have been previously evaluated [5,6]. The Type III variables are listed in Table 3-3.

TABLE 3-1

SONGS 1 Variables - Type I

VARIABLE	REQUIRED OPERATOR ACTION	REF EOI SO1-
o RCS Subcooling	- Initiate/Terminate SI	1.0-10, 1.0-12, 1.0-21, 1.0-31, 1.3-1, 1.4-1
	- Depressurize RCS	1.4-1
o RCS Hot Leg Temperature	- Stop Uncontrolled Cooldown	1.1-1, 1.4-1
	- Initiate/Terminate SI	1.0-31, 1.2-1
	- Place RHR in Service	1.0-22, 1.0-31
	- Initiate RCS Feed/Bleed	1.3-1
o RCS Cold Leg Temperature	- Control RCS Cooldown Rate to Maintain Specified Pressure/Temp Limits	1.0-30, 1.0-31, 1.0-32, 1.0-40, 1.4-1, 1.4-2
o Refueling Water Storage Tank Level	- Manual Transfer of SI to Cold Leg Injection/ Recirculation	1.0-10, 1.0-11, 1.0-12, 1.0-20, 1.0-22, 1.0-30, 1.0-32, 1.0-40, 1.2-1, 1.5-1
	- Manual Transfer to Containment Spray Recirculation	1.0-31
o Steam Generator Narrow Range Level	- Manually Adjust AFW Flow to Maintain Steam Generator Level	1.0-10, 1.0-11, 1.0-12, 1.0-20, 1.0-21, 1.0-30, 1.0-32, 1.0-40, 1.0-60, 1.2-1, 1.3-2, 1.3-3
	- Terminate SI	1.0-10, 1.0-21
	- Terminate Feed/Bleed	1.3-1

TABLE 3-1 (continued)

SONGS 1 Variables - Type I

VARIABLE	REQUIRED OPERATOR ACTION	REF EOI SO1-
o Auxiliary Feedwater Tank Level	- Manual Transfer to Alternate AFW Supply	1.0-10, 1.0-11, 1.0-12, 1.0-20, 1.0-22, 1.0-30, 1.0-31, 1.0-40, 1.3-1
o RCS Pressure	- Initiate/Terminate SI	1.0-10, 1.0-11, 1.0-12, 1.0-21, 1.0-31, 1.0-40, 1.0-60
	- Place RHR in Service	1.0-22, 1.0-31, 1.0-40.
	- Depressurize RCS	1.4-1, 1.4-2
	- Select Feed Path to Steam Generators or SI	1.3-1
o Pressurizer Level	- Initiate/Terminate SI	1.0-10, 1.0-12, 1.0-21, 1.0-31, 1.3-1
	- Operate Charging	1.0-32, 1.0-40, 1.6-1
	- Stop Depressurization of RCS	1.4-1
o Containment Pressure	- Initiate/Terminate SI	1.0-11, 1.0-12, 1.0-60
	- Transfer to Containment Spray Recirculation Mode	1.5-1
o Containment Sphere Level	- Manual Transfer to Cold Leg Injection/Recirculation	1.0-23, 1.0-32, 1.2-1, 1.5-1

TABLE 3-1 (continued)

SONGS 1 Variables - Type I

VARIABLE	REQUIRED OPERATOR ACTION	REF EOI SO1-
o Auxiliary Feedwater Flow	- Terminate SI	1.0-31
	- Establish Secondary Heat Sink; Initiate/Terminate Feed/Bleed	1.0-11, 1.3-1
	- Limit Flow to Prevent Water Hammer	1.3-3
o Main Steam Pressure	- Depressurize RCS/Place RHR in Service	1.0-40
	- Stop Steam Dump/Throttle FW Flow to Prevent Uncontrolled Cooldown	1.1-1
o Containment Hydrogen Concentration	- Manually start hydrogen recombiners	1.2-1, 1.5-1
Recirculation Flow	- Manual transfer to cold leg injection	1.0-20, 1.0-23, 1.0-40, 1.2-1, 1.2-2, 1.3-1, 1.4-1
	- Manual transfer to hot leg injection	1.0-24

Table 3-2

SONGS 1 Variables - Type II

VARIABLE	PRIMARY CRITICAL SAFETY FUNCTION MONITORED	REF EOI SO1-
o RCS Hot Leg Temperature	- Core Cooling	1.0-1, 1.0-10, 1.0-11, 1.0-12, 1.0-20, 1.0-21, 1.0-22, 1.0-30, 1.0-31, 1.0-32, 1.0-60, 1.1-1, 1.2-1, 1.2-2, 1.2-3, 1.3-1, 1.4-1
o RCS Cold Leg Temperature	- RCS Integrity	1.0-1, 1.0-11, 1.0-12, 1.0-21, 1.0-22, 1.0-30, 1.0-31, 1.0-32, 1.0-40, 1.0-60, 1.4-1, 1.4-2
o Steam Generator Narrow Range Level	- Secondary Heat Sink	1.0-1, 1.0-10, 1.0-11, 1.0-12, 1.0-20, 1.0-21, 1.0-22, 1.0-30, 1.0-31, 1.0-40, 1.0-60, 1.2-1, 1.3-1, 1.3-2 1.3-3
o RCS Pressure	- RCS Integrity	1.0-1, 1.0-10, 1.0-11, 1.0-12, 1.0-20, 1.0-21, 1.0-22, 1.0-30, 1.0-31, 1.0-32, 1.0-40, 1.0-60, 1.0-61, 1.1-1, 1.2-1, 1.2-2, 1.3-1, 1.4-1, 1.4-2, 1.6-1
o Pressurizer Level	- RCS Inventory	1.0-1, 1.0-10, 1.0-11, 1.0-12, 1.0-20, 1.0-21, 1.0-22, 1.0-30, 1.0-31, 1.0-32, 1.0-40, 1.0-61, 1.3-1, 1.4-1, 1.6-1, 1.6-2

Table 3-2 (continued)

SONGS 1 Variables - Type II

VARIABLE	PRIMARY CRITICAL SAFETY FUNCTION MONITORED	REF EOI SO1
o Containment Pressure	- Containment Integrity RCS Integrity	1.0-1, 1.0-10, 1.0-12, 1.0-20, 1.0-21, 1.0-22, 1.0-30, 1.0-31, 1.0-40, 1.0-60, 1.2-2, 1.5-1
o Containment Radiation	- RCS Integrity	1.0-1, 1.0-10, 1.0-20, 1.0-40, 1.2-2, 1.5-3
o Containment Sphere Level	- RCS Integrity	1.0-1, 1.0-23, 1.0-32, 1.2-1, 1.5-1, 1.5-2
o Containment Sump Level	- RCS Integrity	1.0-10, 1.0-30, 1.0-40, 1.2-2
o Auxiliary Feedwater Flow	- Secondary Heat Sink	1.0-1, 1.0-10, 1.0-11, 1.0-12, 1.0-20, 1.0-21, 1.0-30, 1.0-31, 1.0-32, 1.0-40, 1.0-60, 1.1-1, 1.2-1, 1.3-1, 1.3-2, 1.4-1, 1.4-2
o Main Steam Pressure	- Secondary Heat Sink	1.0-10, 1.0-11, 1.0-12, 1.0-21, 1.0-22, 1.0-30, 1.0-31, 1.0-32, 1.0-40, 1.0-60, 1.1-1, 1.3-1, 1.3-3, 1.3-4
o Neutron Flux	- Subcriticality	1.0-1, 1.0-10, 1.0-11, 1.0-12, 1.0-21, 1.0-31, 1.0-40, 1.1-1, 1.1-2
o Core Exit Temperature	- Core Cooling	1.0-1, 1.0-11, 1.0-12, 1.0-21, 1.0-22, 1.0-31, 1.0-60, 1.2-1, 1.2-2, 1.3-1

Table 3-2 (continued)

SONGS 1 Variables - Type II

VARIABLE	PRIMARY CRITICAL SAFETY FUNCTION MONITORED	REF EOI SO1-
o RCS Subcooling	- Core Cooling	1.0-1, 1.0-10, 1.0-11, 1.0-12, 1.0-20, 1.0-21, 1.0-22, 1.0-30, 1.0-31, 1.0-32, 1.0-60, 1.1-1, 1.2-1, 1.2-2, 1.2-3, 1.3-1, 1.4-1
o Containment Isolation Valve Status	- Containment Integrity	1.0-10, 1.5-1, 1.5-3
o Control Rod Position	- Subcriticality	1.0-10, 1.0-11

TABLE 3-3

SONGS 1 Variables - Type III

VARIABLE	RESPONSE
o Steam Relief/Dump Vent Radioactivity	Implement dose assessment actions of the offsite emergency plan at the appropriate emergency action level based on magnitude of radiological release and corresponding dose estimate at the exclusion area boundary
o Vent Stack Effluent Release Rate	
o Vent Stack Effluent Radioactivity	
o Meteorological (Wind direction, wind speed, atmospheric stability)	

4.0 SONGS 1 SPECIFIC INSTRUMENTS

The SONGS 1 specific instruments are plant instruments available to monitor the variables discussed in Section 3.0. The available instruments were identified by a review of the EOIs, EP, system P&IDs, electrical drawings, and the control room instrument list.

Detailed design and qualification data for each of the SONGS 1 instruments was assembled and reviewed. The information provided for the SONGS 1 variables includes the following:

4.1 Equipment Qualification Status

The SONGS 1 Environmental Qualification (EQ) program documentation was used as the basis for determining the environmental qualification status of the instruments. The environmental equipment qualification status for instruments exposed to post-accident harsh environments was obtained from the SONGS 1 Equipment Qualification Master List [7].

Designation of the seismic qualification status of instruments that are part of safety-related systems was based on a review of the SONGS 1 Q-List [8]. Seismic qualification of these instruments will be reevaluated as part of the resolution of Unresolved Safety Issue A-46, "Seismic Qualification of Equipment in Operating Plants." Appropriate action will be taken in the event of any change in the seismic qualification status of an instrument due to this reevaluation.

4.2 Instrument Redundancy and Separation

Plant design documents were reviewed to determine if adequate redundant instrumentation exists to allow monitoring each of the specific variables requiring redundancy. Adequate redundancy exists when a single failure within either the accident monitoring instrumentation or its power source or supporting features, concurrent with an accident event, does not prevent the presentation of information necessary for the operating personnel to determine plant status and achieve a safe plant condition. Redundant means of recording variables is not required.

The cabling associated with a given instrument circuit was evaluated for separation and independence from its redundant instrument's circuit to determine if any credible single failure concurrent with event associated failures could compromise the availability of at least one variable monitoring channel.

4.3 Instrument Loop Power Source

Instrument loop power sources were determined by a review of the SONGS 1 electrical design drawings. These drawings included electrical single-line drawings, schematic diagrams and instrument loop diagrams.

4.4 Quality Assurance

The quality assurance requirements applied to instrumentation was determined by a review of the SONGS 1 Q-List [8]. The requirements of the quality assurance program given in 10 CFR 50, Appendix B, are implemented in accordance with the SONGS 1 Topical Quality Assurance Manual for safety-related components.

4.5 Display Type

The type of display provided for each of the variables was determined by a review of the SONGS 1 process and instrumentation diagrams, instrumentation loop diagrams and control panel layout drawings. These information sources were supplemented by control room inspections.

4.6 Range of Instruments

The calibrated range of all instruments was determined by review of instrument calibration sheets, design documents, and control room walkdowns.

The design and qualification status of the variables is discussed in Section 5.0.

5.0 COMPARISON WITH REG. GUIDE 1.97 REQUIREMENTS

Regulatory Guide 1.97 specifies five general types of variables that should be measured and monitored following an accident situation at a PWR. Each of the variables is assigned a design and qualification category (1, 2 or 3) that depends upon the importance of the variable in monitoring plant conditions. Category 1 provides the most stringent requirements and is intended for key variables. Category 2 has lesser requirements and generally applies to variables indicating system operating status. Category 3 variables may be monitored by high-quality commercial instruments and applies to backup and diagnostic instrumentation. A summary of the Regulatory Guide requirements is given in Table 5-1.

RG 1.97 also presents a generic list of PWR variables to be monitored during and following an accident. A comparison between the SONGS 1 site-specific variables and the RG 1.97 variables was performed and is given in Table 5-2. The SONGS 1 site-specific variables provide the essential information to the operators to accomplish and maintain a safe plant shutdown while minimizing risk to the health and safety of the public. This comparison is not intended to justify the omission of RG 1.97 recommended variables from the SONGS 1 list of variables. However, brief statements are provided to explain exclusion of variables based on the information which that variable provides (e.g., the information not within the variable "Type" definitions provided in Section 3.0).

5.1 SONGS 1 Specific Instruments

The design and qualification data applicable to the instruments discussed in Section 4.0 were compared against the design and qualification requirements identified for corresponding instruments given in RG 1.97. In cases where RG 1.97 identified the same variable for more than one purpose with different assigned categories, the instrumentation was reviewed against the requirements of the category specified for the safety function monitored by the SONGS 1 variable.

Comparisons between the design and qualification of SONGS 1 instruments and RG 1.97 design and qualification requirements is presented in Tables 5-3, 5-4 and 5-5. Deviations between Regulatory Guide requirements and the qualification and design of the SONGS 1 instrumentation are noted, with further discussion and justification or recommendation provided in Section 6.0.

Table 5-1

Regulatory Guide 1.97 Design and Qualification Criteria

CRITERIA	CATEGORY 1	CATEGORY 2	CATEGORY 3
Environmental Qualification	Yes	Yes	Not Specified
Seismic Qualification	Yes	If part of Safety-related System	Not Specified
Redundancy and Separation	Yes	Not Specified	Not Specified
Electrical Power Supply	Class 1E with battery backup	High-reliability source with some battery backup	Not Specified
Quality Assurance	Yes	Reduced Requirements	Not Specified
Display Type	Continuous Indication and Recording	On-Demand with continuous update	On-Demand with continuous update

Table 5-2

Comparison of SONGS 1 Site-Specific Variables and RG 1.97 Generic Variables

RG 1.97 Variable	SONGS 1 Variable	Comment
TYPE A VARIABLES		
Plant Specific	Included	Type I variables
TYPE B VARIABLES		
Reactivity Control		
Neutron Flux	Included	Type II
Control Rod Position	Included	Type II
RCS Soluble Boron Concentration	Not Included	Can be verified through PASS. See Section 6.1(1).
RCS Cold Leg Water Temperature	Included	Type I and II
Core Cooling		
RCS Hot Leg Water Temperature	Included	Type I and II
RCS Pressure	Included	Type I and II
Core Exit Temperature	Included	Type II
Coolant Level in Reactor	Not Included	ICC addressed as separate issue. See Section 6.2(1).
Degrees of Subcooling	Included	Type I and II

Table 5-2 (continued)

RG 1.97 Variable	SONGS 1 Variable	Comment
TYPE B VARIABLES (continued)		
Maintaining Reactor System Integrity		
RCS Pressure	Included	Type I and II
Containment Sump Water Level	Included	Type I and II
Containment Pressure	Included	Type I and II
Maintaining Containment Integrity		
Containment Isolation Valve Position	Included	Type II
Containment Pressure	Included	Type I and II
TYPE C VARIABLES		
Fuel Cladding		
Core Exit Temperature	Included	Type II
Radioactivity Concentration or Radiation Level in Circulating Primary Coolant	Not Included	Can be verified through PASS. See Section 6.1(1).
Analysis of Primary Coolant	Not Included	Can be verified through PASS. See Section 6.1(1).

Table 5-2 (continued)

RG 1.97 Variable	SONGS 1 Variable	Comment
TYPE C VARIABLES (continued)		
Reactor Coolant Pressure Boundary		
RCS Pressure	Included	Type I and II
Containment Pressure	Included	Type I and II
Containment Sump Water Level	Included	Type I and II
Containment Area Radiation	Included	Type II
Effluent Radioactivity-Noble Gas Effluent from Condenser Air Removal System Exhaust	Included	Type III
Containment		
RCS Pressure	Included	Type I and II
Containment Hydrogen Concentration	Included	Type I
Containment Pressure	Included	Type I and II
Containment Effluent Radioactivity Noble Gases from Identified Release Points	Included	Type III
Radiation Exposure Rate	Not Included	Not a critical safety function (Reference 11).
Effluent Radioactivity	Included	Type III

Table 5-2 (continued)

RG 1.97 Variable	SONGS 1 Variable	Comment
TYPE D VARIABLES		
Residual Heat Removal or Decay Heat Removal System		
RHR System Flow	Not Included	Required for Cold Shutdown. Not required in response to accident conditions.
RHR Heat Exchanger Outlet Temperature	Not Included	Required for Cold Shutdown. Not required in response to accident conditions.
Safety Injection System		
Accumulator Tank Level and Pressure	Not Included	Not applicable (NA) to SONGS 1.
Accumulator Isolation Valve Position	Not Included	NA to SONGS 1.
Boric Acid Charging Flow	Not Included	NA to SONGS 1. Boron injection included as part of SI flow from RWST.
Flow in HPI System	Not Included	NA to SONGS 1.
Flow in LPI System	Not Included	Not required for verifying system operation (i.e., valve alignment, pump operation).
Refueling Water Storage Tank Level	Included	Type I
Primary Coolant System		
Reactor Coolant Pump Status	Not Included	Not a critical safety function.
Primary System Safety Relief Valve Positions	Not Included	Not required in response to accident conditions.
Pressurizer Level	Included	Type I and II

Table 5-2 (continued)

RG 1.97 Variable	SONGS 1 Variable	Comment
TYPE D VARIABLES (continued)		
Primary Coolant System (continued)		
Pressurizer Heater Status	Not Included	Not required in response to accident conditions.
Quench Tank Level	Not Included	Not required in response to accident conditions.
Quench Tank Temperature	Not Included	Not required in response to accident conditions.
Quench Tank Pressure	Not Included	Not required in response to accident conditions.
Secondary System (Steam Generator)		
Steam Generator Level	Included	Narrow range included and wide range included as part of Auxiliary Feedwater Flow redundant channel. Type I and II.
Steam Generator Pressure	Included	Type I and II
Safety/Relief Valve Positions or Main Steam Flow	Not Included	Not required in response accident conditions.
Main Feedwater Flow	Not Included	Not required in response to accident conditions.

Table 5-2 (continued)

RG 1.97 Variable	SONGS 1 Variable	Comment
TYPE D VARIABLES (continued)		
Auxiliary Feedwater or Emergency Feedwater System		
Auxiliary or Emergency Feedwater Flow	Included	Type I and II
Condensate Storage Tank Water Level	Included	Type I
Containment Cooling Systems		
Containment Spray Flow	Not Included	Not required for verifying system operation (i.e., valve alignment, pump operation).
Heat Removal by the Containment Fan Heat Removal System	Not Included	NA for SONGS 1.
Containment Atmosphere Temperature	Not Included	Instrumentation does not exist. Not required in response to accident conditions.
Containment Sump Water Temperature	Not Included	Instumentation does not exist. Not required in response to accident conditions.
Chemical and Volume Control Systems		
Makeup Flow-In	Not Included	Not required in response to accident conditions.
Letdown Flow-Out	Not Included	Not required in response to accident conditions.
Volume Control Tank Level	Not Included	Not required in response to accident conditions.

Table 5-2 (continued)

RG 1.97 Variable	SONGS 1 Variable	Comment
TYPE D VARIABLES (continued)		
Cooling Water System		
Component Cooling Water Temperature to ESF System	Not Included	Not required in response to accident conditions.
Component Cooling Water Flow to ESF System	Not Included	Not required in response to accident conditions.
Radwaste Systems		
High-Level Radioactive Liquid Tank Level	Not Included	Not required in response to accident conditions.
Radioactive Gas Holdup Tank Pressure	Not Included	Not required in response to accident conditions.
Ventilation Systems		
Emergency Ventilation Damper Position	Not Included	Indication is not provided.
Power Supplies		
Status Standby Power and Other Energy Sources	Not Included	Not required in response to accident conditions.

Table 5-2 (continued)

RG 1.97 Variable	SONGS 1 Variable	Comment
TYPE E VARIABLES		
Containment Radiation		
Containment Area Radiation High Range	Included	Type II
Area Radiation		
Radiation Exposure Rate	Not Included	Not a critical function (Ref 11).
Airborne Radioactive Materials Released from Plant		
Noble Gas and Vent Flow Rate	Included	Type III
Particulates and Halogens	Included	Type III
Environs Radiation and Radioactivity	Not Included	Not required to assess offsite doses.
Meteorology	Included	Type III
Accident Sampling Capability		
(Analysis Capability On Site)		
Primary Coolant and Sump	Not Included	Can be verified through PASS. See Section 6.1(1).
Containment Air	Not Included	Hydrogen monitors available.

Table 5-3

SONGS 1 Variables — Type I
Design/Qualification Compliance with RG 1.97

VARIABLE	CATEGORY	QUALIFICATION ENV	QUALIFICATION SEIS	QA REQ	INSTRUMENT RANGE SONGS 1 / RG 1.97	REDUN-DANCY	POWER SUPPLY	PHYS SEPAR	DISPLAY TYPE	COMMENTS
RCS Hot Leg Water Temperature	1	Yes	Yes	Yes	100-700°F - - - - - - - - - 50-750°F	Yes	Yes	Yes	No	See Section 6.2 Justification
RCS Subcooling	1	Yes	Yes	Yes	50°F Superheat--150°F Subcool - - - - - - - - - 35°F Superheat--200°F Subcool	Yes	Yes	Yes	No	See Section 6.2 Justification
Refueling Water Storage Tank Level	1	Yes	Yes	Yes	0-100% - - - - - - - - - 0-100%	Yes	Yes	Yes	No	See Section 6.2 Justification
Recirculation Flow	1	No	Yes	Yes	0-300 GPM - - - - - - - - - Plant Specific	No	Yes	NA	No	See Section 6.2 Justification and Recommendation
Main Steam Pressure	1	No	Yes	Yes	0-1000 Psig - - - - - - - - - 0-1182 Psig	No	No	NA	No	See Section 6.3 Justification and Recommendation

Table 5-3 (continued)

SONGS 1 Variables — Type I
Design/Qualification Compliance with RG 1.97

VARIABLE	CATEGORY	QUALIFICATION ENV	QUALIFICATION SEIS	QA REQ	INSTRUMENT RANGE SONGS 1 / RG 1.97	REDUN-DANCY	POWER SUPPLY	PHYS SEPAR	DISPLAY TYPE	COMMENTS
Auxiliary Feedwater Tank Level	1	Yes	Yes	Yes	0-100% - - - - - - - - - Plant Specific	Yes	Yes	No	No	See Section 6.3 Justification and Recommendation
Steam Generator Narrow Range Level	1	Yes	Yes	Yes	0-85% 236-274 In - - - - - - - - - Plant Specific	Yes	Yes	Yes	No	See Section 6.3 Justification
Auxiliary Feedwater Flow	1	No	Yes	Yes	0-100% Design Flow - - - - - - - - - 0-100 % Design Flow	Yes	Yes	Yes	No	See Section 6.3 Justification and Recommendation
Containment Pressure	1	Yes	Yes	Yes	0-60 Psig - - - - - - - - - 0-51 Psig	Yes	Yes	Yes	No	See Section 6.4 Justification
Containment Sphere Level	1	Yes	Yes	Yes	-9.5 to +12.0 Ft - - - - - - - - - Plant Specific	Yes	Yes	Yes	No	See Section 6.4 Justification

Table 5-3 (continued)

SONGS 1 Variables -- Type I
Design/Qualification Compliance with RG 1.97

VARIABLE	CATEGORY	QUALIFICATION ENV	QUALIFICATION SEIS	QA REQ	INSTRUMENT RANGE SONGS 1 / RG 1.97	REDUNDANCY	POWER SUPPLY	PHYS SEPAR	DISPLAY TYPE	COMMENTS
RCS Cold Leg Water Temperature	1	Yes	Yes	Yes	100-600°F - - - - - - - - - - 50-750°F	Yes	Yes	No	Yes	See Section 6.4 Justification and Recommendation
RCS Pressure	1	Yes	Yes	Yes	1600-2400 & 0-3000 Psig - - - - - - - - - - 0-3000 Psig	Yes	Yes	No	Yes	See Section 6.4 Justification and Recommendation
Containment Hydrogen Concentration	1	Yes	Yes	Yes	0-10% By Volume - - - - - - - - - - 0-10% By Volume	Yes	Yes	Yes	No	See Section 6.5 Justification
Pressurizer Level	1	Yes	Yes	Yes	0-100% - - - - - - - - - - 0-100%	Yes	Yes	No	Yes	See Section 6.6 Justification and Recommendation

Table 5-4

SONGS 1 Variables -- Type II
Design/Qualification Compliance with RG 1.97

VARIABLE	CATEGORY	QUALIFICATION ENV	QUALIFICATION SEIS	QA REQ	INSTRUMENT RANGE SONGS 1 / RG 1.97	REDUNDANCY	POWER SUPPLY	PHYS SEPAR	DISPLAY TYPE	COMMENTS
** VARIABLES MONITORING SUBCRITICALITY										
Neutron Flux	1	No	Yes	Yes	0-120% Full Power / 1E-6-100% Full Power	Yes	Yes	No	Yes	See Section 6.1 Justification and Recommendation
Control Rod Position	3	NA	NA	NA	Full In/ Not Full In / Full In/ Not Full In	NA	NA	NA	Yes	
** VARIABLES MONITORING CORE COOLING										
RCS Hot Leg Water Temperature	1	Yes	Yes	Yes	100-700°F / 50-750°F	Yes	Yes	Yes	No	See Section 6.2 Justification

Table 5-4 (continued)

SONGS 1 Variables -- Type II
Design/Qualification Compliance with RG 1.97

VARIABLE	CATEGORY	QUALIFICATION ENV	QUALIFICATION SEIS	QA REQ	INSTRUMENT RANGE SONGS 1 / RG 1.97	REDUN-DANCY	POWER SUPPLY	PHYS SEPAR	DISPLAY TYPE	COMMENTS
Core Exit Temperature	1	No	Yes	Yes	100-2200°F - - - - - - - - - - 200-1650°F	Yes	Yes	Yes	Yes	See Section 6.2 Justification
RCS Subcooling	1	Yes	Yes	Yes	50°F Superheat--150°F Subcool - - - - - - - - - - 35°F Superheat--200°F Subcool	Yes	Yes	Yes	No	See Section 6.2 Justification
** VARIABLES MONITORING SECONDARY HEAT SINK										
Main Steam Pressure	1	No	Yes	Yes	0-1000 Psig - - - - - - - - - - 0-1182 Psig	No	Yes	NA	No	See Section 6.3 Justification and Recommendation
Steam Generator Narrow Range Level	1	Yes	Yes	Yes	0-85% 236-274 in - - - - - - - - - - Plant Specific	Yes	Yes	Yes	No	See Section 6.3 Justification

Table 5-4 (continued)

SONGS 1 Variables -- Type II
Design/Qualification Compliance with RG 1.97

VARIABLE	CATEGORY	QUALIFICATION ENV	QUALIFICATION SEIS	QA REQ	INSTRUMENT RANGE SONGS 1 / RG 1.97	REDUNDANCY	POWER SUPPLY	PHYS SEPAR	DISPLAY TYPE	COMMENTS
Auxiliary Feedwater Flow	1	No	Yes	Yes	0-100% Design Flow - - - - - - - - - - 0-100% Design Flow	Yes	Yes	Yes	No	See Section 6.3 Justification and Recommendation
** VARIABLES MONITORING RCS INTEGRITY										
Containment Pressure	1	Yes	Yes	Yes	0-60 Psig - - - - - - - - - - 0-51 Psig	Yes	Yes	Yes	No	See Section 6.4 Justification
Containment Sphere Level	1	Yes	Yes	Yes	-9.5 to +12.0 Ft. - - - - - - - - - - Plant Specific	Yes	Yes	Yes	No	See Section 6.4 Justification
Containment Sump Level	2	Yes	Yes	Yes	-15.5 to -9.5 Ft - - - - - - - - - - Plant Specific	NA	Yes	NA	Yes	

Table 5-4 (continued)

SONGS 1 Variables — Type II
Design/Qualification Compliance with RG 1.97

VARIABLE	CATEGORY	QUALIFICATION ENV	QUALIFICATION SEIS	QA REQ	INSTRUMENT RANGE SONGS 1 / RG 1.97	REDUN-DANCY	POWER SUPPLY	PHYS SEPAR	DISPLAY TYPE	COMMENTS
RCS Cold Leg Water Temperature	1	Yes	Yes	Yes	100-600°F - - - - - - - - - 50-750°F	Yes	Yes	No	Yes	See Section 6.4 Justification and Recommendation
RCS Pressure	1	Yes	Yes	Yes	1600-2400 & 0-3000 Psig - - - - - - - - - 0-3000 Psig	Yes	Yes	No	Yes	See Section 6.4 Justification and Recommendation
Containment Radiation	1	Yes	Yes	Yes	1-1E8 R/HR - - - - - - - - - 1-1E7 R/HR	Yes	Yes	Yes	Yes	
** VARIABLES MONITORING CONTAINMENT INTEGRITY										
Containment Isolation Valve Position	1	No	Yes	Yes	Closed/Not - - - - - - - - - Closed/Not	Yes	Yes	Yes	Yes	See Section 6.5 Recommendation

Table 5-4 (continued)

SONGS 1 Variables — Type II
Design/Qualification Compliance with RG 1.97

VARIABLE	CATEGORY	QUALIFICATION ENV	QUALIFICATION SEIS	QA REQ	INSTRUMENT RANGE SONGS 1 / RG 1.97	REDUNDANCY	POWER SUPPLY	PHYS SEPAR	DISPLAY TYPE	COMMENTS
Containment Pressure	1	Yes	Yes	Yes	0-60 Psig -5-245 Psig --- 0-51 Psig -5-204 Psig	Yes	Yes	Yes	No	See Section 6.5 Justification
** VARIABLES MONITORING RCS INVENTORY										
Pressurizer Level	1	Yes	Yes	Yes	0-100% --- 0-100%	Yes	Yes	No	Yes	See Section 6.6 Justification and Recommendation

Table 5-5

SONGS 1 Variables — Type III
Design/Qualification Compliance with RG 1.97

VARIABLE	CATEGORY	QUALIFICATION ENV	QUALIFICATION SEIS	QA REQ	INSTRUMENT RANGE SONGS 1 / RG 1.97	REDUNDANCY	POWER SUPPLY	PHYS SEPAR	DISPLAY TYPE	COMMENTS
Steam Relief/Dump Valve Vent Radioactivity	2	Yes	Yes	Yes	1E-4 - 1E4 R/HR - - - - - - - - - - 1E-1 - 1E3 uCi/CC	NA	NA	NA	Yes	See Section 6.7 Justification
Effluent Release Rate	2	Yes	Yes	Yes	1 - 1E13 uCi/SEC - - - - - - - - - - 0-100% Vent Flow	NA	NA	NA	Yes	
Effluent Release Radioactivity	2	Yes	Yes	Yes	1E-7 - 1E5 uCi/CC - - - - - - - - - - 1E-6 - 1E4 uCi/CC	NA	NA	NA	Yes	
Meteorological Variables (Wind direction, wind speed, atmospheric stability)	3	NA	NA	NA	See Comments	NA	NA	NA	Yes	Meteorological Instruments for the SONGS 1, 2, 3 site have been previously shown to meet RG 1.97 requirements. [5, 6]

6.0 JUSTIFICATION OF DISCREPANCIES AND RECOMMENDATIONS

A discussion of each of the variables for which design or qualification discrepancies have been identified is presented below. Justifications for use and acceptance of the available instrumentation are provided in cases where the intent of the Regulatory Guide is met even though the specific design and qualification criteria are not met. Recommendations are provided in cases where the existing instrumentation does not meet the intent of RG 1.97.

It should be noted that the Technical Support Center (TSC) Fox 3 computer (Fox 3) has been identified to provide trend information for several of the SONGS 1 variables. The Fox 3 has no continuous on-line hardcopy readout devices, but stores large amounts of data that can be readily obtained in hardcopy form, as required by the operators. The SONGS 1 TSC is located adjacent to the control room and provided with doorways, windows, and a pass-through box connecting the two facilities. Any data available in the TSC is nearly as accessible to control room personnel as it would be if the readouts were in the control room. Use of the Fox 3 in satisfying requirements to monitor trends in essential variables has been previously addressed by Edison and the NRC. [9, 10]

6.1 SUBCRITICALITY

(1) NEUTRON FLUX

Deviation:

(a) Environmental qualification of the neutron flux detectors cannot be verified.

(b) Physical separation of control cables to the neutron monitoring instrumentation does not meet separation requirements.

Justification/Recommendation

(a) Following a design basis accident the reactor can be assumed to be subcritical which could be verified by the difference between the RCS hot-leg and cold-leg temperatures, and by means of the control rod position lights. In the longer term, RCS grab sampling is adequate for confirming proper boron concentration to ensure that the reactor remains shut down. This sampling can be performed using the Post Accident Sampling System (PASS) installed in response to NUREG 0737 item II.B.3.

(b) Upgrade of the cabling to provide adequate separation is recommended.

6.2 CORE COOLING

(1) CORE EXIT TEMPERATURE

Deviation:

Environmental qualification of core exit thermocouples has not been verified.

Justification:

SONGS 1 core exit thermocouple system is being reviewed and will be addressed as part of Edison's response to the requirements of NUREG 0737, item II.F.2, "Inadequate Core Cooling." Further discussion of the qualification of CET's is deferred to this evaluation.

(2) RCS HOT LEG TEMPERATURE

Deviations:

(a) The existing indicator scale ranges are 100-700°F. The RG 1.97 recommended range is 50-750°F.

(b) No recording capability is provided.

Justification:

(a) The existing range of 100-700°F meets the upper range limit of RG 1.97, Rev. 3 [11]. Monitoring RCS temperature down to 50°F is not necessary. EOI specified actions are based on whether or

not the hot leg temperature has exceeded 680°F, and the existing range is adequate for this determination.

(b) Adequate hot leg trend information may be obtained from the Fox 3. The cold leg temperature recorder and the average temperature recorder provide additional backup for following reactor coolant temperature trends.

(3) RCS SUBCOOLING

Deviation:

(a) The existing indicator scale ranges are 50°F superheat to 150°F subcool. The RG 1.97 specified range is 35°F superheat to 200°F subcool.

(b) No recording capability is provided.

Justification:

(a) The monitor range of 150°F subcool provides adequate indication for the operators to take all necessary preplanned actions and to monitor core cooling.

(b) Adequate subcooling trend information may be determined using RCS hot leg temperature and pressurizer pressure trend information maintained by the Fox 3.

(4) REFUELING WATER STORAGE TANK LEVEL

Deviations:

(a) Continuous indication of tank level is provided by only one of the redundant instrument loops (LT/LI-950).

(b) No recording capability is provided.

Justifications:

(a) The operator action (manual transfer to containment recirculation) associated with this variable takes place when the water level in the RWST reaches a specified low level. The operators receive indication of tank level from LI-950, are alerted to a low level (21%) condition by control room annunicator A-7, and may also obtain level information from the Fox 3. Separate qualified instruments provide input to LI-950, annunciator A-7 and the Fox 3. The single continuous indicator and related annunciator, with the additional level information available from the Fox 3, is adequate.

(b) Adequate RWST trend information may be obtained from the Fox 3.

(5) RECIRCULATION FLOW

Deviations:

(a) Environmental qualification of flow transmitters FT-2114B, 2114C, 3114A has not been verified.

(b) Redundant channels of control room indication for each injection line are not provided.

(c) No recording capability is provided.

Justification/Recommendations:

(a,b) Upgrade of flow instrumentation to provide redundant, environmentally qualified indication is recommended.

(c) Trending of recirculation flow rate is not required to assure appropriate operator response.

6.3 SECONDARY HEAT SINK

(1) AUXILIARY FEEDWATER TANK LEVEL

Deviations:

(a) Physical separation of the instrument loop power supply cables do not meet separation requirements.

(b) No recording capability is provided.

Justification/Recommendation:

(a) The power supply circuits to the instrument loop are routed in common cable trays from the DC Switchgear Room to the Control Room. Upgrade of the power supply installation is recommended.

(b) Adequate auxiliary feedwater tank level trend information may be obtained from the Fox 3.

(2) AUXILIARY FEEDWATER FLOW

Deviations:

(a) Redundant auxiliary feedwater flow indication for each steam generator is provided by means of one channel of steam generator level (wide range) and one channel of auxiliary feedwater flow rate. Auxiliary feedwater flow instrumentation (flow transmitters FT-3453, 3454, 3455) are qualified, however, qualification of steam generator wide range level transmitters LT-450, 451, 452 has not been verified.

(b) No recording capability is provided.

Justification/Recommendation:

(a) Upgrade of level transmitters LT-450, 451 and 452 to qualified status is recommended.

(b) Adequate auxiliary feedwater flow trend information may be obtained from the Fox 3, which maintains data for both feedwater flow and steam generator wide range level.

(3) MAIN STEAM PRESSURE

Deviations:

(a) Qualification of pressure transmitter PT-459 has not been verified.

(b) The range of the existing control room indicator is 0-1000 psig. The RG 1.97 specified range is 0-20% above the lowest safety valve setting of 985 psig, or approximately 0-1182 psig.

(c) Redundant channels of control room indication are not provided.

(d) No qualified recording capability is provided.

(e) The power supply to the instrument loop is not battery backed.

Justification/Recommendations:

(a,b,c) Upgrade of pressure instrumentation to provide redundant, qualified indication with adequate range is recommended.

(d) Main steam pressure is recorded on non-safety related control room recorder R-8, and adequate trend information is available from the Fox 3. However, trending of main steam pressure is not required.

(e) It is recommended that the instrument loop be powered from an uninterruptable power supply.

(4) STEAM GENERATOR NARROW RANGE LEVEL

Deviation:

No qualified recording capability is provided.

Justification:

Adequate steam generator level trend information may be obtained from the Fox 3.

6.4 RCS INTEGRITY

(1) RCS COLD LEG TEMPERATURE

Redundant cold leg temperature indication for RCS loops is provided by one channel of RCS cold leg temperature and one channel of RCS loop temperature differential. The temperature differential instruments provide a diverse means of determining cold leg temperature by referencing hot leg temperature readings.

Deviations:

(a) The existing recorder scale range is 100-600°F. The RG 1.97 specified range is 50-750°F.

(b) Physical separation of control and power cables to cold leg temperature and differential-temperature instrumentation does not meet separation requirements.

Justifications/Recommendation:

(a) The primary function of this variable is to monitor the RCS cooldown rate based on downcomer coolant temperature. The existing instrument/recorder range is adequate for this purpose.

(b) The instrument loop cables are routed in common cable trays. These cable trays contain only low voltage instrument circuits and do not have

sufficient energy to cause common mode failures and are adequately separated from all other cable trays. Common mode failures due to high energy line break interactions will be evaluated as part of the high energy line break analysis.

The power supply circuits to the instrument loops are routed in common cable trays and are subject to common mode failures. Upgrade of the power supply circuits to provide adequate separation is recommended.

(2) CONTAINMENT PRESSURE

Deviation:

No recording capability is provided.

Justification:

Adequate wide range containment pressure trend information may be obtained from the Fox 3.

(3) CONTAINMENT SPHERE LEVEL

Deviation:

No recording capability is provided.

Justification:

Adequate sphere level trend information may be obtained from the Fox 3. Use of the Fox 3 in monitoring trend information for this variable has been previously addressed and found acceptable by the NRC [9].

(4) RCS PRESSURE

Deviation:

(a) The scale range for indicators PI-430, 431, 432 and recorder PR-430 are 1600-2400 psig. The RG 1.97 specified range is 0-3000 psig.

(b) Physical separation of control and power cables to the four RCS pressure transmitters PT-425, 430, 431, 432 does not meet separation requirements.

Justifications/Recommendation:

(a) The scale range of redundant recorder PR-425 meets the RG 1.97 specified range of 0-3000 psig. In addition, the Fox 3 monitors RCS pressure and provides adequate trend information for the range of 0-3000 psig.

(b) The instrument loop cables are routed in common raceways. These raceways contain only low voltage instrument circuits and do not have sufficient energy to cause common mode failures and are adequately separated from all other raceways. Common mode failures due to high energy line break interactions will be evaluated as part of the high energy line break analysis.

The power supply circuits to the instrument loops are routed in common cable trays and are subject to common mode failures. Upgrade of the power supply circuits to provide adequate separation is recommended.

6.5 CONTAINMENT INTEGRITY

(1) CONTAINMENT HYDROGEN CONCENTRATION

Deviation:

No recording capability provided.

Justification:

Adequate containment hydrogen trend information may be obtained from the Fox 3. Use of the Fox 3 in monitoring trend information for this variable has been previously addressed and found acceptable by the NRC [9].

(2) CONTAINMENT PRESSURE (WIDE RANGE)

Deviation:

No recording capability provided.

Justification:

Adequate containment pressure trend information may be obtained from the Fox 3. Use of the Fox 3 in monitoring trend information for this variable has been previously addressed and found acceptable by the NRC [9,10].

(3) CONTAINMENT ISOLATION VALVE POSITION

Deviation:

Qualification of position switches for CI valves CV-949, CV-951, CV-953, CV-955, CV-956, CV-957, CV-962 and CV-992 has not been verified.

Recommendation:

Upgrade of position switches to qualified status is recommended.

6.6 RCS INVENTORY

(1) PRESSURIZER LEVEL

Deviation:

Physical separation of control and power cables to the three pressurizer level transmitters does not meet separation requirements.

Justification/Recommendation

The instrument loop cables are routed in common cable trays. These cable trays contain only low voltage instrument circuits and do not have sufficient energy to cause common mode failures and are adequately separated from all other cable trays. Common mode failures due to high energy line break interactions will be evaluated as part of the high energy line break analysis.

The power supply circuits to the instrument loops are routed in common cable trays and are subject to common mode failures. Upgrade of the power supply circuits to provide adequate separation is recommended.

6.7 EFFLUENT RADIATION

(1) STEAM DUMP VALVES/SAFETY VALVES EFFLUENT MONITORS

Deviation:

Dose rate is provided in lieu of RG 1.97 specified specific activity, flow rate, and duration.

Justification:

The dose rate measurement provided by the steam dump valves/safety valve radiation monitors, in conjunction with AFW flow (or steam flow as backup) provides for adequate determination of release magnitude.

7.0 REFERENCES

1. SONGS 1 Emergency Operating Instructions.

2. Emergency Plan for San Onofre Nuclear Generating Station Units 1, 2, and 3, Rev. 1, Dated 12/21/84.

3. "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," USNRC Regulatory Guide 1.97, Rev. 2, dated December 1980.

4. Westinghouse Owners Group Emergency Response Guidelines.

5. Letter, K.P. Baskin (Edison) to F. Miraglia (NRC), dated May 13, 1982, re: Edison RG 1.97 review for SONGS 2 and 3.

6. Letter, M.O. Medford (Edison) to G. W. Knighton (NRC), dated July 26, 1984, re: Edison RG 1.97 review for SONGS 2 and 3.

7. SONGS 1 Equipment Qualification Master List, CDM 'M' No. M85003, dated 7/31/85.

8. SONGS 1 Q-List Report M-37560, Rev. 1, dated August 1985.

9. Letter, D.M. Crutchfield (NRC) to K.P. Baskin (Edison), dated April 16, 1984, re: NUREG 0737 items II.F.1.4, 5 and 6.

10. Letter, W.A. Paulson (NRC) to K.P. Baskin (Edison), dated August 3, 1984, re: NUREG 0737 item II.F.1.4.

11. "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," USNRC Regulatory Guide 1.97, Rev. 3, dated May 1983.