ENGINEERED SAFEGUARD TESTING

7A.1 TESTING DESCRIPTION

7A.1.1 TESTING PROGRAM

7A.1.1.1 Overall Testing

Procedure QO-1, "Safety Injection" demonstrates the operability of the Safety Injection System (SIS) initiation circuitry by using the internal testing capability of the system. This procedure tests the performance of the SIS circuits during a simulated SI, both with and without offsite power available. This test is run quarterly with the Primary Coolant System pressure greater than 1,400 psia. Other specific procedures that provide quarterly testing of the Engineering Safeguards are performed at power:

QO-16, "Inservice Test Procedure - Containment Spray Pumps"

QO-19, "Inservice Test Procedure - HPSI Pumps and ESS Check Valves Operability Test"

QO-20, "Inservice Test Procedure - Low Pressure Safety Injection Pumps"

QO-32, "Inservice Test Procedure - Closure Verification of HPSI Train 2 and LPSI Injection Check Valves"

QI-4, "Pressurizer Low Pressure SIS Initiation Functional Check"

QI-5, "Containment High Pressure Test"

Specific monthly and shiftly test procedures performed during power operations:

DWO-1, "Operator’s Daily/Weekly/Bi-weekly Items Modes 1, 2, 3, and 4"

MI-6, "Area Monitor Operational Check"

SHO-1, "Operators' Shift Items Modes 1, 2, 3, and 4"

Specific procedures are provided for testing with the reactor shut down. These procedures are listed below:

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QO-2, "Recirculation Actuation System"

QO-8B, "LPSI Check Valve Operability Test and LPSI Motor Operated Valve Open Stop Verification Test"

QO-43, "SIRW Tank Outlet Check Valves (Includes Boron Equalization) and Shutdown Cooling Bypass and Loop Isolation Valves Inservice Test

RI-3A, "High Pressurizer Pressure Channel A Calibration"

RI-3B, "High Pressurizer Pressure Channel B Calibration"

RI-3C, "High Pressurizer Pressure Channel C Calibration"

RI-3D, "High Pressurizer Pressure Channel D Calibration"

RI-3E, “Pressurizer Pressure Transmitter Calibrations”

RI-7, "Low Pressure SIS Initiation Logic"

RI-14, "SIRW Tank Level Switch Interlocks Test"

RI-86F, "Containment Isolation Monitor Calibration"

RO-11, "Containment High Radiation Test"

RO-12, "Containment High Pressure (CHP) and Spray System Tests"

RO-65, "High Pressure Safety Injection (HPSI) Trains 1 and 2, and Hot Leg Injection (HLI) Check Valve Test and Cold Leg/Hot Leg Flow Balance Test"

RO-98, "LPSI and Containment Spray Comprehensive Pump Test and Check Valves Test"

RO-105, "Full Flow Test for SIT Check Valves and PCS Loop Check Valves"

RO-141, “Containment Sump Check Valves Inservice Test”

RO-147, “Comprehensive Pump Test – High Pressure Safety Injection Pump P-66A and P-66B”

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RT-8C, "Engineered Safeguards System - Left Channel"

RT-8D, "Engineered Safeguards System - Right Channel"

RT-116, "Miscellaneous Systems Safety Valve Setpoint Testing"

SO-9, “Primary Coolant System Pressure Isolation Check Valves”

Procedures RT-8C+D are conducted at every refueling to determine the operability of the Emergency Power System, engineered safeguards system and the manual safety injection feature of the engineered safeguards controls. This is determined by verifying correct sequencing and loading of safeguards equipment (including all ECCS pumps) when an SIS actuation is simulated (by manually initiating a simulated SIS) coincident with a simulated loss of offsite power. The manual SIS feature is verified by alarm indication after the SIS push button is depressed. This test duplicates, as close as practical, the integrated performance required from the Engineered Safety Features Actuation System (ESFAS), the Engineered Safety Features (ESF) and their auxiliary support systems as defined in the design criteria of Subsection 7.3.5.1. SIS circuit design is such that each redundant circuit (or channel) is tested separately, so that the correct operation of each circuit can be identified.

Left channel procedure RT-8C and right channel procedure RT-8D are performed during refueling outages to demonstrate the operability of the normal shutdown sequence through testing the equipment starting circuits and contact closure times. Resetting SIS while bus 1C or 1D is being fed exclusively by the diesel generator, initiates the NSD Sequencer. Sequencer timing is verified. Loads may or may not be started. NSD and DBA Sequencer testing provides an adequate overlap to ensure proper equipment operation and meet Technical Specification testing requirements.

Procedure RI-14 requires that the RAS be tested by simulating actuation of the safety-related SIRW tank level switches to effect an auto RAS actuation. Upon actuation, the control room recirculation initiation alarm is verified. This alarm is wired to a contact on one of the SIRW tank low-level relays. Upon RAS initiation, these relays energize, and among other things, cause the alarm. This procedure tests all possible one-out-of-two (taken twice) level switch combinations.

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Quarterly Procedure QO-2, "Recirculation Actuation System" (which, like RI-14, is conducted during shutdown) also tests the RAS. In this test, however, a test switch is used to simulate the RAS initiation condition (low SIRW tank level). Upon placing this switch in the "test" position, the SIRW tank low-level relays are energized to effect RAS initiation. Actual component response verifications are made in this procedure. All required component response verifications are made except for the closure of the low-pressure safety-injection pump minimum recirculation valves, which is done at shutdown. The component response verifications include:

1. Low-pressure safety injection pumps trip

2. SIRW tank isolation valves close

3. Containment sump valves open

4. Component cooling water heat exchanger main service water valves open while the heat exchanger bypass service water valves close

5. Component cooling water heat exchanger cooling water valves open

6. HPSI subcooling valve CV-3071 opens if the HPSI breaker is closed

7. Enable closing of spray valve CV-3001, if sump valve CV-3030 does not open

7A.1.1.2 Pump Testing

Pump head and flow, are tested for the ECCS pumps during the quarterly inservice inspection pump tests. These tests are:

QO-16 for the containment spray pumps,
QO-19 for the high-pressure injection pumps, and
QO-20 for the low-pressure safety injection pumps.

The high-pressure safety-injection pumps, low-pressure safety-injection pumps (shutdown cooling pumps) and the containment spray pumps are tested quarterly. According to Test Procedures QO-16, QO-19 and QO-20, the method of starting each pump is alternated between the control room and the local breaker every quarter.

Also, pump head and flow, are tested for the ECCS pumps at intervals not exceeding 24 months during comprehensive pump tests. During these tests, it is required that the pumps operate for at least 2 minutes. These tests are:

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RO-98, "LPSI and Containment Spray Comprehensive Pump Test and Check Valves Test"

RO-147, "Comprehensive Pump Test – High Pressure Safety Injection Pump P-66A and P-66B"

7A.1.1.3 Instrumentation Testing

In accordance with Procedures DWO-1 "Operator's Daily/Week/Biweekly Items Modes 1, 2, 3, and 4," and SHO-1 "Operators' Shift Items Modes 1, 2, 3, and 4," all of the safety-injection and containment spray initiation instrumentation that features control room indication (such as pressurizer-pressure channels and containment high-radiation channels), are checked either daily or each shift. The safety-related containment high-pressure circuits do not feature control room indication and are, therefore, tested monthly or quarterly along with the other SIS and containment spray initiation circuitry. The procedures listed below are used to perform these tests.

QI-4, "Pressurizer Low Pressure SIS Initiation Functional Check"

QI-5, "Containment High Pressure Initiation Test"

MI-6, "Area Monitors, Operational Check"

As previously mentioned, Procedure QO-1 (which is performed quarterly) tests the operation of the starting circuits and verifies that the active components (ie, pumps and valves) operate satisfactorily upon receipt of the SIS signal.

7A.1.1.4 Engineered Safeguards Passive Devices Testing

Procedure SHO-1 requires that the safety injection tank level and pressure be checked each shift during power operation.

Procedure QO-8B is used during cold shutdown to full flow test the LPSI check valves.

Procedure RO-98 is used each Refueling Outage to verify full open and closure capability of the Containment Spray Header Check Valves. Procedures QO-19 and RO-217 are used to periodically part stroke the SIRW Tank Discharge Check Valves.

Procedure RO-98 is used each refueling to verify full open and closure capability of the Containment Spray Pump Discharge Check Valves, and part stroke the Containment Spray Header Check Valves.

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Procedure QO-32 quarterly verifies closure of the High Pressure Safety Injection (HPSI) Train 2 and Low Pressure Safety Injection check valves by opening the associated motor operated valve and measuring and recording a differential pressure across the check valve.

Procedure RO-141 is used during Mode 5 or 6 and once per 18 months to verify full stroke of the Containment Sump Check Valves.

Procedure RO-65 is used during Refueling Outages to full stroke the High Pressure Safety Injection (HPSI) Trains 1 and 2, and Hot Leg Injection (HLI) check valves. RO-65 also verifies the operability of the interlock between the HLI mode select and the HLI letdown valves.

Procedure RO-105 is used during Refueling Outages to verify full stroke capability of the Safety Injection Tank's Outlet Check Valves.

Procedure RO-147 is used once per 24-month period to verify full open and closure capability of the various ESS recirculation line check valves.

Procedure RT-116 administratively controls and documents the testing of various Class 2 and 3 safety valves located in the Engineering Safeguards System.

Procedure SO-9 is used to verify closure of the LPSI, HPSI and PCS loop check valves.

7A.1.2 TEST METHODS

Since the engineered safeguards equipment being initiated varies according to whether power is available from the offsite source or the diesel generator, mode selector switches are provided so that either the normal SIS or the Design Basis Accident (DBA) portions of the circuit can be tested separately. Individual momentary-type push buttons are provided to simulate the SIS in each of the redundant control circuits. The test is in progress only as long as the push button is depressed. Releasing this push button during a test will automatically reset the SIS or DBA sequence relays.

A momentary-type push button is provided to simulate the SIS in each of the redundant control channels. Procedure QO-1 calls for the use of this SIS test push button as a means of system initiation. QO-1 utilizes the left push button for left channel testing and the right push button for right channel testing. As described in QO-1, the test is terminated upon releasing the push button. The SIS relays or DBA sequencer will reset automatically.

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Testing in the "without offsite power" mode does not initiate load shedding, since load shedding is purely a function of actual voltage on the emergency buses. Each component that features load shed input circuitry, utilizes a load shed "a" contact in its trip circuits. This "a" contact closes to provide component trip whenever the emergency bus de-energizes.

Procedure QO-1 simulates the SIS by requiring that the momentary test push buttons be depressed. Upon depressing the button, the test requires that the operation verifies proper load response. An alternate method of initiating the SIS is by tripping two-out-of-four pressurizer low-low pressure instruments in the SIS initiating circuit matrix. Procedures RT-8C+D actually call for this method of SIS initiation.

Procedure QO-1 simulates the loss of offsite power and sequences the loads. Procedures RT-8C+D verify bus shedding and actual sequence loading of components by causing an actual loss of power to each of the Class 1E buses.

7A.1.3 ACCEPTANCE CRITERIA

As previously described, the procedures used to test the Safety Injection System are QO-1 and RT-8C+D. The acceptance criteria for each of these are stated in the procedures.

Acceptance criteria for pump shutoff head at minimum recirculation flow and pump operability is included in the quarterly inservice inspection pump tests as given earlier.

7A.2 TESTING OVERLAP EVALUATION

7A.2.1 SAFETY INJECTION

The SIS is initiated by either pressurizer low-pressure or containment high-pressure conditions. Pressurizer pressure channel calibration procedures RI-3A, B, C, and D require that a test pressure be input to the safety-related pressurizer pressure sensors (transmitters). Upon reaching the proper set point by varying the pressure input, the appropriate pressurizer pressure indicator and alarm (PPIA) unit actuation is verified. Procedure RI-7, "Low-Pressure SIS Initiation Logic," overlaps with the RI-3 procedures, in that RI-7 requires that a signal generator, connected into the various pressurizer pressure current loops (upstream of the PPIAs) be used to activate various combinations of the four PPIA units (one per channel) to produce the two-out-of-four pressurizer low-pressure trip inputs to the SIS. The SIS initiation logic is verified by the safety injection test indicating lamps, which are energized by safety injection auxiliary relays, and by verifying voltage which would energize the SIS output relays. Actual actuation of the

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SIS output relays takes place during the performance of RT-8C, “Engineered Safeguards System - Left Channel,” and RT-8D, “Engineered Safeguards System - Right Channel.” During the performance of RO-12, “Containment High Pressure (CHP) and Spray System Tests,” only the SIS signal is verified. SIS is not initiated. RO-12 in conjunction with RT-8C and RT-8D provides proper testing overlap to ensure CHP will initiate safety injection. Quarterly Procedure QI-4, "Pressurizer Low-Pressure SIS Initiation Functional Check," also tests these circuits in a method similar to Procedure RI-7. In QI-4, however, the 2/4 combinations are not verified. QI-4 simply verifies one channel at a time.

RO-12 requires that a test pressure be inserted into the safety-related CHP sensors (pressure switches). Upon reaching the proper set point, CHP is initiated. The CHP signal provides an initiation signal to the SIS circuitry. However, the containment high-pressure (CHP) input to the SIS is isolated during the performance of RO-12. Therefore, the initiation signal is verified by voltage readings. This minimizes the impact on plant equipment.

The SIS is tested quarterly per Section QO-1, "Safety Injection System," to demonstrate the operability of the SIS circuitry by using the internal testing capability of the system. This test overlaps Tests RI-7 and RO-12 in that, during the QO-1 test, the internal test circuits are used to simulate a safety-injection condition with and without offsite power available which energizes the SIS output relays. Upon initiation, all of the engineered safeguards loads are verified to respond appropriately.

During refueling, Procedures RT-8C+D, "Engineered Safeguards System," require that an actual loss of voltage occurs in the emergency buses concurrent with a trip of the PPIA units to effect a full design basis accident. Proper sequencing and timing of the sequenced loads are verified. Also verified, is the appropriate response of the other engineered safeguards loads. This test overlaps Tests RI-7, RO-12 and QO-1.

7A.2.2 CONTAINMENT ISOLATION

The containment isolation function is verified in one "system test." As previously mentioned, Procedure RO-12 requires that a test pressure be inserted into the CHP sensors (pressure switches). In addition to verifying SIS initiation, the procedure also requires that Containment Isolation (CI) actuation be verified. The verification is to be made by logging the response of at least one containment isolation valve for each of the CHP relays that energize upon receipt of the CHP condition as sensed by the pressure switches (sensors). The response is checked by valve position indication lights. Although overlap is not a problem with this test, the test does not verify the leak tightness of the containment isolation valves to the CHP condition.

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This is verified via the Containment Leak Rate testing program (Procedure RO-32).

In addition, the containment high-radiation input to containment isolation is verified. Procedures RI-86F, RO-11 and MI-6 are used. RI-86F, "Containment Isolation Monitor Calibration," utilizes a known external radiation source to verify the proper safety-related area monitor output. A current source is also used to simulate detector signal input and is adjusted until the high (trip) is reached. Verification of trip is through a RIAX relay contact initiating a control room alarm. During the conduct of RO-11, "Containment High Radiation Test," the radiation monitors are de-energized in each possible 2-out-of-4 combination. This causes the high (trip) circuit to de-energize in the radiation monitors to complete the logic actuation. The response of all the containment isolation valves is verified.

Valid verification of trip action with sufficient testing overlap is provided with the RI-86F and RO-11 procedure combination. The trip circuitry in the radiation monitors is fully functionally checked by increasing a simulated input to above the trip setpoint. The bistable comparison between the input and trip setpoint causes the output relay to de-energize. This in turn causes the RIAX relay in containment isolation 2/4 scheme to de-energize thus alarm. Removing power to the radiation monitor will also de-energize the output relay and cause RIAX actuation.

Procedure MI-6, "Area Monitor Functional Checks," requires verification of high alarm or trip setpoint on a monthly basis. Verification is by adjusting an internal current to the input of the meter amplifier to check the pre-trip and trip setpoints. An internal circuit prevents actual trip relay actuation in this mode. The setpoints are only adjusted if acceptance criteria is violated.

7A.2.3 RECIRCULATION ACTUATION

Proper overlap exists in the recirculation actuation testing program. Test RI-14 requires simulating actuation of the safety-related SIRW tank level switches which energize the SIRW tank low-level relay as procedurally verified by a control room alarm which is energized by these relays. Procedure QO-2 utilizes a test switch to energize the SIRW tank low-level relays, to actuate the required loads. Load response is then procedurally verified. These two tests overlap sufficiently to enable them to be combined to provide a valid system verification. Although the tests are performed only during shutdown, they duplicate (as closely as practical) the integrated performance of the RAS which is required in the event of an accident. This is consistent with the intent of 10 CFR 50, Appendix A, General Design Criterion 37; Regulatory Guide 1.22 and Standard Review Plan, Section 7.3, Appendix A.

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The RAS is not designed to be tested while the reactor is at power. Shutting the SIRW tank outlet valves would eliminate a source of water to more than one high-pressure or low-pressure safety-injection pump. It should be noted that upon RAS initiation, both of the SIRW tank outlet valves receive an auto closure signal and the containment sump isolation valves receive an auto open signal. Therefore, should an RAS initiation occur during normal conditions, the ECCS (or portions thereof) would be aligned to take suction from an empty sump for some period of time.

REGULATORY GUIDE 1.97 REV 3
PALISADES PLANT PARAMETER SUMMARY TABLE

The attached tables provide a comparison of the instrumentation provided at Palisades against the requirements of Regulatory Guide 1.97 Revision 3. These tables provide the following information for each parameter: Item, Tag Number, Variable Description, Type and Category, Existing and Required Instrument Ranges, QA Requirements, Environmental and Seismic Qualification, Redundance, Power Supply Display Location and a Comment section which provides a schedule for instrument loop upgrade or justification for acceptability of existing noncomplying instrumentation. The information provided in each column of the table is defined as follows:

ITEM: Consists of the RG 1.97 category followed by a sequential number. Item numbering is consistent with the RG 1.97 ordering of parameters.

TAG NO: This column lists component ID's of the sensors, indicators, power supplies, displays and recorders in each instrument loop selected to compare against the RG 1.97 requirements.

VARIABLE DESCRIPTION: Provides a description of the variable as taken from RG 1.97 Revision 3 Table 3.

VARIABLE TYPE: Lists the variable type as defined by RG 1.97.

VARIABLE CATEGORY: Lists the variable category as defined by RG 1.97

QA REQUIREMENT: Describes compliance with the RG 1.97 QA requirement for the specific variable category. Descriptions provided in this in this column are defined as follows:

- PRE-QA: Equipment was procured and installed prior to the establishment of a formal QA program. Equipment considered acceptable based on successful operating experience.
- COMPLY: Equipment was procured and installed under auspices of Palisades QA program.
- N/A: QA requirement not applicable to this category.

ENVIRONMENTAL QUALIFICATION: Describes compliance with the RG 1.97 EEQ requirements for the specific variable category. Descriptions provided in this column are defined as follows:

- COMPLY: Equipment located in a harsh environment are included in the Palisades Plant Equipment Qualification List and/or the equipment is located in a mild environment.
- N/A: EEQ requirements not applicable to this category.

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PARAMETER SUMMARY TABLE

SEISMIC QUALIFICATION: Describes compliance with the RG 1.97 Seismic requirements for the specific variable category. Descriptions provided in this column are defined as follows:

- COMPLY: Equipment is seismically qualified to criteria described in FSAR.
- N/A: Seismic qualification not applicable to this category.

REDUNDANCE: Indicates the number of instrumentation loops meeting the RG 1.97 requirements provided for this variable. Indicates N/A if redundance not applicable for this category.

POWER SUPPLY: Describes the type power provided to energize the instrument loop. Descriptions provided in this column are defined as follows:

- PREFERRED 1E: Instrument loop powered by battery backed 1E ac power.
- RELIABLE NON-1E: Instrument loop powered by Non-1E ac which is capable of being energized from the standby power sources and for which procedural guidance is provided for bus restoration.
- 1E BATTERY: Instrument loop is 1E dc powered.
- Non-1E: Instrument loop ac power not backed up by standby power supply.

DISPLAY LOCATION: Indicates control room (CR) panel where variable is indicated. For the Technical Support Center (TSC) and Emergency Offsite Facility (EOF) indicates if the parameter is available via the Plant Process Computer (PPC).

COMMENT: Provides additional information where required. Also provides justification for acceptability of existing instrumentation not in compliance with RG 1.97 requirements.

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REGULATORY GUIDE 1.97 REV 3
PARAMETER SUMMARY TABLE

TYPE A VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
A01	Inputs Loop 1 TE-0112CC TT-0112CC I/I-0112CC TE-0112CD TT-0112CD I/I-0112CD TE-0112HC TT-0112HC I/I-0112HC TE-0112HD TT-0112HD I/I-0112HD PT-0105A SMM-0114 Inputs Loop 2 TE-0122CC TT-0122CC I/I-0122CC TE-0122CD TT-0122CD I/I-0122CD TE-0122HC TT-0122HC I/I-0122HC TE-0122HD TT-0122HD I/I-0122HD PT-0105B SMM-0124	Degrees of Subcooling	A	1	200°F Sub-cooling to 35°F superheat	200°F Sub-cooling to 35°F superheat	Comply	Comply	Comply	2 Channels	Preferred 1E	C12	PPC	PPC	Indication used to initiate trip of primary coolant pumps. Also used to allow termination or throttling of SIS flows.
A02	PT-0105A P/S-0751C PI-0105A PTR-0112 PT-0105B P/S-0751D PI-0105B PTR-0122	Pressurizer Pressure	A	1	0-3000 PSIG	0-4000 PSIG	Comply	Comply	Comply	2 Channels	Preferred 1E	C12 C02	PPC	PPC	Indication used to initiate trip of primary coolant pump following small break LOCA. See Note 13.

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PARAMETER SUMMARY TABLE

TYPE A VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
A03	Stm Gen A LT-0757A P/S-0757A LI-0757A LT-0757B P/S-0757B LI-0757B STM GEN B LT-0758A P/S-0758A LI-0758A LT-0758B P/S-0758B LI-0758B	Steam Generator Level	A	1	160% to -140% (Equivalent to tube sheet to steam separators)	Tube Sheet to Steam Separators	Comply	Comply	Comply	2 Channels /Steam Generator	Preferred 1E	C12	PPC	PPC	Indication used to determine steam generator with ruptured tube to be isolated. Indication also used to initiate once thru cooling on low/low level.
A04	Stm Gen A PT-0751C P/S-0751C PIC-0751C PT-0751D P/S-0751D PIC-0751D Stm Gen B PT-0752C P/S-0751C PIC-0752C PT-0752D P/S-0751D PIC-0752D	Steam Generator Pressure	A	1	0-1200 PSIG	From Atmospheric to 20% above lowest safety valve setting	Comply	Comply	Comply	2 Channels /Steam Generator	Preferred 1E	C12	PPC	PPC	Indication used to determine ruptured steam generator to allow isolation following steam line break. Lowest relief valve setting 985 psig.
A05	LT-0103 P/S-0103 LI-0103A LT-0102 P/S-0751A LIA-0102A	Pressurizer Level	A	3	0-100% (Equivalent to top to bottom of vessel)	Top to Bottom of Vessel	N/A	N/A	N/A	N/A	N/A	C12 C02	PPC	PPC	
A06	AE-2401L AIT-2401L AI-2401L AE-2401R AIT-2401R AI-2401R	Containment Hydrogen Concentration	A	3	0-10 Vol% or 0-20 Vol% (switch selectable) from -2 to 60 PSIG	0-10 Vol% (capable of operating from -2 to 60 PSIG)	N/A	N/A	N/A	N/A	N/A	C11A	PPC	PPC	

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REGULATORY GUIDE 1.97 REV 3
PARAMETER SUMMARY TABLE

TYPE B VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
B01	NE-1/3 NI-1/3B NI-1/3D NI-1/3A EC-175 NE-2/4 NI-2/4B NI-2/4A EC-176	Neutron Flux	B	1	10^{-8} to 200% of full power	10^{-6} TO 100% of full power	Comply	Comply	Comply	2 Channel	Preferred 1E	C06	PPC	PPC	
B02	CRD-1 Thru-45	Control Rod Position	B	3	Full in or not full in, analog position for any of 45 Control Rods	Full in or not full in	N/A	N/A	N/A	N/A	Reliable Non-1E	C12 C02	PPC	PPC	These indications are shown on the core map display and rod position display.
B03	Deleted														
B04	-	PCS Cold Leg Water Temperature	B	3		50°F to 400°F									Covered by Item B06.
B05	Loop 1 TE-0112HC TT-0112HC PTR-0112 Loop 2 TE-0122HD TE-0122HD PTR-0122	PCS Hot Leg Water Temperature	B	1	50°F to 700°F	50°F to 700°F	Comply	Comply	Comply	2 Channels	Preferred 1E	C12	PPC	PPC	
B06	Loop 1 TE-0112CC TT-0122CC PTR-0112 Loop 2 TE-0122CD TT-0122CD PTR-0122	PCS Cold Leg Water Temperature	B	1	50°F to 700°F	50°F to 700°F	Comply	Comply	Comply	2 Channels	Preferred 1E	C12	PPC	PPC	
B07		PCS Pressure (Pressurizer Pressure)	B	1		0-400 PSIG									Covered by A02.
B08		Core Exit Temperature	B	3		0°F to 2300°F									Covered by Item C01.

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REGULATORY GUIDE 1.97 REV 3
PARAMETER SUMMARY TABLE

TYPE B VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
B09	LE-0101A LTRI-0101A LE-0101B LTRI-0101B	Coolant Inventory	B	1	Top of Core to Top of Vessel	Bottom of Hot Let to Top of Vessel	Comply	Comply	Comply	2 Channels	Preferred 1E	C11A	PPC	PPC	
B10		Degrees of Subcooling	B	2		200°F subcooling 35°F superheat									Covered by A01.
B11		PCS Pressure (Pressurizer Pressure)	B	1		0-4000 psig									Covered by Item A02.
B12	LT-0383 P/S-1812A LPIR-0383 LT-0382 P/S-1805A LPIR-0382	Containment Sump Water Level (Narrow Range)	B	2	0-100% (Bottom to Top of Sump)	Narrow Range (Sump)	Comply	Comply	N/A	2 Channels	Preferred 1E	C13	PPC	PPC	
B13	LE-0446A LIT-0446A LPIR-0383 LE-0446B LIT-0446B LPIR-0382	Containment Water Level (Wide Range)	B	1	0-100% (Exceeds Maximum Expected Water Level by 1.5 ft)	Wide Range (Plant Specific)	Comply	Comply	Comply	2 Channels	Preferred 1E	C13	PPC	PPC	
B14	-	Containment Pressure	B	1		0 - Design Pressure									Covered by C12.
B15	POS-0155 POS-0738 POS-0739 POS-0767 POS-0768 POS-0911 POS-0939 POS-1001 POS-1002 POS-0910 POS-0940	Containment Isolation Valve Position	B	1	Closed - Not Closed	Closed - Not Closed	Comply	Comply	Comply	Redundant Isolation Method for each flow path. Redundant Position Indication for each valve not provided.	1E Battery	Various	PPC	PPC	See Note 14.

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PARAMETER SUMMARY TABLE

TYPE B VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
	POS-1004 POS-1007 POS-1036 POS-1037 POS-1038 POS-1044 POS-1045 POS-1064 POS-1065 POS-1101 POS-1102 POS-1103 POS-1104 POS-1358 POS-1805 POS-1806 POS-1807 POS-1808 POS-1813 POS-1814 POS-1910 POS-1911 POS-2009 POS-2083 POS-2099 POS-2412A POS-2412B POS-2413A POS-2413B POS-2414A POS-2414B POS-2415A POS-2415B														
B16		Containment Pressure	B	1		-5 PSIG to Design Pressure									Covered by Item C12

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PARAMETER SUMMARY TABLE

TYPE C VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
C01	INCE-14H02 INCE-16G07 INCE-21N11 INCE-25RO8 INCE-32Q04 INCE-42R17 INCE-43X14 INCE-52M13 INCE-66J16 INCE-71H13 INCE-73B13 INCE-76G17 INCE-86J10 INCE-81J07 INCE-36R07 INCE-41Q16 LTRI-0101A LTRI-0101B	Core Exit Temperature	C	1	0°F to 2300°F	200°F to 2300°F	Comply	Comply	Comply	2 Channels (8 Thermo-couples per Channel)	Preferred 1E	C11A	PPC	PPC	See Note 15.
C02	None	Radioactivity Concentration or Radiation Level in Circulating Primary Coolant	C	1	-	½ Tech Spec Limit 50 to 100 times Tech Spec Limit									Online Analysis capability isolated during accident. Grab sample to be used to evaluate variable.
C03	None	Analysis of Primary Coolant (Gamma Spectrum)	C	3	-	10µCi/ml to 10Ci/ml or TIDI4844 source term in coolant volume									No online system for analysis available. Grab sample to be used to evaluate variable.
C04		PCS Pressure (Pressurizer Pressure)	C	1	-	0-4000									Covered by Item A02.
C05		Containment Pressure	C	1	-	-5 PSIG to design pressure									Covered by Item C12.
C06		Containment Sump Water Level (Narrow Range)	C	2	-	Narrow Range (Sump)									Covered by Item B12.
C07		Containment Water Level (Wide Range)	C	1	-	Wide Range (Plant Specific)									Covered by Item B13.
C08		Containment Area Radiation	C	3	-	1 R/HR to 10^{-4} R/HR									Covered by Item E01.

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PARAMETER SUMMARY TABLE

TYPE C VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
C09	RE-0631 RIA-0631	Effluent Radioactivity Noble Gas Effluent from Condenser air Removal System Exhaust	C	3	10^0 to 10^5 CPM (Equivalent to $1x10^{-5}$ to $2x10^{-2}$ µci/cc	10^{-6} µc/cc to 10^{-2} µc/cc	N/A	N/A	N/A	N/A	Preferred 1E	C11	PPC	PPC	
C10		PCS Pressure (Pressurizer Pressure)	C	1	-	0-4000 PSIG									Covered by Item A02.
C11		Containment Hydrogen Concentration	C	3		0-10 Vol-% (Capable of Operating from -2psig to 60psig)									
C12	PT-1812A P/S-1812A LPIR-0383 PT-1805A P/S-1805A LPIR-0382	Containment Pressure	C	1	-14.7 to 185.34 PSIG	-5 PSIG to 3 times Design Pressure for Concrete	Comply	Comply	Comply	2 Channels	Preferred 1E	C13	PPC	PPC	Design Pressure 55 PSIG
C13		Containment Effluent Radioactivity Noble Gases from Identified Release Points	C	2	-	10^{-6} µCi/cc to 10^{-2} µCi/cc									Covered by item E03
C14		Effluent Radioactivity Noble Gases (From building or areas where penetrations and hatches are located)	C	2	-	10^{-6} µCi/cc to 10^{3} µCi/cc									Covered by Item E03

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PARAMETER SUMMARY TABLE

TYPE D VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
D01	FT-0306 FIC-0306	RHR System Flow	D	2	O-8000 GPM GPM (6000 GPM design Flow)	0-110% Design Flow	Pre-QA	Comply	N/A	N/A	Reliable Non-1E	C02	PPC	PPC	All components located in mild environment
D02	TT-0351B TR-0351 TE-0351B	RHR Heat Exchanger outlet Temperature	D	2	0°F to 400EF	40°F to 350°F	Pre-QA	Comply	N/A	N/A	Reliable Non-1E	C02	PPC	PPC	
D03	LT-0365 P/S-0365 LIA-0365 LM-0365 LT-0368 P/S-0368 LIA-0368 LM-0368 LT-0372 P/S-0372 LIA-0372 LM-0372 LT-0374 P/S-0374 LIA-0374 LM-0374	Accumulator Tank Level	D	3	0-100% (Equivalent to 5% to 95% Tank Volume)	10% to 90% Volume	N/A	N/A	N/A	N/A	Preferred 1E	C13	PPC	PPC	Note 1
D04	PT-0363 P/S-0363 PIA-0363 PT-0367 P/S-0367 PIA-0367 PT-0371 P/S-0371 PIA-0371 PT-0369 P/S-0369 PIA-0369	Accumulator Tank Pressure	D	3	0 to 300 PSIG	0 to 750 PSIG	N/A	N/A	N/A	N/A	Preferred 1E	C13	PPC	PPC	SI Tank Designed for 300 PSIG. Note 1
D05	VOP-3041 VOP-3045 VOP-3049 VOP-3052	Accumulator Isolation Valve Position	D	2	Closed or Open	Closed or Open	Pre-QA	None	N/A	N/A	1E Battery	C03	PPC	PPC	Note 2

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PARAMETER SUMMARY TABLE

TYPE D VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
D06	FT-0212 FY-0212 FIA-0212 P/S-0212	Boric Acid Charging Flow	D	2	0-140 GPM	0-110% Design Flow	Pre-QA	Comply	N/A	N/A	Reliable Non-1E	C02	PPC	PPC	Design Flow is 132 GPM. All components located in mild environment.
D07	FT-0308 P/S-0751A FI-0308A FM-0308 FT-0310 P/S-0751B FI-0310A FM-0310 FT-0312 P/S-0751C FI-0312A FM-0312 FT-0313 P/S-0751D FI-0313A FM-0313	Flow in HPI System (Flow to Cold Legs)	D	2	0-250 GPM per injection line	0-110% Design Flow	Comply	Comply	N/A	N/A	Preferred 1E	C13	PPC	PPC	Design flow is 225 GPM per injection line.
D07A	FT-0316 P/S-0316 FI-0316A FT-0317 P/S-0377 FI-0317A	Flow in HPI System (Flow to Hot Legs)	D	2	0-350 GPM per injection line	0-110% Design Flow	Comply	Comply	N/A	N/A	Preferred 1E	C13			Design flow is 300 GPM per injection line.

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D08	FT-0307 P/S-0751A FI-0307A FM-0307 FT-0309 P/S-0751B FI-0309A FM-0309 FT-0311 P/S-0751C FI-0311A FM-0311 FT-0314 P/S-0751D FI-0314A FM-0314	Flow in LPSI System	D	2	0-2000 GPM per injection line	o-110% Design Flow	Comply	Comply	N/A	N/A	Preferred 1E	C13	PPC	PPC	Design flow is 1500 GPM per injection line.
D09	LT-0331 P/S-0331 LIA-0331 LT-0332A P/S-0332A LIA-0332A	Refueling Water Storage Tank Level	D	2	0-100% Equivalent to Top to Bottom	Top to Bottom	Pre-QA	Comply	N/A	N/A	Preferred 1E	C13	PPC	PPC	All components located in mild environment
D10	EAI-2103 EAI-2104 EAI-2203 EAI-2204	Reactor Coolant Pump Status	D	3	0-800 Amps	Electric Current	N/A	N/A	N/A	N/A	Same Bus as Powers Pump	C12	PPC	PPC	
D11	FE-1039 FM-1039 FI-1039 FE-1040 FM-1040 FI-1040 FE-1041 FM-1041 FI-1041 FE-1042B FM-1042B FI-1042B FE-1043B FM-1043B FI-1043B	Primary System Safety Valve Positions (including PORV and Code Valves)	D	2	Closed - Not Closed	Closed - Not Closed	Comply	Comply	N/A	N/A	Preferred 1E	C11A	PPC	PPC	
D12		Pressurizer Level	D	1		Top to Bottom									Covered By Item A05
D13	EAI-1211 EAI-1305	Pressurizer Heater Status	D	2	0-200 Amps Current	Electric	Pre-QA	Comply	N/A	N/A	Same bus as heaters	C02	PPC	PPC	All components in mild environment
D14	LT-0116 LIA-0116	Quench Tank Level	D	3	0-100%	Top to Bottom	N/A	N/A	N/A	N/A	Reliable Non-1E	C02	PPC	PPC	

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PARAMETER SUMMARY TABLE

D15	TE-0116 TIA-0116	Quench Tank Temperature	D	3	0°F to 350°F	50°F to 750°F	N/A	N/A	N/A	N/A	Reliable Non-1E	C02	PPC	PPC	Note 3
D16	PT-0116 PIA-0116	Quench Tank Pressure	D	3	0 to 25/100 PSIG Dual Range	0 to Design Pressure	N/A	N/A	N/A	N/A	Reliable Non-1E	C02	PPC	PPC	Rupture Disk at 100 PSIG.
D17		Steam Generator Level	D	1		From tube sheet to separators									Covered by Item A03
D18		Steam Generator Pressure	D	2		From atmospheric to 20% above lowest safety valve setting									Covered by Item A04
D19	Stm Gen A FT-0702 PT-0702 LIC-0701 FLIR-0701 Stm Gen B FT-0704 PT-0704 LIC-0703 FLIR-0702	Safety/Relief Valve Positions or Main Steam Flow	D	2	Main Steam Flow 0-6 x 10^6 lbs/hr per Steam Generator	Closed - Not Closed	Pre-QA	Comply Note 6	N/A	N/A	Reliable Non-1E	C11 C12	PPC	PPC	Design Flow 5.6 x 10^6 lbs/hr per Steam Generator
D20	Stm Gen A FT-0701 PT-0701 FLIR-0701 LIC-0701 Stm Gen B FT-0703 PT-0703 FLIR-0702 LIC-0703	Main Feedwater Flow	D	3	0-6 x 10^6 lbs/hr per Steam Generator	0-110% Design Flow	N/A	N/A	N/A	N/A	Reliable Non-1E	C11 D20	PPC	PPC	Design Flow 5.6 x 10^6 lbs/hr per Steam Generator

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PARAMETER SUMMARY TABLE

D21	Stm Gen A FT-0737 FM-0737 FI-0737 P/S-0737A FT-0749A FM-0749A FI-0749A P/S-0727 Stm Gen B FT-0727A FM-0727A FI-0727A P/S-0727 FT-0736 FM-0736 FI-0736 P/S-0737A	Auxiliary Feedwater Flow	D	2	0-650 GPM	0-110% Design Flow	Comply	Comply	N/A	2 Channels per Steam Generator	Preferred 1E	C11	PPC	PPC	Design Flow 415 GPM
D22	LT-2021 P/S-2021 LIA-2021 LT-2022 P/S-2022 LIA-2022	Condensate Storage Tank Level	D	1	0-100% (Essentially Top to Bottom of vessel)	Plant Specific	Comply	Comply	Note 17	2 Channels	Preferred 1E	C13	PPC	PPC	All components located in a mild environment
D23	FT-0301 FI-0301A FI-0301B FI-0302 FI-0302A FI-0302B	Containment Spray Flow	D	2	0-3000 GPM	0-110% Design Flow	Pre-QA	Comply	N/A	2 Channels	Preferred 1E	C13 C33	PPC	PPC	Design Flow 2700 GPM All components located in a mild environment. FI-0301B and FI-0302B part of same current loop as other components.

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PARAMETER SUMMARY TABLE

D24	Cooler Valve Position POS-0824 POS-0847 POS-0861 POS-0862 POS-0864 POS-0865 POS-0873 POS-0870 Cooler Fan Status 52-1208 52-1209 52-1210 Service Water Pump Status 152-103 152-204 152-205	Heat removal by Containment fan heat removal system	D	2	Indicating lights	Plant Specific	Comply	Comply	N/A	N/A	1E Battery	C08	PPC	PPC	Status determined by confirming cooler valves aligned, fans running and service water available. Only cooler inlet and outlet valves located in a harsh environment.
D25	TE-1812 TI-1812 TE-1813 TI-1813 TE-1814 TI-1814 TE-1815 TI-1815 TT-1815	Containment Atmospheric Temperature	D	2	0°F to 400°F	40°F to 400°F	Pre-QA	Note 7	N/A	4 Channels	Preferred 1E	C13	PPC	PPC	Maximum Containment Temperature 283EF.
D26	-	Containment Sump Water Temperature	D	2		50°F to 250°F									Not provided. Note 8
D27		Makeup Flow-in	D	2		0-110% Design Flow									Same as Charging Flow. See Item D06.
D28	FT-0202 FIC-0202	Letdown Flow-out	D	2	0 to 160 GPM	0 to 100% Design Flow	Pre-QA	Comply	N/A	N/A	Reliable Non-1E	C02	PPC	PPC	Design flow 132 GPM. All components in mild environment.
D29	LT-0205 LA-0205 LIC-0205	Volume Control Tank Level	D	2	0 to 100% (Equivalent to top to bottom of tank)	Top to Bottom	Pre-QA	Comply	N/A	N/A	Reliable Non-1E	C02	PPC	PPC	All components in mild environment.
D30	TE-0914 TIA-0914 TE-0916 TIA-0916	Component Cooling Water Temperature to ESF System	D	2	0°F to 200°F	40°F to 200°F	Pre-QA	Comply	N/A	N/A	Preferred 1E	C08	-	-	Max temp 114EF.

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PARAMETER SUMMARY TABLE

D31	CCW Pump Current EAI-1116 EAI-1208 EAI-1109 CCW Pump Pressure PT-0918 PIA-0918 CCW Surge Tk Level LT-0920 LIA-0920 SDC Hx Out Temp TE-0912 TI-0912 TE-0913 TI-0913	Component Cooling Water Flow to ESF System	D	2	0-100 amp 0-150 psig 0-100% 20-200EF	0-110% Design Flow	Comply	Comply	N/A	N/A	From device being monitored Preferred 1E Reliable Non-1E	C08	-	-	Note 9
D32	LT-1012 LIA-1012 LT-1014 LIA-1014 LT-1016 LIA-1016 LT-1018 LIA-1018	High Level Radioactive Liquid Tank Level	D	3	0-100% (Equivalent to Top to Bottom)	Top to Bottom	N/A	N/A	N/A	N/A	Reliable Non-1E	PPC	PPC	PPC	
D33	PT-1160 PIA-1160 PT-1161 PIA-1161 PT-1162 PIA-1162 PT-1119 PIA-1119 PT-1120 PIA-1120 PT-1121 PIA-1121	Radioactive Gas Holdup Tank Pressure	D	3	0 to 120 PSIG	0 to 150% Design Pressure	N/A	N/A	N/A	N/A	Reliable Non-1E	PPC	PPC	PPC	Design Pressure 120 PSIG Note 10

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PARAMETER SUMMARY TABLE

D34	POS-1657 POS-1659 POS-1663 POS-1679 POS-1713 POS-1743 PO-1745 POS-1711 POS-1658 POS-1660 POS-1664 POS-1680 POS-1714 POS-1744 PO-1746 POS-1712 POS-1757 POS-1758 POS-1768 POS-1769	Emergency Ventilation Damper Position	D	2	Open - Closed Status	Open - Closed Status	Comply	Comply	N/A	N/A	1E Battery	C11A	-	-	Only Emergency dampers are in control room HVAC system All components in mild environment Note 18 Note 18

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PARAMETER SUMMARY TABLE

D35A		Power supplies status of standby power	D	2		Plant Specific	Pre-QA	Comply	N/A	N/A	From Bus being monitored	Various Location	-	-	All components located in mild environment
		Safeguards Xfmr Status													
		Volts									Power to alarm from 1E Battery bus				
	EVI-0015	Amps			0-3 KV										
	EAI-0015				0-3 KAMP										
		Startup Xfmr Status													
		1-2 Volts													
	EVI-0003	1-2 Amps-X			0-3 KV										Note 19
	EAI-0001X	1-2 Amps-Y			0-3 KAMP										
	EAI-0001Y	1-2 Amps-Z			0-3 KAMP										
	EAI-0001Z				0-3 KAMP										
		Safeguards Bus Status													
		Volts													
	EVI-0008				0-3 KV										Note 19
		2400 Volt 1E Bus Status													
		1-C Volts													
	EVI-0001	1-D Volts			0-3 KV										Note 19
	EVI-0002	1-C Amps			0-3 KV										Note 19
	EAI-0003	1-D Amps			0-2 KAMP										
	EAI-0004	1-C Power			0-2 KAMP										
	EWI-0007	1-D Power			0-5 MW										
	EWI-0009				0-5 MW										
		Diesel Gen Status													
		1-1 Volt													
	EVI-1107	1-1 Volt			0-3 KV										
	EVI-1107L	1-2 Volt			0-3 KV										
	EVI-1213	1-2 Volt			0-3 KV										
	EVI-1213L	1-1 Power			0-3 KV										
	EWI-1107	1-1 Power			0-3 MW										
	EWI-1107L	1-2 Power			0-3 MW										
	EWI-1213	1-2 Power			0-3 MW										
	EWI-1213L	1-1 Frequency			0-3 MW										
	SPI-1107	1-1 Frequency			55-65 Hz										
	SPI-1107L	1-2 Frequency			55-65 Hz										
	SPI-1213	1-2 Frequency			55-65 Hz										
	SPI-1213L				55-65 Hz										

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D35A Cont		480 Volt 1E Bus Status	D	2		Plant Specific	Pre-QA	Comply	N/A	N/A	From Bus being monitored Power to alarm from 1E battery bus	Various Locations	-	-	All components located in mild environment
	27-11	Bus 11			Undervoltage Alarm/ No alarm										
	27-12	Bus 12													
	27-19	Bus 19													
	27-20	Bus 20													
		480 Volt 1E MCC Status	D	2	Supply Bkr. Alarm/No Alarm										
	52-1906	MCC 1													
	52-2006	MCC 2													
	52-1112	MCC 21+23													
	52-1214	MCC 22+24													
	52-1901	MCC 25													
	52-2001	MCC 26													
		Preferred 1E 120 Volt Status			Undervoltage Alarm/No Alarm										
	27-1	Y 10													
	27-2	Y 20													
	27-3	Y 30													
	27-4	Y 40			Undervoltage Alarm/No Alarm										
		1E DC Bus Status													
	74-D1	DC Bus 1													
	74-D2	DC Bus 2													
D35B		Power Supplies Other Sources Important to Safety	D	2		Plant Specific	Pre-QA	None	N/A	N/A	1E Battery	Various	-	-	See Note 12
	PS-0441	High Pressure Air			Low Pressure Alarm/No Alarm										
	PS-0439														
	PS-2273	AFW Backup N2			Low Pressure Alarm/No Alarm										
	PS-2274														

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TYPE E VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
E01	RE-2321 RIA-2321 RE-2322 RIA-2322	Containment Area Radiation High Range	E	1	1 Rem/hr to 10^7 Rem/hr	1 Rem/hr to 10^7 Rem/hr	Comply	Comply	Comply	2 Channels	Preferred 1E	C11A	PPC	PPC	
E02	RE-2300 thru RE-2317 RIA-2300 thru RIA-2317	Radiation Exposure rate (inside buildings or area where access is required to service equipment important to safety).	E	3	10^{-4} Rem/hr to 10^4 Rem/hr	10^{-1} Rem/hr to 10^4 Rem/hr	N/A	N/A	N/A	N/A	N/A	C11	-	-	Radiation Monitors inside Auxiliary/Turbine buildings. Portable instrumentation will be used to determine radiation levels a long access routes and in areas where emergency maintenance is required.
E03A	RE-2326 RIA-2326 RE-2327 RIA-2327 FE-1818 FT-1818 FM-1818	Noble gases and vent flow rate (common plant vent)	E	2	10^{-7}µc/cc to 10^5µc/cc	10^{-6}µc/cc to 10^4µc/cc	Comply	Comply	N/A	N/A	Non-1E	C11A	PPC	PPC	All releases except steam gen relief valves or atmospheric dump valves through common stack. FT-1818 display on PPC only.
E03B	RE-2323 RIA-2323 RE-2324 RIA-2324	Noble gases and vent flow rate (vent from steam gen relief valves or atmospheric dump valves)	E	2	10^{-1}µc/cc to 10^3µc/cc	10^{-1}µc/cc to 10^3µc/cc	Comply	See Note 16	N/A	N/A	Preferred 1E	C11A	PPC	PPC	Flow rate not provided calculated in procedure based on primary temperatures
E04	-	Particulates and Halogens	E	3	10^{-3}µCi/cc to 10^2µCi/cc	10^{-3}µc/cc to 10^2µc/cc	N/A	N/A	N/A	N/A	N/A	-	-	-	Capability of sampling stack effluent provided. Onsite analysis capability provided.
E05	-	Airborne Radiohalogens and Particulates	E	3	10^{-9}µCi/cc to 10^{-3}µCi/cc	10^{-9}µCi/cc to 10^{-3}µCi/cc	N/A	N/A	N/A	N/A	N/A	-	-	-	Portable sampling and analysis equipment provided

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PARAMETER SUMMARY TABLE

TYPE E VARIABLES

ITEM	TAG NO	VARIABLE			INSTRUMENT RANGE		QA REQUIRE-MENT	ENVIRON-MENTAL QUALIFICATION	SEISMIC QUALIFI-CATION	REDUNDANCE	POWER SUPPLY	DISPLAY LOCATION			COMMENTS
		DESCRIPTION	TYPE	CATE-GORY	EXISTING	REQUIRED						CR	TSC	EOF	
E06	-	Plant and Environs Radiation (Portable Instrumentation)	E	3	10-3 Rem./hr to $2x10^4$ Rem/hr Beta and Gamma	10^{-3} Rem/hr to 10^4 Rem/hr Photons 10^{-3} rad/hr to 10^{-4} rad/hr and low energy photons	N/A	N/A	N/A	N/A	N/A	-	-	-	Portable radiation monitors are provided
E07	-	Plant and Environs Radioactivity (Portable Instrumentation)	E	3	Isotopic	Isotopic	N/A	N/A	N/A	N/A	N/A	-	-	-	Samples collected remotely transported to multi channel analyzer Analysis
E08	-	Wind Direction	E	3	0-360° ±5°	0-360° ±5°	N/A	N/A	N/A	N/A	N/A	PPC	PPC	PPC	Measured at 2 elevations 10 Meters and 60 Meters.
E09	-	Wind Speed	E	3	0-100 MPH ±5 MPH	0-22 MPS (50 MPH) ± .2 MPS	N/A	N/A	N/A	N/A	N/A	PPC	PPC	PPC	Measured at 2 elevations 10 Meters
E10	-	Estimation of Atmospheric Instability	E	3	-5°C to +10°C ±.15°C	Based on vertical temperature difference from primary met system (-5°C to 10°C ±0.15°C)	N/A	N/A	N/A	N/A	N/A	PPC	PPC	PPC	Based on temperatures at 2 elevations 10 Meters and 60 Meters

NOTES

1. Safety Injection Tank (SIT) level and pressure monitoring instrumentation changed to Category 3. Reference NRC Safety Evaluation. “Safety Injection Tank Pressure and Volume Instrumentation.” dated Nov. 29, 1993.

2. Power to the SI tank isolation valves is locked out during normal operations to prevent inadvertent isolation of the SI tank from the primary coolant system (PCS). For postulated events, which result in rapid PCS depressurization to a point at which the SI tanks discharge their contents, there is no need to close the SI tanks isolation valve. For events which result in a slowly decreasing primary system pressure, the containment environment would not be expected to be as severe as that resulting from a rapid PCS depressurization. For these less sever events, it is expected that both the SI tanks ‘isolation valves and vent valves‘ position indication would function properly to indicate isolation and/or venting of the tank. Therefore, based on the above, CPCo considers that qualification of the SI tank isolation valve position indication is not required.

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3. Events which heat the quench tank result from the release of steam to the tank through underwater spargers. As the volume of water to be heated is large, the temperature of the tank will remain less than the saturation temperature corresponding to tank pressure. The maximum tank temperature is thus restricted to the saturation temperature corresponding to the tank rupture disk pressure setpoint of 100 psig which is 338°F.

4. Deleted.

5. Deleted.

6. The purpose of this indication is to monitor for potentially stuck open steam generator relief valves. Palisades has main steam flow instrument loops with flow transmitters located inside containment which can be utilized to monitor for excessive steam flows which would result from stuck open steam generator relief valves. The steam generator relief valves are located outside containment, and a Main Steam Line Break (MSLB) resulting from a stuck open relief valve would not result in a harsh environment inside of containment. Based on the above, it is concluded that the main steam flow instrument loops are located in a mild environment for events (MSLB outside containment) during which it would be required to function and, thus, are not subject to the provisions of 10CFR50.49.

7. Containment atmosphere temperature indicating loops are provided for routine surveillance of containment temperature during normal operations. The temperature elements associated with these loops are located in containment and have not been environmentally qualified. Qualified containment pressure indicating loop are, however, provided which can be utilized to assess containment temperature. During accident conditions, when energy is released to the containment the saturation temperature corresponding to the containment pressure provides a close approximation of the actual containment atmosphere temperature. As there are no post-accident operator actions required based on knowledge of containment temperature, CPCo considers that containment pressure is an acceptable alternative for monitoring post accident containment temperature.

8. The Palisades design does not contain provisions for monitoring sump water temperature. Monitoring containment pressure, however, allows an assessment of sump temperature as the sump temperature will be equal to or less (ie, slightly subcooled) than the saturation temperature corresponding to the containment pressure. As there are no operator actions required, based on knowledge of containment sump water temperature, CPCo considers that containment pressure is an acceptable alternative for monitoring sump water temperature.

9. CCW parameters monitored in the control room include: CCW pump current, CCW pump discharge pressure, CCW surge tank level and shutdown cooling heat exchanger inlet and outlet temperature (CCW side). These parameters are sufficient to allow determination of events such as flow blockage or pipe rupture. Flow blockage events, resulting in decreased system flow, would be indicated by increased CCW pump discharge pressure, decreased CCW pump current and increased differential temperatures across the shutdown cooling heat exchangers. Pipe rupture events would be indicated by decreasing levels in the CCW surge tanks. Providing these parameters in the control room precludes the need for CCW flow instrumentation.

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10. The radioactive waste gas system consists of a waste gas surge tank, three air compressors and six waste gas decay tanks. The design pressure of the waste gas decay tanks is 120 psig and pressure-monitoring instrumentation is provided to indicate from 0 psig to design pressure (120 psig). This range of the pressure instrumentation is considered acceptable based on the following operating and design features which prevent the design pressure of the tank from being exceeded:

    a. During normal operation the tanks are isolated when reaching 95 psig (80% of design pressure).

    b. An alarm is provided to indicate when tank pressure exceeds 100 psig (83% design pressure).

    c. Two relief valves set at tank design pressure are available to relieve pressure when the tank is being filled. One relief is located on the discharge of the air compressors and the other on the tank. The total relief valve capacity exceed the design capacity of the pumping system. The relief valves relieve back to the waste gas surge tank.

    d. The tanks are located in an area of the plant where the environment would be unaffected during any design basis event. Thus, isolated tanks could not be overpressured by extreme temperature changes.

11. Deleted

12. Other standby energy sources include emergency high pressure air systems utilized to operate selected air operated valves in the event that the normal instrument air system is disabled. Status of the various standby pressure sources is provided by local pressure indications and control room alarms actuated on low pressure. The accumulator tanks in the standby high pressure air systems are passive devices which function automatically to provide air to required valves through appropriate check valves in the event normal instrument air is lost. The status indications provided are used for monitoring during normal operations to assure that sufficient air is available in the accumulators to perform their function if required. Some of the components of the status indication system are located in harsh environments, however, as these indications are only required to determine system availability prior to use, CPCo considers that upgrading these components is not required.

13. The range of the installed PCS pressure instrument loops deviates from the 0-4000 psig range required by Regulatory Guide. The existing range of 0-3000 psig is considered to be adequate based on the improved readability of the smaller range and the modification installed to limit anticipated transient without scram (ATWS) events. (Reference: CPCo letter to NRC, “Response to NRC Interim Report, Conformance to Regulatory Guide 1.97,” dated April 30, 1986).

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14. Cable separation for the containment penetration isolation valve position indication listed below deviates from the guidance on redundancy provided in Regulatory Guide 1.97 and the Palisades design basis. A lack of position indication would not result in misleading the operator and by placing the valve handswitch in the closed position, the operator would assure that power is removed from the solenoid operator thus closing the valve. (Reference: supplemental Safety Evaluation, "Conformance to Regulatory Guide 1.97," dated January 11, 1994.)

CONTROL VALVE	PENETRATION NO	FUNCTION
CV-1910, 1911	40	PRIMARY COOLANT SYSTEM SAMPLE
CV-1064, 1065	25	CLEAN WASTE RECEIVER TANK VENT
CV-1002, 1007	47	PRIMARY SYSTEM DRAIN TANK PUMP SUCTION
CV-1036, 1038	49	CLEAN WASTE RECEIVER TANK RECIRCULATION OUTLET
CV-1044, 1046	69	CLEAN WASTE RECEIVER TANK PUMP SUCTION
CV-1101, 1102	46	CONTAINMENT VENT HEADER TO WASTE GAS
CV-1103, 1104	52	CONTAINMENT SUMP DRAIN
CV-2083, 2099	44	PRIMARY COOLANT PUMP SEAL LEAKOFF

Redundancy per penetration deviates from the guidance in Regulatory Guide 1.97 for the containment isolation valves associated with containment atmosphere hydrogen monitoring. For this system there are two penetrations for each channel of hydrogen monitoring. Each channel has its own power supply, resulting in both valves and both position indications per penetration having the same power source. The isolation valves are solenoid valves which are normally closed and deenergized, and are opened to sample the containment atmosphere following an accident. Lack of position indication would not result in misleading the operator, and the opposite channel system would then be used (opened) if necessary.

ISOLATION VALVE	PENETRATION NO	CHANNEL
SV-2412A, SV-2412B	40B	RIGHT
SV-2414A, SV-2414B	40A	RIGHT
SV-2413A, SV-2413B	21A	LEFT
SV-2415A, SV-2415B	21	LEFT

15. Cable separation requirements for the core exit thermocouple cables between the reactor head and control room are not met. Justification for this deviation is provided in CPCo letter to the NRC, "Inadequate Core Cooling Instrumentation System," dated May 31, 1984.

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16. The main steam line radiation monitors are located in an area defined as a harsh environment for a main steam line break outside of containment. The installed radiation monitors are not qualified to operate in this harsh environment. Justification for this deviation is based on the following:

    a. The main steam radiation monitors are used to quantify radiation releases for a steam generator tube rupture. The steam generator tube rupture does not result in a harsh environment in the area containing the radiation monitors. Thus the main steam radiation monitors do not need to be environmentally qualified.

    b. The function of the main steam line radiation monitors is to calculate the potential offsite dose which could occur following a release through the steam generator safety relief or atmospheric dump valves. An alternate method of performing this calculation is provided by the backup High Range Effluent Monitors located on the auxiliary building roof. Use of this backup method is included in Plant Emergency Implementation Procedure.

    (Reference: Supplemental Safety Evaluation, “Conformance to Regulatory Guide 1.97,” dates January 11, 1994)

17. Both channels of condensate storage level indication cabling are routed through the non-seismic turbine building. This condition has been reviewed and found acceptable as documented in Reference 16.

18. PO-1745 and PO-1746 provide position indication via limit switches in the motor operator. Power supply is from the motor operator's breaker cubicle via a step-down transformer.

19. The faceplate range of the voltmeters EVI-0001, EVI-0002, EVI-0003 and EVI-0008 is 0 – 3 KV. The voltmeters are self powered devices and require a minimum bus voltage of 1700 V. Therefore, the effective range of the meters is 1.7 – 3 KV.