GENERAL ELECTRIC

NUCLEAR POWER

SYSTEMS DIVISION

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MFN 014-83
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January 28, 1983

U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D.C. 20555

Attention: Mr. D.G. Eisenhut, Director
Division of Licensing

SUBJECT: IN THE MATTER OF 238 NUCLEAR ISLAND
GENERAL ELECTRIC STANDARD SAFETY ANALYSIS REPORT
(GESSAR II) DOCKET NO. STN 50-447

Attached please find the remaining final draft responses to the Instrumentation and Control Systems Branch (ICSB) questions in the Commission's October 5, 1982 request for additional information. These responses reflect the NRC/GE information exchange meetings held in Bethesda October 14 & 15, 1982; San Jose December 7-9, 1982; and again in Bethesda January 11-13, 1983.

This transmittal contains the last ten responses for the 421-series as promised in our previous submittal dated January 21, 1983. They are 421.02, 04, 13, 16,* 18, 22,* 32,* 40, 44 and 50. Also included is Attachments 1 and 2 (referenced in Response 421.04d) and Attachment 3 (referenced in Response 421.23 submitted January 21). Four extra copies of these attachments are included for reference purposes in conjunction with the amendment scheduled for February 1983.

Sincerely,

Willa for

E003
Limited Dist

Glenn G. Sherwood, Manager
Nuclear Safety & Licensing Operation

Attachments

cc: M.J. Virgilio, NRC
D.C. Scaletti, NRC
L.S. Gifford, GE-Bethesda (Without Attachments)
F.J. Miraglia (Without Attachments)
C.O. Thomas (Without Attachments)
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*To be provided under separate cover.

FINAL DRAFT

421.02 QUESTION

In Section 7.1 of your FSAR, you do not address the Branch Technical Positions (BTP) relating to the instrumentation and control systems listed in Table 7-1 of the SRP and provided in Appendix A to Chapter 7 of the SRP. Provide a detailed discussion using drawings, schematics and P&ID's to demonstrate that your proposed design conforms to the guidance provided in the applicable BTP's, including Branch Technical Position ICSB 18 (PSB) contained in Appendix 8-A of the SRP.

421.02 RESPONSE

The following Table provides GE's assessments for all BTP's shown in Table 7-1 of the SRP and BTP ICSB 18 (PSB):

(Next 6 Pages & Attachment)

SRP ASSESSMENT

RESPONSE TO QUESTION 421.02

SRP ACCEPTANCE CRITERIA	DEVIATION	JUSTIFICATION
(a) BTP ICSB 3: Isolation of low pressure systems from the High Pressure Reactor Coolant System.	Diversity exception is taken for RHR suction lines which incorporate two motor - operated valves as the LP/HP interface. Otherwise, no deviations.	See response to question 421.40.
(b) BTP ICSB 4: Requirements of MOVs in the ECCS accumulator lines (PWR plants)	Not applicable to BWR plants.	BTP ICSB 4: BWRs do not employ safety injection tanks with MOIVs.
(c) BTP ICSB 12: Protection System trip point changes for operation with reactor coolant pumps out of service.	Not applicable to BWR plants	BTP ICSB 12: BWRs do not employ reactor coolant pumps and safety setpoints are fixed.
(d) BTP ICSB 13: Design criteria for auxiliary feedwater systems.	Not applicable to BWR plants.	BTP ICSB 13: BWRs do not employ steam generators nor auxiliary feedwater systems.
(e) BTP ICSB 14: Spurious withdrawals of single control rods in PWRs.	Not applicable to BWR plants.	BTP ICSB 14: SRP identified single-failure rod withdrawal problem unique to PWRs only.
(f) BTP ICSB 16: Control Element Assembly (CEA) interlocks in Combustion Engineering reactors.	Not applicable to GE BWRs.	BTP ICSB 16: SRP identifies requirement unique to Combustion Engineering Vendor.
(fg) BTP ICSB 18 (PSB): Application of the single-failure criterion to manually-controlled electrically-operated valves.	No deviation	BTP ICSB 18: Valve operations have been evaluated in the design. If inadvertent open operation has adverse safety consequences, two valves are placed in series

*Unless otherwise indicated, all references are in GESSAR II.

SRP ASSESSMENT

RESPONSE TO QUESTION 421.02

SRP ACCEPTANCE CRITERIA	DEVIATION	JUSTIFICATION
(fg) BTP ICSB 18 (PSB): Continued		on the pipe with logic segregation such that no single electrical failure can open both valves (e.g., see valves F007 and F008 on Figure 6.7-1a). Likewise, if inadvertent close operation has adverse safety consequences, two valves are placed in parallel on the pipe with logic segregation such that no single electric failure can close both valves (e.g., see valves F001A and F001B on Figure 9.3-5). The power disconnect option is therefore unnecessary and is not used except for valve FF038 on Figure 9.5-1B. See Section 9.5.9.3 for its Safety evaluation and Section 9.5.9.5 for its instrumentation requirements, which includes the BTP discussion. Also see Response 430.39 (attached).

9.5.9.1.1 Safety Design Bases (Continued)

Code Section III, Class 2, Quality Group B and Quality Assurance B requirements.

(2) Secondary containment penetrations, isolation valves, and piping up to these valves are ~~Piping that penetrates secondary containment are~~ designed to Seismic Category I, ASME Code Section III, Class 3, Quality Group C and Quality Assurance B requirements.

(3) The deep-bed demineralizer is designed and fabricated in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

(4) The two horizontal, centrifugal SPCU pumps are designed and fabricated in accordance with API 610.

(5) The remainder of the system is designed to the ANSI B31.1 Power Piping Code and Quality Group D requirements.

9.5.9.1.2 Power Generation Design Bases

(1) During normal plant operation, the SPCU System is designed to recirculate approximately 1,100 gpm of suppression pool water.

(2) In circumstances of high suppression pool activity or conductivity, such as following a blowdown transient, the system is capable of providing cleanup of the suppression pool water at the rate of 2,200 gpm.

(3) The system is designed to maintain the suppression pool water quality at or better than the following conditions:

Conductivity	$\leq$ 10μmho/cm at 25°C
Chlorides	$\leq$ 0.5 ppm

9.5.9.2 Systems Description (Continued)

In the event of a LOCA, the SPCU System function is automatically terminated to accomplish containment isolation. Power for the SPCU System pumps and valves is supplied only from the preferred power buses. Containment isolation valves are provided with Class 1E preferred and standby power.

The SPCU System, consisting of piping, valves and instrumentation, is shown in Figure 9.5-18 (K-172). The system has no unique major components.

9.5.9.3 Safety Evaluation

The system has no safety-related function as previously defined. Failure of the system does not compromise any safety-related system or component and does not prevent safe reactor shutdown.

However, the system does incorporate some features that assure reliable operations over the full range of normal plant operations. These features consist primarily of instrumentation that monitors and/or controls SPCU operation and performance.

Portions of the SPCU System that penetrate the containment are provided with isolation valves which are automatically closed by an isolation signal.

The containment isolation signal logic receives reactor low-water-level signals and drywell high-pressure signals. These inputs isolate the SPCU System to prevent containment bypass leakage.

Emergency power is supplied by Class 1E buses to containment isolation valves and leak detection instrumentation for the DBA and for LOPP events.

A portion of the SPCU System that penetrates only the secondary containment is provided with an isolation valve, FF038, which is normally closed with its power disconnected as the means of designing against a single failure that might cause an undesirable component action (ie-opening). This valve isolates the SPCU System to prevent secondary containment bypass leakage. Power is supplied by Non-Class 1E buses to this valve and its position indication.

9.5.9.5 Instrumentation Requirements (Continued)

turn it off using a hand selector switch located in the control room. [illegible]

The containment isolation valves are supplied with position indication in the control room and remote-manual as well as automatic operation. (See Subsection 7.3.1 for details.)
(See the attached section 9.5.9.5 continuation)

9.5.10 Nuclear Island - BOP Interface

9.5.10.1 Nuclear Island Fire Protection System - BOP Interface

The Applicant shall provide the water and CO_2 supplies for the Nuclear Island Fire Suppression System.

9.5.10.1.1 Design Criteria

Fire water supply for the Nuclear Island shall be provided by the BOP Fire Water System, Essential Service Water System and Condensate Transfer System. The Essential Service Water System provides a backup Seismic Category I source of water for hose reels for essential equipment. Condensate is the preferred source of water for the Wet Standpipe System inside the containment. The ESW and condensate connections and actuation and isolation provisions are within the scope of the Nuclear Island design.

CO_2 shall be supplied to the Nuclear Island at a sufficient rate and duration for the Diesel Generator Building CO_2 Fire Suppression System.

The classification of the BOP Fire Water and CO_2 Supply System for the Nuclear Island may be Quality Group D and nonseismic Category I.

9.5.9.5 Instrumentation Requirements (Continued)

The secondary containment isolation valve, FF038, conforms to the guidance provided in Branch Technical Position ICSB 18 (PSB) as follows.

BTP ICSB 18 (PSB)

B1. Failures in both the "fail to function" sense and the "undesirable function" sense of components in electrical systems including valves and other fluid system components were considered in designing against a single failure, even though the valve or other fluid system component may not be called upon to function in a given safety operational sequence.

B2. For valve FF038 it was determined that failure of an electrical system component can cause undesired mechanical motion of the valve and this motion results in loss of the system safety function. For this reason the valve's portion of the electrical system includes a device to disconnect power to the valve's electric motor operator. This device is a local-mounted key-locked hand-operated two-position maintained-contacts switch which is connected between the valve's reversing motor starter and its operator's motor. The switch is normally OFF which disconnects the 480 VAC 3ϕ power to the valve operator's motor, and also interrupts the 120 VAC 1ϕ power in the valve reversing motor starter's controls.

The plant technical specifications will include this electrically-operated valve, and the required position of the valve, to which the requirement for removal of electric power is applied in order to satisfy the single failure criterion. The utility applicant will be required to comply.

B3. This portion does not apply since this electrically-operated valve is not classified as an "active" valve.

B4. Since the single failure criterion is satisfied by removal of electrical power from the valve described in B2. above, the valve has two sets of position indications in the main control room and the position indications, themselves, meet the single failure criterion. This Non-Class 1E position indication meets the single failure criterion by utilizing two diverse and segregated indication methods. The first indication uses a limit switch in the valve's motor

9.5.9-5 Instrumentation Requirements (continued)

operator connected to the annunciator system which is DC powered, battery backed. In addition the OFF switch has an auxiliary contact connected to the same circuit. If the valve operator is moved from the fully closed position or the OFF switch is moved to the ON position the annunciator produces an audible and visual indication.

The second indication uses a stem switch on the valve connected to indicating lights which are AC powered, diesel generator backed. If the valve is moved from the fully closed position the lights produce a visual indication.

The circuits are segregated by using two different wiring routes for the circuits.

B5. The phrase "electrically-operated valves" includes both valves operated directly by an electrical device (e.g., a motor-operated valve or a solenoid-operated valve) and those valves operated indirectly by an electrical device (e.g., an air-operated valve whose air supply is controlled by an electrical solenoid valve).

SRP ACCEPTANCE CRITERIA	DEVIATION	JUSTIFICATION
(g) BTP ICSB 20: Design of instrumentation and controls provided to accomplish changeover from injection to recirculation mode.	No Deviation	BTP ICSB 20: It is not within the BWR operating design base, to transfer from injection to recirculation mode. The BTP is primarily a PWR concern. However, HPCS suction automatically transfers from its preferred source (condensate storage tank) to the suppression pool on receipt of low condensate water level or high suppression pool water level signals. See 7.3.1.1.1.1.C.1 and 6.3.2.2.1. Likewise, RCIC has similar transfer (automatically), as described in 7.4.1.1.D.6 and 5.4.6.1.
(h) BTP ICSB 21: Guidelines for application of Regulatory Guide 1.47.	No deviation	BTP ICSB 21: See analysis sections for each system for application of Regulatory Guide 1.47. For example, 7.3.2.1.2.A.7 for ECCS. Also see Response 421.04. B.1 & B.2 Individual system components meeting guidelines B.1, 2 & 3 of Regulatory Guide 1.47 are annunciated at a single "system out of service" window for each division. In addition, status lights identify which component causes the out-of-service condition. Manual switches are provided to compliment administrative procedures which cover functions not automatically annunciated. Both annunciators and status lights are located in the Control Room immediately accessible to the operator.

*Unless otherwise indicated, all references are in GESSAR II.

SRP ASSESSMENT

RESPONSE TO QUESTION 421.02

SRP ACCEPTANCE CRITERIA	DEVIATION	JUSTIFICATION
(h) BTP ICSB 21: (continued)		B.3 The operator cannot cancel erroneous indications. He can silence the horn, but cannot clear the window or status lights until the problem is cleared. B.4 The annunciators and status lights are not safety related. However, no safety action is required by the operator based solely on annunciator indication. B.5 Interfaces between annunciators and safety-related logic are optically isolated such that no annunciator failures could cause failures of essential safety functions. Status lights are retained in the divisional circuits and are qualified with the panels housing them. Compliance with Regulatory Guide 1.75 assures redundant safety system independence is not compromised. B.6 All indicating and annunciating functions can be tested during normal plant operation. (This should be confirmed by applicant).
(i) BTP ICSB 22: Guidance for application of Regulatory Guide 1.22.	No Deviation	BTP ICSB 22: RPS conformance to Regulatory Guide 1.22 is addressed in Subsection 7.2.2.2.A.1. RPS conformance to IEEE-279 is addressed in Subsection 7.2.2.2.C.1. Corresponding conformance sections for ECCS are 7.3.2.1.2.A.3 and 7.3.2.1.2.C.1 respectively.

*Unless otherwise indicated, all references are in GESSAR II.

SRP ACCEPTANCE CRITERIA	DEVIATION	JUSTIFICATION
(j) BTP ICSB 26: Requirements for Reactor Protection System anticipatory trips.	Some RPS inputs come from devices mounted on non-seismically qualified equipment and/or located in non-seismically qualified enclosures.	See Subsection 7.2.3; the analysis on the use of RPS inputs from devices mounted on nonseismically qualified equipment and/or located in nonseismically qualified enclosures has been accepted per three safety evaluation reports: (1) NUREG-0124 (supplement to NUREG 75/110) "Safety Evaluation Report, GESSAR 238 Nuclear Island Standard Design Supplement 1", September 1976, pp. 7-78, 15-3,4. (2) NUREG-0151, "SER, GESSAR 251, Nuclear Steam Supply System Standard Design", March 1977. (3) NUREG-0124 Supplement 2, January 1977, pp. 15-1, 2. The above reports include data for generic 238 and 251 BWR/6 designs. This analysis considers turbine trip, generator load rejection trip and recirculation pump trip (RPT). Generally, GE requires all hardware contributing to scram be qualified per IEEE-279 (7.2.2.2.C.1). This means that such equipment located in the turbine building is required to be qualified to all class 1E requirements (except seismic in some cases). Interconnecting cables are treated as class 1E cables and are run in separate conduit for each division in

*Unless otherwise indicated, all references are in GESSAR II.

SRP ACCEPTANCE CRITERIA	DEVIATION	JUSTIFICATION
(j) BTP ICSB 26: (continued)		accordance with Regulatory Guide 1.75 as required by GE specifications. As indicated in the response to question 421.38, single failures associated with cable or sensors in the non-seismic area will not jeopardize the integrity of the RPS. Where exceptions are taken by customer/AE (i.e., applicants turbine control valve fast closure and turbine stop valve closure sensors), isolation is provided to protect the integrity of the RPS.

*Unless otherwise indicated, all references are in GESSAR II.

FINAL DRAFT

421.04 QUESTION

Discuss in detail, your design of the bypassed and inoperable status indication system using detailed schematics. Provide the following additional information in your discussion:

a. Your conformance with the recommendations of Regulatory Guides 1.47 and 1.22 (Positions D.3a and 3b).

421.04 a RESPONSE

Conformance with Regulatory Guides 1.22 and 1.47 is discussed in GESSAR II, Sections 7.1.2.10.5 and 7.1.2.10.10 respectively; and in the analysis sections for the various systems. The GESSAR II design is in full compliance with Regulatory Guide 1.47 and with positions D.3a and 3b of Regulatory Guide 1.22.

Refer to Question 421.42 and its associated response for bypass and inoperable conditions of the HPCS.

421.04 (b) QUESTION

FINAL DRAFT

Provide the design philosophy used in selecting which equipment and systems to monitor, including auxiliary and support systems.

421.04 (b) RESPONSE

In general, the following design philosophy can be inferred and is a summary of the designers interpretation of the content of Reg Guide 1.47.

a) Automatic Indication at the System Level on Loss of the System
   * Loss of a train is annunciated
   * Motor operated valves in test are indicated by lights
   * System isolation (valve closure) is indicated by lights

b) Automatic Indication at the System Level When Auxiliary Systems are Lost
   * Loss of auxiliary temperature control, level control, cooling water and pump turbine drivers are annunciated

c) Automatic Indication for a Train or Component
   * Loss of motor operated valves or pumps that can cause loss of a train are annunciated
   * Loss of power, logic power, equipment in test or calibration is indicated by lights
   * All RPS out-of-service status is annunciated

d) Manual Initiation of Bypass Indication
   * Bypass of any channel or train is indicated by lights

These guidelines have been applied to those safety-related systems that are discussed in FSAR Sections 7.2, 7.3, 7.4 and 7.6. The specific choice of annunciators or lights for safety-related systems is given in the ~~attached table.~~ tables submitted in response 421.04d. Essentially lights are provided for component status. Annunciators are provided for auxiliary systems and major components whose failure could render a primary system inoperative. If any component or auxiliary system does cause loss of a train or the system, then this condition is annunciated at the system level. These indications serve to provide the operators with a convient Summary status so that actions can follow to observe the individual status indicators and return the affected component or system to service.

Design of the system allows testing during normal operation and precludes the possibility of adverse effects on safety systems. Those portions of the bypassed/inoperative indication system which, when faulted, could reduce independence between redundant safety systems are electrically isolated from the protection circuits.

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JAN 27 1983
R.W. STRONG

FINAL DRAFT

421.04 c QUESTION

Provide a discussion of how your design of the bypass and inoperable status indication system comply with positions B.1 through B.6 of Branch Technical Position ICSB 21.

421.04 c RESPONSE

The design of the bypass and inoperable status indication system complies with positions B.1 through B.6 of the BTP ICSB 21 as follows:

B.1
The bypass/inop. indicators and annunciators are located on control room panels convenient to the operator. They provide necessary information to the operator concerning status of each safety system.

B.2
There are no safety systems shared between one unit and another in the GESSAR II design. Therefore, position B.2 does not apply.

B.3
No means are provided to cancel erroneous bypass/inop. indications. Therefore, position B.3 does not apply.

B.4
The annunciators and status lights are not safety related. However, no safety action is required by the operator based solely on annunciator indication. (Administrative procedures by ~~utility~~/applicant)

B.5
Interfaces between annunciators and safety-related logic are optically isolated such that no annunciator failures could cause failures of essential safety functions. Status lights are retained in the divisional circuits and are qualified with the panels housing them. Compliance with Regulatory Guide 1.75 assured redundant safety system independence is not compromised.

B.6
The design of the system allows testing during normal operation. In addition, indicator and annunciator lamps are testable by means of test switches on the control room panels.

FINAL DRAFT

421.04 d QUESTION

Provide the list of system automatic and manual bypasses in light of the recommendations of Regulatory Guide 1.47.

421.04 d RESPONSE

(letter dated 1-28-

The requested lists are tabularized and submitted under separate cover ~~attached as Appendix~~ as Attachment 1 (NSSS list for the Nuclear Island. Approx. 19 pages) and as Attachment ~~Appendix~~ 2 (Non-NSSS list for the Nuclear Island. Approx. 51 pages).

The ~~utility~~/applicant shall provide the list of automatic and manual bypasses for at least the following systems: Essential/HPCS Service Water System, Diesel Generator Control System and the HPCS Power Supply System. BOP interface connection points for these systems are provided in the elementary diagrams in Appendix 7A. Any other BOP systems requiring bypass indication to comply with Regulatory Guide 1.47 shall be identified by the ~~utility~~/applicant.

421.04 e QUESTION

Provide a discussion of the hardware features employed to provide a consolidated display, including human factors considerations, of the bypassed and inoperable status of engineered safety systems (ESF) equipment. (Refer to Regulatory Guide 1.47.)

421.04 e RESPONSE

The displays of the bypassed and inoperable status of ESF systems/equipments are grouped together by systems at the respective control panels. The bypass and inoperable conditions are indicated at the system level (e.g. LPCS system "out of service") as well as at the component level (e.g. "injection valve in manual override). In addition, such inputs are fed to the Emergency Response Information System (ERIS) to provide a consolidated display of systems status. The ERIS is described in Appendix 18B of GESSAR II.

Audible alarm (annunciators) are included to attract the operator's attention when the status of the safety system changes to/from the out-of-service condition. Switches at the control panels provide manual capability to activate the indicators and audible alarms.

421.04 f QUESTION

Provide a discussion of the rationale for your statement on page 7.5-42 of your FSAR that Regulatory Guide 1.47 which requires an automatically operated indication of the bypassed and inoperable status, is not applicable.

421.04 f RESPONSE

The safety-related display instrumentation (SRDI) itself does not perform any automatic safety function. It is designed to operate continuously and there is no provision for automatic or operating bypasses. Its redundant channels meet the single failure criterion. Removal of instrumentation of a single channel for servicing during plant operation is administratively controlled. Therefore, automatically operated indication of the inoperable status of the SRDI is not applicable.

FOR QUESTION 421.04d

ATTACHMENT 1

NSSS LIST FOR NUCLEAR ISLAND

REGULATORY GUIDE 1.47 BYPASSES AND INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
1. B21- ADS	* ADS Div (1,2) out of Service (A)		* ADS Div (1,2) ACU in calibration or gross failure (L) * Relief valve control switch 'A' in off position Div (1,2) (A) * ADS Div (1,2) ACU out of file or power loss (L) * Div (1,2) ADS/SRV Logic power or valve power failure. (L)	* ADS Div (1,2) System out of Service Switch (L)
2. B21-NS[4]	* Div (1,2) out board/in board System out of Service (A)		* Out board/inboard Valves powerloss or thermal over load (L) * Div (1,2) ACU in calibration or Gross failure (L). * Div (1,2,3) Trip unit out of file. * Div (1,2) V_1, V_2, V_3 power supply failure. (L) * Div (1,2,3,4) Logic card out of file. (A)	* Inboard/out board isol system out of Service Switch (L)

REGULATORY GUIDE 1.47 BYPASSES AND INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION O BYPASS INDICATION
3. C41-SLC	* Standby liquid system (A,B) out of Service (A)		* SQUIB Valve loss of Continuity or power loss (L) * F008 CLOSED (L) * C001(A,B) or F001(A,B) overload trip or power loss (L) * F001(A,B) IN TEST STATUS (L) * C001(A,B) AUTO TRIP (L) * F031 OPEN (L)	* SLC System (A,B) Manually out of Service (L)
4. C51-NMS S/U Range			* IRM ch (A,B,C,D,E,F,G,H) upscale trip OR INOP (L) * SRM UPSCAL OR INOP (A) * SRM ch (A,B,C,D) UPSC AL or INOP (L) * IRM. ch (AE, BF, CG, DH) up sc trip or Inop. (A)	* Single channel manual Bypass Indication for SRM or IRM (L)
5. C51-NMS POWER RANGE			* APRM Channel (A,B,C,D) upsc Trip or INOP Trip. (A) (L)	*APRM Channel (A,B,C,D) Bypass Indication (L)

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
6. C71-RPS.	* RPS System (A,B) out of Service (A) * RPS Div (1,2,3,4) ACU in calibration or gross failure.	* Power loss or trip unit out of file. (A) * CRD scram discharge volume high level (A)	* RPS Div (1,2,3,4) ACU in calibration or gross failure (L) * Trip unit out of file or power loss (Div 1,2,3,4) (A) * Div (1,2,3,4) logic card out of file. (A) * RPS Autopulse Test Div (1,2,3,4) fault (L) * Turbine SV/CV trip bypass (A) * Trip unit out of file, Gross failure or power loss (A) * Isolator Card out of file or power loss. (A)	* RPT Div (1,2,3,4) Bypass (A)
7. D17-PMS.	* MSL Div 1,4 or Div 2,3 inop		* Off Gas post Treat HiHi/Inop (A) * Contmt Vent stack HiHi/INOP (A) * Service Water Loop (A,B) Hi Rad /INOP (A) * MSL hihi rad /Inop Div (1/4 or 2/3) (A) * Off gas vent pipe hihi RAD/Inop (A)	

REGULATORY GUIL 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION C BYPASS INDICATION
7. D 17 - PMS (Cont'd)			* Contmt Vent HiHi Rad /inop (A) * Reactor Bldg Closed cooling hi rad / inop (A) * RHR loop (A,B) hi rad / inop (A) * off gas pretreat hihi rad / inop (A) * High voltage Inop (A) * RadWaste effl. HiHi Rad / Inop (A) * Carbon bed Vault hihi rad/Inop (A)	
8. E12-RHR.	*RHR (A,B,C) out of service (A). * RHR (A,B,C) MOV's in test status (L) * RHR pump (A,B,C) Auto start failure (A) * RHR pump (A,B,C) Auto trip (A)		* 125V DC Div (1,2) Logic power failure (L). * Div (1,2) Logic card out of file or power loss. * pump (A,B,C) breaker not in operating position (L) * Power loss or thermal overload any valve. (L) * ACU card out of file or power loss (L)	* RHR (A,B,C) out of service switch (L) (A).

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

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(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
8. E12 - RHR (Contd)			* Div 2 Safety Associated ACU Trouble (A) * Automatic Pulse test (RHR A, B, C) fault (L) * Suction valve F004 A/B/F105 control SW in close pos. or valve fully closed (L) * RHR (A, BC) Line break (L) * ACU in cal or Gross failure. * RHR B/C waterleg pump auto trip (A)	
9. E21 - LPCS.	* LPCS System out of service (A)		* Logic power Loss (L) * LPCS Logic Card out of file or power loss (L) * Pump C001 in manual override (A) * Injection valve in manual override (A) * MOV in Test (L) * ACU in cal or out of file or failed (L) * pump pre-overloaded (A)	* LPCS out of Service (A)

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
9. E21-LPCS (Contd)			* Loss of power or overload of any LPCS valve (L) * Suction valve closed or control switch in closed postion (L) * ACU out of file/power loss (L) * pump breaker not in operating position or loss of power (L) * Automatic pulse test fault (L) * LPCS Line break (L) * DIV I safety Associated ACU trouble (A) * LPCS waterleg pump auto trip (A) * LPCS pump auto trip (A) * LPCS pump auto start failure (A)	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
10a. E22-HPCS POWERSUPPLY System.	* HPCS System Ground (A)	—	* HPCS pump motor feeder trip (A) * HPCS Control power failure or breaker in lower position. (A) * Generator Trip/lockout or failure of it (A). * DG Aux load overload or power failure (A) * HPCS battery charger trouble. (A) * 125 VDC system trouble. (A) * Diesel engine trouble. (A) * Normal source breaker trip (A) * 480 V Trans. feeder Trip. (A)	* Div 3 out of service (A) —

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
106. E22-HPCS System	* HPCS out of service (A)	* Condensate Storage tank low level (A) * Suppression pool High level (A)	* MOV in test (L) * HPCS ACU Div (3,4) out of file or power loss (L) * HPCS ACU Div (3,4) ACU in cal or gross failure (L) * HPCS Div 3,4 Logic Card out of file or power loss (L) * Injection valve F004 in manual override (A) * Suppression pool suction valve F015 manual override (A) * Power loss/thermal overload any valve (L) * HPCS Div 3, 125 VDC Logic power failure (L) * HPCS Line break (L) * Div 3 safety associated ACU in trouble (A) * HPCS Waterleg pump Auto trip (A)	* HPCS out of service (A) (L)

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
10b. E22-HPCS System (cont'd)			* HPCS pump autotrip (A) * HPCS pump auto start failure (A).	
11. E32 MS-PLCS	* Inboard/outboard MSIV-PLCS Tripped (A) * Inboard/outboard MSIV-PLCS inoperative (A). * Mov's in Test (L).		* Inboard/outboard loss of Isolator power (A) * Trip unit out of File or power loss (L) * Trip unit in Calibration or gross Failure (L). * MCC loss of power or overload. (L) * Control logic powerloss (L)	* Inboard/outboard MSIV-PLCS inoperative (A) (L).
12. E51-RCIC	* RCIC out of service (A)	* Condensate Storage tank water level low (A) * Suppression pool water level High (A)	* RCIC 125 VDC Logic (Div 1,2) power failure (L) * RCIC ACU (Div 1,2) in calibration or gross failure (L) * RCIC ACU (Div 1,2) out of File or power loss (L)	* Div (1,2) out of Service (L)

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12. E51-RCIC (cont'd)			* RCIC logic card out of file or power loss (Div1,2) (L) * RCIC MOV overload or powerloss (Div1,2) (L) * RCIC Valve F064/F068 not fully open or control switch in close pos. (L) * RCIC Steamline high diff press. (steam line or instrument line break) (A) * RCIC pump suction pr high (A) * RCIC Exhaust diaph. pr. high (A) * RCIC Steam supply Pr low (A)	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
13. B21-Nuclear Boiler Process Instrument System			* DIV (1,2) MOV LOSS OF POWER (A)	
14. B33-Reactor Recirculation System				
15. C11B-Control Rod Drive Hydraulic System			* CRD ISO VLV PWR LOSS OR OVERLOAD (A)	
16. C11A-Rod Control and Information System				
17. C61-Remote Shutdown System				* Remote Shutdown Transfer Switch in Emergency Position
18. D23-CAMS	* DIV (1,2) DRYWELL OR CNTMT MON INOP (A)		* DIV(1,2) ISOL CARD OUT OF FILE OR PWR LOSS (A)	
19. E31-LDS			* 120 VAC LOGIC (A,B,C,D) PWR FAILURE (A) * RWCU HI DIFF FLOW IN TIMER BYPASS (A) * ISOLATOR OUTPUT CARD OUT OF FILE H13-P6(32,42) (A) * ISOLATOR CARD POWER LOSS H13-P6(32,42) (A)	* LOGIC (A,B) IN BYPASS(A) * RCIC STM TNL TIMER BYPASS (A)

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
20. G41-FPCCU System			* PUMP SUCTION "(A,B)" LOW (A) * DIV (1,2) MOTOR OVERLOAD/LOGIC FAULT (A) * DIV (1,2) MOV IN TEST (A) * LEAK F/D FPC & CU SYSTEM (A) * DRAIN TANK LEVEL LOW LOW (L) (A)	

FOR QUESTION 421.04d

ATTACHMENT 2

NON-NSSS FOR NUCLEAR ISLAND

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
D17 PROCESS RADIATION MONITORING SYS (RI) (PRMS)	DIV (1,2) PRMS OUT OF SERVICE (A)		DIV (1,2) PRMS TRIP UNIT INOP/LOGIC FAULT (L)	DIV (1,2) PRMS OUT OF SERVICE SWITCH (L)

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
E31 FLOOD DETECTION & ALARM SYS	DIV (1, 2, 3) FLOOD DETECTION SYS OUT OF SERVICE (A)		DIV (1, 2, 3) FLOOD DETECTION SYS LOGIC FAULT (L)	DIV (1, 2, 3) FLOOD DETECTION SYS OUT OF SERVICE SWITCH (L)

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
G38 SUPPRESSION POOL CLEANUP SYS			SPCU PRI CNMT ISOL DIV(1,2) LOGIC FAULT (C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT. STATUS LIGHT ON SYS H13 (I-498) SEE Page H13-1	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
G51 SUPPRESSION POOL TEMPERATURE MONITORING SYS	DIV (1, 2) SYS OUT OF SERVICE (A)		DIV (1, 2) SYS LOGIC FAULT (L)	DIV (1,2) SYS OUT OF SERVICE (L) SWITCH

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
G38 SUPPRESSION POOL CLEANUP SYS			SPCU PRI CNMT ISOL DIV(1,2) LOGIC FAULT (C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT. STATUS LIGHT ON SYS H13 (I-498) SEE Page H13-1	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
H13 NSSS/RI INTERFACE	SEE FIG 7A.3-5 OF GESSAR II AMENDMEND 8		PRI CNMT ISOL DIV (1, 2) RI ↓ VALVE CONTROL IN LOCAL (EMERG) (L) MOV MTR OVLD OR PWR LOSS (L) LOGIC FAULT (L) NOTE: LOGIC FAULT STATUS ALSO REPORTED WITHIN INDIVIDUAL SUB SYSTEMS. SEE PAGES G38-1, P55-1, P56-1, P42-1, P44-1, P46-1, P39-1, P52-1, P65-1, T41-1, T41-2, X43-1 AND P61-3.	SEE FIG 7A.3-5 OF GESSAR II AMENDMEND 8

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
H13 PGCC RI POWER DISTRIBUTION	RI LOGIC POWER TROUBLE IN DIV (1, 2, 3) CONTROL PNLS (A)		RI LOGIC FAULT IN DIV (1, 2, 3) CONTROL PNLS (A)	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P38 STANDBY GAS TREATMENT SYSTEM (SGTS)	SGTS "A" HEAT REMOVAL SYS OUT OF SERVICE(A)		SGTS "A" HEAT REMOVAL SYS ↓ CHARCOAL FILTER DOWNSTREAM CONTROLS INOPERATIVE (L) FAN MTR OVLD OR PWR LOSS (L) MOV IN TEST (L) MOV MTR OVLD OR PWR LOSS (L) LOGIC FAULT (L)	SGTS "A" HEAT REMOVAL SYS OUT OF SERVICE (L) SWITCH

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P38 STANDBY GAS TREATMENT SYS (CONT'D)	SGTS "B" HEAT REMOVAL SYS OUT OF SERVICE (A)		SGTS "B" HEAT REMOVAL SYS ↓ CHARCOAL FILTER DOWNSTREAM CONTROLS INOPERATIVE (L) FAN MTR OVLD OR PWR LOSS (L) MOV IN TEST (L) MOV MTR OVLD OR PWR LOSS (L) LOGIC FAULT (L)	SGTS "B" HEAT REMOVAL SYS OUT OF SERVICE (L) SWITCH

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P38 STANDBY GAS TREATMENT SYS (CONT'D)	SEC CNMT ISO DIV 2 OUT OF SERVICE (A)		SEC CNMT ISO DIV 2 SYS ↓ SGTS "B" INLET EMER CLOSURE VALVE CLOSED (L) SGTS "B" CONTROLLER NOT IN AUTO (L) LOGIC FAULT (L) SGTS "B" FAN MTR OVLD OR PWR LOSS (L) MOV MTR OVLD OR PWR LOSS (L) MOV IN TEST (L) SGTS "B" CHARCOAL FILTER OVER TEMP ACTION LOCKOUT (L) SGTS "B" CHARCOAL FILTER UPSTREAM CONTROLS INOPERATIVE (L)	SEC CNMT ISO DIV 2 OUT OF SERVICE (L) SWITCH

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P38 STANDBY GAS TREATMENT SYS (CONT'D)	SEC CNMT ISO DIVI OUT OF SERVICE (A)		SEC CNMT ISO DIVI SYS ↓ SGTS "A" INLET EMER CLOSURE VALVE CLOSED (L) SGTS "A" CONTROLLER NOT IN AUTO (L) LOGIC FAULT (L) SGTS "A" FAN MTR OVLD OR PWR LOSS (L) MOV MTR OVLD OR PWR LOSS (L) MOV IN TEST (L) SGTS "A" CHARCOAL FILTER OVER TEMP ACTION LOCKOUT (L) SGTS "A" CHARCOAL FILTER UPSTREAM CONTROLS INOPERATIVE (L)	SEC CNMT ISO DIVI OUT OF SERVICE (L) SWITCH

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P39- RI NON-ESSENTIAL CHILLED WATER SYSTEM			* RI CW PRI CNMT ISOL DIV (1,2) LOGIC FAULT C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT. STATUS LIGHT ON SYSTEM H13 (I-498) See Page H13-1	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P40 ESSENTIAL SERVICE WATER (ESW) SYSTEM	DIV 3 ESW SYS OUT OF SERVICE (A)		DIV 3 ESW SYSTEM ↓ *MOV IN TEST (L) *MOV MOTOR OVLD OR PWR LOSS (L) *LOGIC FAULT (L)	*DIV 3 ESW SYSTEM OUT OF SERVICE (L) SWITCH

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P41 - ESSENTIAL SERVICE WATER (ESW) SYSTEM	DIV (1,2) ESW OUT OF SERVICE (A)		DIV (1,2) ESW SYSTEM ↓ * MOV IN TEST (L) * MOV MOTOR OVLD OR PWR LOSS (L) * LOGIC FAULT (L) * CONTROL IN LOCAL (EMERGENCY) (L) DIV 1 ONLY	* DIV (1,2) ESW SYSTEM OUT OF SERVICE SWITCH (L)

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P42- CLOSED COOLING WATER SYSTEM			* CCW PRI CNMT ISOL DIV (1,2) LOGIC FAULT (C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT. STATUS LIGHT ON SYSTEM H13 (I-498) See page H13-1	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P44- DRYWELL CHILLED WATER SYSTEM			* DW CW PRI CNMT ISOL DIV 1, 2) LOGIC FAULT (C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT STATUS LIGHT ON SYSTEM H13 (I-498) SEE Page H13-1	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P45- CONTROL BUILDING CHILLED WATER SYSTEM (CBCW) SYS		DIV (1,2) CONTROL BLDG CHLR RM CLG INOPERATIVE (L)	CONTROL BUILDING CHILLED WATER SYSTEM DIVISION (1,2) ↓ * LOGIC FAULT (L) * MTR OVLD OR PWR LOSS (L) * CHLR, COMPR MTR BKR INOP (L) * CHLR, COMPR MTR AUTO TRIP (L) * NOT IN AUTO (L) * MOV IN TEST (L) * MOV MTR OVLD OR PWR LOSS (L)	

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P45- CBCW SYS (CONT.)		DIV (1, 2) CONTROL BLDG CHLR RM COOLING INOPERATIVE (L) (FROM CB HVAC SYS) SEE Page X93-1&3	CBCW SYSTEM DIV 1,2 (CONT.) * CHILLER PACKAGE TROUBLE (L) - TRIP - OIL TEMP LOW - EXCESS PURGE	

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P46-DEMINERALIZED WATER AND CONDENSATE DISTRIBUTION SYSTEM			* DIV(1,2) DEMIN WATER DISTRIBUTION PRI CNMT ISOL LOGIC FAULT C) (SEE NOTE) * DIV (1,2) CONDENSATE DISTRIBUTION PRI CNMT ISOL LOGIC FAULT C) (SEE NOTE) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT. STATUS LIGHT ON SYSTEM H13 (I-498) SEE Page H13-1	

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P50 SPMU SYS	DIV (1, 2) SPMU SYS OUT OF SERVICE (A)		DIV (1, 2) SPMU SYS ↓ MOV MTR OVLD OR PWR LOSS (L) MOV IN TEST (L) LIT's IN TEST (L) NOT IN AUTO (L) LOGIC FAULT (L)	DIV (1, 2) SPMU SYS OUT OF SERVICE (L) SWITCH

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P51- SERVICE AIR DISTRIBUTION SYSTEM			*DIV (1,2) SERV AIR PRIM CNMT ISOL VLV CLOSED (C) * DIV (1,2) SERV AIR SEC CNMT ISOL VLV CLOSED (C) * SERVICE AIR PRI CNMT ISOL DIV(1,2) LOGIC FAULT (C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT STATUS LIGHT ON SYSTEM H13 (I-498) See page H13-1	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P52- INSTR AIR DISTR SYSTEM			* INSTRUMENT DISTRIBUTION PRI CNMT ISOL DIV (1,2) LOGIC FAULT (C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT STATUS LIGHT ON SYSTEM H13 (I-498) SEE Page H13-1 * DIV (1,2) INSTR AIR PRI CNMT ISOL VLV CLOSED (C) * DIV (1,2) INSTR AIR SEC CNMT ISOL VLV CLOSED (C)	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P53-PNEUMATIC SUPPLY SYSTEM	DIV(1, 2) PNEU SUPPLY SYSTEM OUT OF SERVICE (A)		PNEUMATIC SUPPLY SYS DIV (1, 2) ↓ * VALVE NOT FULLY OPEN (L) - PNEU SUPPLY PRI CNMT OUTBD ISOL VALVE POS - PNEU SUPPLY DW OUTBD ISOL VALVE POS * LOGIC FAULT (L) * AIR BOTTLES AIR PRESS LOW, LOW (L) (C)	DIV (1, 2) PNEU SUPPLY SYSTEM OUT OF SERVICE (L) SWITCH

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P55- CRW DRAIN SYSTEM			* CRW DRAIN PRI CNMT ISOL DIV (1,2) LOGIC FAULT (C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT, STATUS LIGHT ON SYSTEM H 13 (I-498) SEE Page H13-1	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P56- DRW DRAIN SYSTEM			* DRW DRAIN PRI. CNMT ISOL DIV (1, 2) LOGIC FAULT (C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT. STATUS LIGHT ON SYSTEM H 13 (I-498) SEE Page H13-1	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P60 WATER POSITIVE SEAL ISOLATION VALVE LEAKAGE CONTROL SYS	PRI CNMT (INBD, OUTBD) ISO VALVE SEAL SYS OUT OF SERVICE (A)		PRI CNMT (INBD, OUTBD) ISO VALVE SEAL SYS ↓ MOV IN TEST (L) MOV MTR OVLD OR PWR LOSS (L) LOGIC FAULT (L) HAND OPERATED VALVE NOT FULLY OPEN (L)	PRI CNMT (INBD, OUTBD) ISO VALVE SEAL SYS OUT OF SERVICE (L) SWITCH

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P61 AIR COMPRESSOR SYS	(INBD, OUTBD) HIGH PRESSURE SYS TRIPPED (A) (INBD, OUTBD) LOW PRESSURE SYS TRIPPED (A)		DIV(1, 2) AIR COMPRESSOR SYS ↓ COMPRESSOR INOPERATIVE (L) COMPRESSOR MOTOR OVLD OR PWR LOSS (L) LOGIC FAULT (L)	

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SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P61 ESF INSTR AIR SUPPLY SYS	DIV (1,2) ESF INSTR AIR SUPPLY SYS OUT OF SERVICE (A)		DIV (1,2) ESF AIR SUPPLY SYS ↓ AIR COMPRESSOR TROUBLE (L) LOGIC FAULT (L)	DIV (1,2) ESF INSTR AIR SUPPLY SYS OUT OF SERVICE (L) SWITCH

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(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
P61 AIR POSITIVE SEAL ISO VALVE LEAKAGE CONTROL SYS	DIV (1, 2) AIR POSITIVE SEAL SYS OUT OF SERVICE (A)		DIV (1, 2) AIR POSITIVE SEAL SYS ↓ HAND OPERATED SEAL BLOCK VALVE CLOSED (L) AIR COMPRESSOR TROUBLE (L) LOGIC FAULT (L) --- PRI CNMT ISO DIV (1, 2) LOGIC FAULT (C) NOTE! ALSO SHOWN AT COMMON NSSS LOGIC FAULT STATUS LIGHT ON SYS H13 (I-498) SEE PAGE H13-1	DIV (1, 2) AIR POSITIVE SEAL SYS OUT OF SERVICE (L) SWITCH

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
R43 DIESEL GENERATOR CONTROL SYS	DIV(1,2) DG OUT OF SERVICE (A)		DIV (1,2) DG ↓ ENGINE FUEL OIL SHUTOFF VALVE CLOSED (L) EMERG START INOPERATIVE (L) LOCAL CONTROL ONLY (L) BOP OUT OF SERVICE (L) HEATER/MOTOR OVLD OR PWR LOSS (L) LOGIC FAULT (L)	DIV(1,2) DG OUT OF SERVICE (L) SWITCH

REGULATORY GUIDE 1.47 BYPASSES AND INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
T41 RB PRI CNMT VENT SYS			RB PRI CNMT VENT SYS ISOL DIV (1,2) LOGIC FAULT (C) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT, STATUS LIGHT ON SYSTEM H13 (I-498) SEE PAGE H13-1	

(A) Ann
(L) Lamp
(C) Computer

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
T41 RB DW BLEED OFF VENT SYS	RB DW BLEEDOFF VENT SYS OUTBOARD NORMAL LINE ISOLATION OUT OF SERVICE (A)		RB DW BLEED OFF VENT SYS OUTBOARD NORMAL LINE ISOLATION ↓ LOGIC FAULT (L) (SEE NOTE) MOV MOTOR OVLD OR PWR LOSS (L) MOV IN TEST (L)	RB DW BLEED OFF VENT SYS OUTBOARD NORMAL LINE ISOLATION OUT OF SERVICE (L) SWITCH
	RB DW BLEED OFF VENT SYS INBOARD NORMAL LINE ISOLATION OUT OF SERVICE (A)		RB DW BLEED OFF VENT SYS INBOARD NORMAL LINE ISOLATION ↓ LOGIC FAULT (L) (SEE NOTE) MOV MOTOR OVLD OR PWR LOSS (L) MOV IN TEST (L) NOTE: ALSO SHOWN AT COMMON NSSS LOGIC FAULT STATUS LIGHT ON SYS H13 (I-498) SEE Page H13-1	RB DW BLEED OFF VENT SYS INBOARD NORMAL LINE ISOLATION OUT OF SIRVICE (L)

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
T41 RB DW BLEEDOFF VENT SYS (CONT'D)	RB DW BLEED OFF VENT SYS INBOARD ALTERNATE LINE ISOLATION OUT OF SERVICE (A) DIV 3 DW BLEEDOFF VENT SYS PRI CNMT ISOLATION SYS ACTIVATED (A)		RB DW BLEED OFF VENT SYS INBOARD ALTERNATE LINE ISOLATION ↓ LOGIC FAULT (L) MOV MOTOR OVRLD OR PWR LOSS (L) MOV IN TEST (L)	RB DW BLEED OFF VENT SYS INBOARD ALTERNATE LINE ISOLATION OUT OF SERVICE SWITCH (L)

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
T41 HYDROGEN MIXING SYS	DIV (1,2) H_2 MIXING SYS OUT OF SERVICE (A)		DIV (1, 2) H_2 MIXING SYS ↓ BLOWER MTR OVLD OR PWR LOSS (L) MOV IN TEST (L) MOV MTR OVLD OR PWR LOSS (L) LOGIC FAULT (L)	DIV (1,2) H_2 MIXING SYS OUT OF SERVICE SWITCH (L)

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
T41 PRI CNMT VAC REL SYS	DIV (1, 2) PRI CNMT VAC REL SYS OUT OF SERVICE (A)		DIV (1,2) PRI CNMT VAC REL SYS LOGIC FAULT (L)	DIV (1,2) PRI CNMT VAC REL SYS OUT OF SERVICE (L) SWITCH

Panel 41-6 12-

(A) Ann
(L) Lamp
(C) Computer

REGULATORY GUIDE 1.47 BYPASSES AND INOP STATUS INDICATION

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
T41 DW VAC REL SYS	DIV(1,2) DW VAC REL SYS OUT OF SERVICE (A)		DIV (1, 2) DW VAC REL SYS LOGIC FAULT (L)	DIV (1, 2) DW VAC REL SYS OUT OF SERVICE (L) SWITCH

Pa. T41-7 (2-)

(A) Ann
(L) Lamp
(C) Computer

REGULATORY GUIDE 1.47 BYPASSES AND INOP STATUS INDICATION

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
T41 SHIELD ANN SEC CNMT VENT SYS	(DIV 1,2) SYS FAN SYS OUT OF SERVICE (A)		(DIV 1, 2) FAN SYS FAN MTR OVLD OR PWR LOSS (L) (DIV 1, 2) FAN SYS MOV IN TEST (L) (DIV 1, 2) FAN SYS MOV MTR OVLD OR PWR LOSS (L) (DIV 1, 2) LOGIC FAULT (L)	(DIV 1, 2) SYS OUT OF SERVICE (L) SWITCH (DIV 1, 2) SYS FAN SYS NOT IN AUTO (A)

Pa T49-1
12-

(A) Ann
(L) Lamp
(C) Computer

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
T49 HYDROGEN RECOMBINER SYSTEM	DIV (1,2) H_2 RECOMB SYS OUT OF SERVICE(A)			DIV(1,2) H_2 RECOMB SYS OUT OF SERVICE(L) SWITCH

REGULATORY GUIDE 1.47 BYPASSES AND INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
XA3 DG RM VENT SYS	DIV (1,2,3) DG RM VENT SYS OUT OF SERVICE (A)		DIV (1, 2, 3) DG RM VENT SYS ↓ FAN MTR OVLD OR PWR LOSS (L) MOV IN TEST (L) MOV MTR OVLD OR PWR LOSS (L) NOT IN AUTO (L) LOGIC FAULT (L)	DIV (1, 2, 3) DG RM VENT SYS OUT OF SERVICE (L) SWITCH
			DIV 1 DG RM VENT SYS CONTROL IN LOCAL (EMERGENCY) (L)	

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
XA3 SWGR RM/ BATTERY RM VENT SYS	DIV 3 SWGR RM/ BATT RM VENT SYS OUT OF SERVICE (A)		DIV 3 SWGR RM VENT SYS ↓ FAN MTR OVLD OR POWER LOSS (L) MOV IN TEST (L) MOV MTR OVLD OR PWR LOSS (L) SUMMER/WINTER TROUBLE (L) LOGIC FAULT (L)	DIV 3 SWGR RM VENT SYS OUT OF SERVICE SWITCH (L)

REGULATORY GUIDE 1.47 BYPASSES AND INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X 43 WET Standpipe Fire Protection System			WET STANDPIPE FIRE PROTECTION WATER SUPPLY PRIMARY CONTAINMENT ISOLATION (DIV 1 & 2) LOGIC FAULT (O) NOTE ALSO SHOWN AT COMMON NSSS LOGIC FAULT STATUS LIGHT IN SYS H13 (I-498)	

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X63 FUEL BLDG HVAC SYS			FPCCU DIV (1,2) PUMP AREA COOLING UNIT FAN MTR OULD OR PWR LOSS (L) FPCCU DIV (1,2) PUMP AREA COOLING UNIT FAN LOGIC FAULT (L)	

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X73 ECCS AREA PRESSURE CONTROL SYS			DIV I ECCS AREA ↓ LPCS PUMP RM CLG UNIT FAN MTR OVLD OR PWR LOSS (L) LPCS PUMP RM CLG UNIT FAN LOGIC FAULT (L) RHR A PUMP RM CLG UNIT FAN MTR OVLD OR PWR LOSS (L) RHR A PUMP RM CLG UNIT FAN LOGIC FAULT (L) RCIC PUMP RM CLG UNIT FAN MTR OVLD OR PWR LOSS (L) RCIC PUMP RM CLG UNIT FAN LOGIC FAULT (L)	

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X73 ECCS AREA PRESSURE CONTROL SYS (CONT'D)			DIV 2 ECCS AREA ↓ RHR B PUMP RM CLG UNIT FAN MTR OVLD OR PWR LOSS (L) RHR B PUMP RM CLG UNIT FAN LOGIC FAULT (L) RHR C PUMP RM CLG UNIT FAN MTR OVLD OR PWR LOSS (L) RHR C PUMP RM CLG UNIT FAN LOGIC FAULT (L)	

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X73 ECCS AREA PRESSURE CONTROL SYS (CONT'D)			DIV 3 ECCS AREA ↓ HPCS PUMP RM CLG UNIT FAN MTR OVLD OR PWR LOSS (L) HPCS PUMP RM CLG UNIT FAN LOGIC FAULT (L)	

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X73 ECCS AREA PRESSURE CONTROL SYS (CONT'D)			LPCS PUMP RM CLG UNIT FAN TROUBLE (C) RHR A PUMP RM CLG UNIT FAN TROUBLE (C) RHR B PUMP RM CLG UNIT FAN TROUBLE (C) RHR C PUMP RM CLG UNIT FAN TROUBLE (C) RCIC PUMP RM CLG UNIT FAN TROUBLE (C) HPCS PUMP RM CLG UNIT FAN TROUBLE (C) NOTE: ALL THE ABOVE ALARMS ALSO INCLUDED IN SYSTEM H13 (I-498)	

REGULATORY GUIDE 1..7 BYPASSES AND INOP STATUS INDICATION

(A) A... (12-)
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X73 AUX BLDG ELECT SWGR RM SELF CONTAINED AC UNIT SYS	AB DIV (1, 2) ELECT SWGR RM SELF CONTAINED AC UNIT SYS OUT OF SERVICE (A)		AB DIV (1, 2) ELECT SWGR RM SELF CONTAINED AC UNIT SYS ↓ UNIT INOPERABLE (L) NOT IN AUTO (L) LOGIC FAULT (L) CONTROL IN LOCAL (EMER) (L)	AB DIV (1, 2) ELECT SWGR RM SELF CONTAINED AC UNIT SYS OUT OF SERVICE (L) SWITCH

(A) Ann
(L) Lamp
(C) Computer

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X73 BATT RM VENT EXH (STBY) FAN SYS	DIV (1, 2, 4) BATT RM VENT EXH (STBY) FAN SYS OUT OF SERVICE (A)		DIV (1, 2, 4) BATT RM VENT EXH (STBY) FAN SYS ↓ FAN MOTOR OVLD OR PWR LOSS (L) LOGIC FAULT (L) NOT IN AUTO (L) CONTROL IN LOCAL (EMER) (L) -(DIV 1 ONLY)-	DIV (1, 2, 4) BATT RM VENT EXH (STBY) FAN SYS OUT OF SERVICE (L) SWITCH

(L) Lamp
(C) Computer

REGULATORY GUIDE 1.4, BYPASSES AND INOP STATUS INDICATION

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X73 AUX BLDG ELECT SWGR RM AC UNIT SYS	AB DIV(1,2) ELECT SWGR RM FCU OUT OF SERVICE (A)	DIV (1,2) CHILL WATER SYS INOPERATIVE (L)	AB DIV(1,2) ELECT SWGR RM COOLING TROUBLE (C) AB DIV (1,2) ELECT SWGR RM AC UNIT SYS FAN MOTOR OVLD OR PWR LOSS (L) MOV IN TEST (L) MOV MOTOR OVLD OR PWR LOSS (L) NOT IN AUTO (L) LOGIC FAUT (L)	AB DIV(1,2) ELECT SWGR RM AC UNIT SYS OUT OF SERVICE (L) SWITCH

(A) Ann
(L) Lamp
(C) Computer

REGULATORY GUIDE 1.47 BYPASSES AND INOP STATUS INDICATION

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X93 CB HVAC SYS			DIV (1,2) CHLR RM STBY CLG ↓ FAN MTR OVLD OR PWR LOSS (L) MOV IN TEST (L) MOV MTR OVLD OR PWR LOSS (L) NOT IN AUTO (L) LOGIC FAULT (L)	

REGULATORY GUIDE 1.47 BYPASSES AND
INOP STATUS INDICATION

(A) Ann
(L) Lamp
(C) Computer

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X93 CB HVAC SYS (CONT'D)			OAC SYSTEM CHARCOAL FILTER ↓ OVER TEMP ACTION LOCKOUT (L) UPSTREAM LOCAL CONTROL INOPERATIVE (L) DOWNSTREAM LOCAL CONTROL INOPERATIVE (L) UPSTREAM LOCAL CONTROLS IN AUTO (L)	

(A) Ann
(L) Lamp
(C) Computer

REGULATORY GUIDE 1.47 BYPASSES AND INOP STATUS INDICATION

SYSTEM	AUTOMATIC AT SYSTEM LEVEL ON LOSS OF SYSTEM	AUTOMATIC AT SYSTEM LEVEL WHEN AUXILIARY SYSTEM(S) LOST	AUTOMATIC INDICATION TRAIN OR COMPONENT	MANUAL INITIATION OF BYPASS INDICATION
X93 CB HVAC SYS (CONT'D)	CB HVAC DIV(1,2) SYS OUT OF SERVICE (A)	DIV (1,2) CHILL WATER SYS TROUBLE (L)	CB HVAC DIV(1,2) SYS ↓ FAN MTR OVLD OR PWR LOSS (L) MTR OPERATOR IN TEST (L) MTR OPERATOR MTR OVLD OR PWR LOSS (L) NOT IN AUTO (L) LOGIC FAULT (L) ACU FAN LOCKOUT (L)	CB HVAC DIV (1,2) SYS OUT OF SERVICE (L) SWITCH

421.13 QUESTION

In Table 7-2 of Section 7.1 of the SRP, we provide an applicability matrix for various sections of Chapter 7, including references to the appropriate NUREG documents. We note that you provide general information on this matter in Appendix A of your FSAR. You should be prepared to provide at a forthcoming meeting, more detailed information, using drawings as appropriate, indicating how your proposed design satisfies the following TMI action items:

a. II.D.3, Relief and safety valve position indication.

b. II.E.4.2, Containment isolation dependability, Positions (4), (6) and (7).

c. II.F.1, Accident monitoring instrumentation, Positions (4), (5) and (6).

d. II.F.3, Instrumentation for monitoring accident conditions (Regulatory Guide 1.97, Revision 2).

e. II.K.1.23, Reactor vessel level indication.

f. II.K.3.13, HPCS and RCIC initiation levels.

g. II.K.3.15, Isolation of HPCS and RCIC.

h. II.K.3.18, ADS actuation.

i. II.K.3.21, Restart of LPCS and LPCI.

j. II.K.3.22, RCIC automatic switchover.

Discuss the applicability of the resolution achieved by the BWR Owners Group for the items listed above, to your proposed design.

421.13 RESPONSE

The meeting requested in the question was held December 7-9, 1982. It was agreed between GE and the NRC that information contained in Appendix 1A sufficiently describes items b,e,g,i and j. The following is provided to suppliment appendix 1A for the remaining items:

a. (See following page)

FINAL DRAFT

SAFETY RELIEF VALVE POSITION INDICATION

Three pressure switches are installed in each SRV (including ADS) discharge line to monitor line pressure and give a positive indication of valve position. The switches are arranged in a two-out-of-three logic and actuate a common control room annunciator on high discharge line pressure. The annunciator is continuously on when pressure is above the pressure switch set point for any logic group. The pressure switch set point is high enough to avoid spurious alarms (e.g. leakage around the valve) yet low enough to give a positive indication of an open valve. Each SRV valve is provided with open-closed lights on the front panel in the main control rrcm near the SRV manual switches. The lights are connected to the SRV discharge line pressure switches. These pressure switches are also connected to the process computer via isolators in order to provide a permanent record of the history of each SRV actuation. The pressure switch power supply is class IE. A power system monitor (sensor and/or associated power supply failure) annunciator providesindication of power supply failure. All pressure switches and related components are qualified to seismic category 1 requirements and qualified to operate in their respective environments.

In addition, a diverse monitoring method is available. A temperature element is installed on the safety/relief valve discharge piping several feet from the valve body. The temperature element is connected to a multipoint recorder in the control room to provide a means of detecting safety/relief valve leakage during plant operation. When the temperature in any safety/relief valve discharge pipeline exceeds a preset value, an alarm is sounded in the main control room. The alarm setting is enough above normal rated power drywell ambient temperatures to avoid spurious alarms, yet low enough to give early indication of safety/relief valve leakage. Non essential power is used for this monitoring system.

421.13 c.

Information is provided in Appendix 1D as indicated in the response to question 421.06 concerning Regulatory Guide 1.97.

421.13 d.

Information is provided in Appendix 1D as indicated in the response to question 421.06 concerning Regulatory Guide 1.97.

421.13 f.

HPCS is presently designed to "restart" (injection valve reopens) following a level 8 trip as described in Subsection 7.3.1.1.1.1.C.4 of GESSAR II. The commitment to modify RCIC with the auto-restart feature is found in Appendix 1A, Section 1A.58. A copy of the section (marked up with minor corrections) is attached along with the referenced section 15D.2.1.4.1 which details the modification in conjunction with NUREG-0737.

FINAL DRAFT

421.13 h.

The BWR Owners' Group submitted a letter to the NRC (BWROG-8260, T.J. Dente to D.G. Eisenhut, October 28, 1982) which identified 8 options for resolution. The NRC has judged option 2 (ELIMINATE HIGH DRYWELL PRESSURE TRIP AND ADD MANUAL INHIBIT SWITCH) and option 4 (BYPASS HIGH DRYWELL PRESSURE TRIP AND ADD MANUAL INHIBIT SWITCH) to be acceptable. Therefore the applicant will commit to one of the following:

- Impliment Option 2

  or
- Impliment Option 4

  or
- Renegotiate NRC approval for another option

1A.58 SEPARATION OF HIGH-PRESSURE COOLANT INJECTION AND REACTOR CORE ISOLATION COOLING SYSTEM INITIATION LEVELS -- ANALYSIS AND IMPLEMENTATION (NUREG-0737 Item II.K.3.13)

NRC Position

Currently, the reactor core isolation cooling (RCIC) system and the high-pressure coolant injection (HPCI) system both initiate on the same low-water-level signal and both isolate on the same high-water-level signal. The HPCI system will restart on low water level but the RCIC system will not. The RCIC system is a low-flow system when compared to the HPCI system. The initiation levels of the HPCI and RCIC system should be separated so that the RCIC system initiates at a higher water level than the HPCI system. Further, the initiation logic of the RCIC system should be modified so that the RCIC system will restart on low water level. These changes have the potential to reduce the number of challenges to the HPCI system and could result in less stress on the vessel from cold water injection. Analyses should be performed to evaluate these changes. The analyses should be submitted to the NRC staff and changes should be implemented if justified by the analysis.

Response

The response to this task will be divided into two parts: the first response will address the need to separate the RCIC and HPCS initiation level, and the second response will address the need to provide an auto-restart feature for the RCIC system.

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1A.58 SEPARATION OF HIGH-PRESSURE COOLANT INJECTION AND REACTOR CORE ISOLATION COOLING SYSTEM INITIATION LEVELS -- ANALYSIS AND IMPLEMENTATION (NUREG-0737 Item II.K.3.13) (Cont'd)

Response (Cont'd)

Evaluation of HPCS and RCIC Initiation Level

The BWR Owners' Group sponsored a program to evaluate this concern. The results of this program were submitted to the NRC via a letter from R. H. Buchholz, General Electric Company, to D. G. Eisenhut, Director of NRC, dated October 1, 1980.

The conclusion drawn from this analysis is that the separation of HPCS and RCIC initiation setpoints is unnecessary for safety considerations. The basis for this conclusion, as described in the above referenced letter, is that for rapid level changes associated with accident scenarios and severe transients, their initiation would be essentially simultaneous in that possible separation distances could not preclude HPCS challenges; likewise, for slow level changes due to small leaks or slow transients, adequate time exists for manual initiation of RCIC by the reactor operator, prior to HPCS auto-initiation.

As a result of the above challenges, thermal stresses will occur in the reactor vessel and its internals. The most severe thermal cycle due to RCIC and HPCS initiation at the current low water level was assessed and compared to the thermal cycle analysis for the limiting reactor components. Furthermore, operating

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1A.58 SEPARATION OF HIGH-PRESSURE COOLANT INJECTION AND REACTOR CORE ISOLATION COOLING SYSTEM INITIATION LEVELS -- ANALYSIS AND IMPLEMENTATION (NUREG-0737 Item II.K.3.13) (Cont'd)

Response (Cont'd)

plant experience was evaluated to estimate the frequency of occurrence of HPCS* and RCIC initiations. Based on this evaluation, it was concluded that the current design is satisfactory, and a significant reduction in thermal cycles is not achievable or necessary.

Evaluation of Proposed Auto-Restart of RCIC

The BWR Owners' Group sponsored a program to evaluate this concern and develop an appropriate modification. The results of this program were submitted to the NRC via a letter from D. B. Waters, Chairman of BWR Owners' Group, to D. G. Eisenhut, Director of NRC, dated December 29, 1980 (Reference 20). These results conclude

No ¶

~~An evaluation of modifications to the RCIC system to allow automatic restart following a trip of the system at high RPV water level was conducted. The evaluation of the~~ that automatic restart of the RCIC ~~indicates that it~~ would contribute to improved system reliability and that it could be accomplished without adverse effects on system function and plant safety. Therefore, the 238 Nuclear Island design will be modified to allow automatic restart of the RCIC system following its trip on high RPV water level.

*The HPCS system replaces the HPCI system in the 238 Nuclear Island. The above referenced BWR Owners' Group analysis addresses the use of both systems.

1A.58 SEPARATION OF HIGH-PRESSURE COOLANT INJECTION AND REACTOR CORE ISOLATION COOLING SYSTEM INITIATION LEVELS -- ANALYSIS AND IMPLEMENTATION (NUREG-0737 Item II.K.3.13) (Cont'd)

Response (Cont'd)

The plant modifications to allow automatic restart of the RCIC system following its trip on high RPV water level will be reflected in Subsection 5.4.6 following staff approval of this response. A technical description of this modification is included in Section 15D.2.1.7.1. 4

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15D.2.1.3 Decay Heat Removal (Continued)

a stuck open relief valve or a loss-of-coolant accident inside primary containment provide a direct pathway for energy to reach the suppression pool. If available for these events, a flow path to the main condenser limits the amount of energy delivered to the suppression pool. Thus, if RHR system suppression pool or containment cooling mode is unavailable for any reason, this path to the main condenser and then to the ultimate heat sink serves as a backup to the RHR system.

Because of the substantial capacity of the suppression pool to absorb the decay heat following a transient or loss-of-coolant accident, the time made available by this capacity allows time for the operator to concentrate on establishing and maintaining adequate core cooling systems as his first priority and the establishment of a containment cooling function is of secondary importance. No operator actions are needed to initiate most of the high pressure and low pressure water delivery systems. This fundamental feature of the BWR design ensures a highly reliable design to prevent core damage.

15D.2.1.4 Plant Improvements

Plant improvements for the 238 Nuclear Island are described in Appendix 1A which addresses post-Three Mile Island requirements. This section describes those specific modifications which are significant in reducing the calculated plant risk (Section 15D.3) following severe transients or accidents.

15D.2.1.4.1 Automatic RCIC Restart

This change is made in response to NUREG-0737, item II.K.3.13 (Reference 1). The change increases the

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15D.2.1.4.1 Automatic RCIC Restart (Continued)

availability of the RCIC system during transients and accidents by allowing the system to automatically restart following high vessel water level shutoff.

Existing System Operation

The RCIC system is described in Subsection 5.4.6. During normal plant operation the steam supply valve to the turbine is closed. Upon receipt of a vessel low water level signal, the RCIC system starts automatically. The following automatic actions occur:

1. The steam supply valve to the turbine opens to supply steam to the turbine. Steam line drain isolation valves then close, which isolates the RCIC steam supply from the main condenser.

2. Once the steam supply valve leaves the fully closed position the ramp generator "ramp" function is initiated. This ramp generator controls the acceleration of the turbine via the turbine control valve.

3. The gland seal system automatically starts.

4. Condensate suction valve remains open or is automatically opened to supply water to the RCIC pump.

5. The pump discharge valve opens to supply the water to the reactor vessel.

6. The cooling water supply valve opens automatically and coolant is supplied to the turbine lube oil cooler.

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15D.2.1.4.1 Automatic RCIC Restart (Continued)

7. The test bypass valve to the condensate storage tank closes, if initially open.

The RCIC system will automatically shut down upon receipt of any of the following signals:

1. Reactor high water level (see modification below)
2. RCIC pump low suction pressure
3. Turbine high exhaust pressure
4. Turbine overspeed
5. Auto-isolation signal
6. Manual turbine trip pushbutton

The shutdown is affected by releasing the spring-loaded turbine trip valve. In order to reset the system it is necessary to first close the steam supply valve, then drive the motor operator of the turbine trip valve in the close direction until the spring-loaded closing latch mechanism is reset. Finally, the turbine trip valve is driven to the full open position. Closure of the steam supply valve also resets the ramp generator, closes the vessel injection valve, closes the minimum flow valve and opens the appropriate drain valves.

Automatic Reset Modification

The planned change (Figure 15D.2-5) utilizes the steam supply valve to shut off steam to the turbine following reactor high water level, rather than using the turbine trip valve. Closure of the steam supply valve puts the system in a partial standby configuration because of the existing interlocks associated with closure of this valve. This plant change will be reflected in Subsection 5.4.6 following staff approval.

15D.2.1.4.1 Automatic RCIC Restart (Continued)

Effect of the Planned Changes

The planned change will utilize the RCIC steam supply valve (E51-F045) to shut off the steam to the turbine on high vessel level rather than the turbine trip valve. The steam supply valve will now be used to both initiate system operation at low reactor vessel water level and terminate system operation at high water level.

The time taken to shut off steam flow will be longer due to the nominally longer travel time of the steam supply valve compared to the trip valve. The spring-loaded turbine trip valve closes essentially instantaneously. The steam supply valve closes in fifteen seconds or less. Conservatively assuming full rated flow throughout this extended shutoff period and a maximum rated RCIC flow of 800 gpm, an additional 200 gallons will be added to the reactor vessel following the high vessel water level trip. This volume addition has an insignificant effect on high vessel level transients including those involving high-flow rate systems (e.g., HPCS) (Subsection 15.5.1).

Additional logic circuitry is added as shown in Figures 15D.2-6 and 15D.2-7. Also, an additional annunciator is added (Figure 15D.2-8) because the existing turbine trip alarm is produced by a limit switch on the turbine trip valve.

The total effect on the 238 Nuclear Island design is to improve safety. The operator is no longer required to manually reset the system following a high vessel water level trip to permit later operation if needed. He will no longer be distracted by the reset action and the possibility of inadvertent failure to reset is eliminated. The change

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15D.2.1.4.1 Automatic RCIC Restart (Continued)

utilizes the steam supply valve to terminate steam flow on high water level only. The other five RCIC trip parameters will still close the turbine trip valve requiring manual reset of the system.

15D.2.1.4.2 RCIC Break Detection Logic Modification

This change is made in response to NUREG-0737 (Reference 1), Item II.K.3.15. The change increases the starting reliability of the RCIC system by reducing the likelihood of an inadvertent trip during system startup.

Existing System Operation

Each RCIC steam supply line is provided with two normally open isolation valves (E51-F063 and E51-F064). These valves close automatically upon receipt of an isolation signal. Each line contains a flow metering device located downstream of the isolation valves.

The flow sensing system will initiate closure of the isolation valves when the flow in that line exceeds 300% of rated. A pipe rupture can produce up to ten times rated flow. The issue raised by NUREG-0737, Item II.K.3.15 (Reference 1), is that the 300% setpoint may be momentarily exceeded during the RCIC start sequences causing unnecessary trip of the RCIC system and thus less than optimum reliability. Changing the setpoint would require extensive accident analyses involving the leak detection systems as well as the RCIC system. Addition of a time delay to the break detection circuitry directly addresses the problem and can be designed to have no impact on the currently documented accident analyses of RCIC steam supply line breaks (Subsection 15.6.4).

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(7.1)
(7.3)

Provide a detailed discussion of your methodology to establish the trip setpoint and allowable value for each RPS and ESF channel, including the following additional information:

a. The trip value assumed in your analyses in Chapter 15 of your FSAR.

b. The margin between the combined channel error allowance and the total channel error allowance assumed in the accident analyses.

c. The values assigned to each component of the combined channel error allowance (e.g., process measurement accuracy, sensor calibration accuracy, sensor drift, sensor environmental allowances and instrument rack drift), the basis for these values and your methodology to sum these errors.

d. The degree of your conformance with the guidance provided in Positions C.1 through C.6 of Regulatory Guide 1.105.

<u>Response</u>

See "attachment 1" on following pages.

ATTACHMENT 1

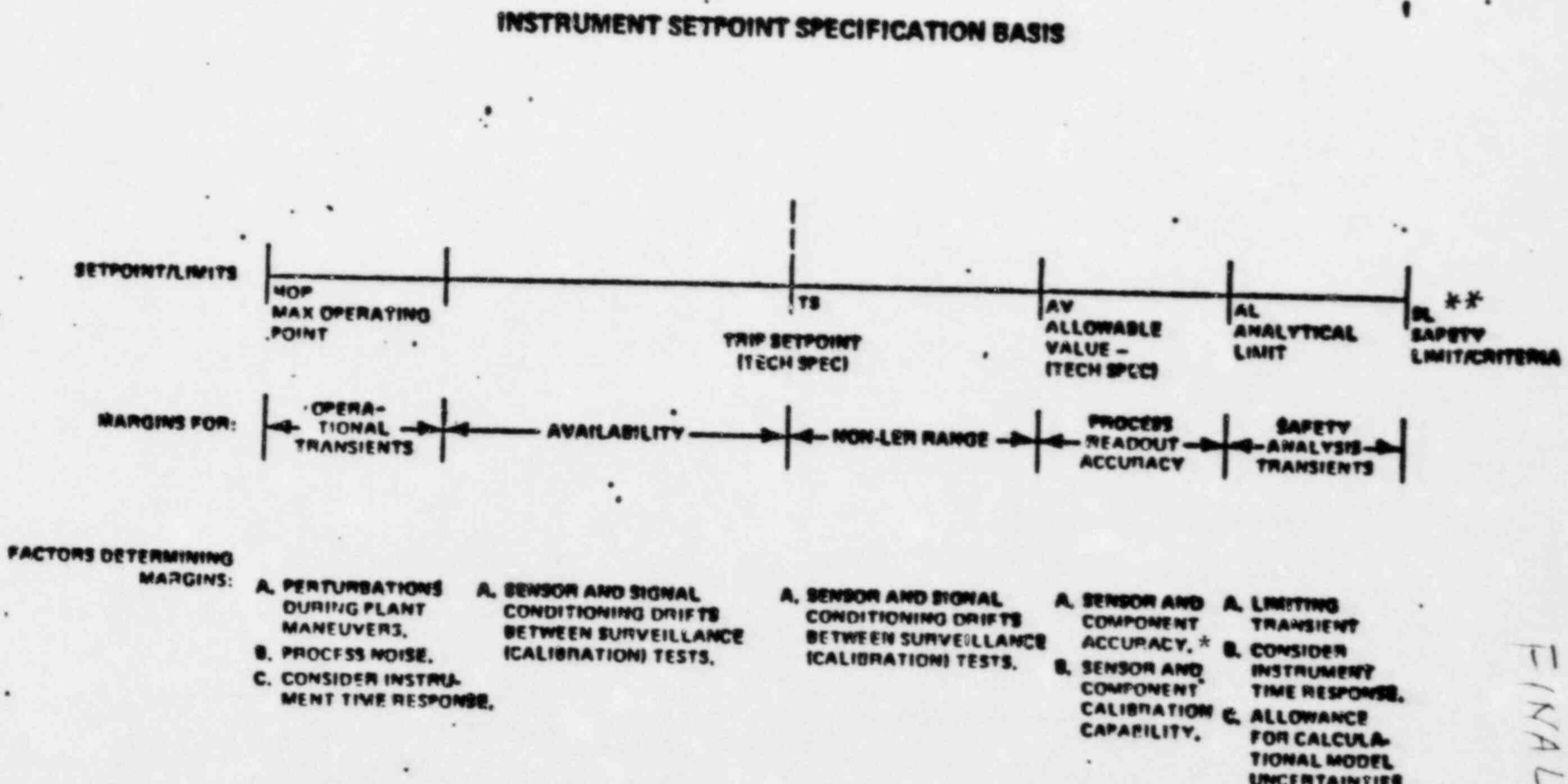
Instrument Setpoint Methodology FINAL DRAFT

The method employed to establish adequate margins for instrument setpoint drift, inaccuracy and calibration uncertainty as discussed in NRC Regulatory Guide 1.105 is explained by reference to Figure 1. Because of the generic nature of this figure it is not drawn to any scale and is used solely to illustrate the qualitative relationships of the various margins. Starting with a Safety Limit as indicated at the extreme right hand of the figure, the first margin extends to the point marked Analytic Limit. This margin is there to account for uncertainties in the calculational model used but excludes allowances for instrumentation. Thus the calculational model can assume ideal or perfect instruments. The next margin is between the Analytical Limit and the Allowable Value of the parametric setpoint, and accounts for instrument errors and calibration capability for the specific instrumentation. The remaining margin which is of interest from a safety standpoint is that shown between the Allowable Value and the Instrument Setpoint. This margin is that which is deemed adequate to cover instrument drift which might occur during the established surveillance period. It follows that if during the surveillance period an instrument has drifted from its setpoint in a non-conservative direction but not beyond the allowable value, then the instrument performance is still within the requirements of the plant safety analysis. In this case, a Licensing Event Report (LER) would not be required.

For completeness Figure 1 shows further margin between the Instrument Setpoint and the Maximum (Licensed) Operating Point for the plant. During plant operation transient overshoots may occur for certain parameters and instrument "noise" may be present. The instrument setpoint may also drift in a conservative manner. There must be sufficient margin between the instrument setpoint and the maximum operating point to avoid spurious reactor scrams or unwarranted system initiations.

Not all parameters (functional units) have an associated analytical limit, and a Design Basis (DB) limit is indicated. In general, the analytic limit is employed in those cases where a functional unit setpoint is directly associated with an analyzed abnormal plant transient or accident as described in the FSAR, Section 15. Where a design basis limit is used it is not always possible to provide simple quantification of the limit, e.g., IRMs are only required to overlap in range with portions of the SRM and APRM ranges. A similiar situation occurs with the main steam line radiation sensors which have a setpoint based essentially on previous operating experience.

Figure 1



*The "accuracy" used in the margin calculation is applicable to normal plant environmental conditions.

**Evaluations performed to date indicate that there is considerable conservatism in the design analysis to accommodate the effects of harsh environments. Instrument performance under harsh environmental conditions can be evaluated based on results of the applicant's equipment environmental qualification program.

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In accordance with NRC request, the standard tech specs will be modified to show a trip setpoint and allowable value for the pressure transmitter and the trip unit as separate line items under the "loop" values now specified. An example is sketched below:

CURRENT STANDARD TECH SPEC

TABLE 2.2.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUE
3. Reactor Vessel Steam Dome Pressure - High	( )	( )

- - - - - - - - - - - - - - -

PROPOSED STANDARD TECH SPEC

TABLE 2.2.1-1

REACTOR PROTECTION SYSTEM INSTRUMENTATION SETPOINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUE
3. Reactor Vessel Steam Dome Pressure - High	( )	( )
a. Pressure Transmitter	( )	( )
b. Trip Unit	( )	( )

Question 421.18- Additional Information FINAL DRAFT

Establishment of Protective Instrument Setpoints (BWR)

The objective is to ensure that all protective instruments will perform their safety trip functions at values of the measured parameter which do not violate the plant safety analysis or design basis. Regulatory guide 1.105 supports this objective by requiring that each setpoint shall include an allowance for the accuracy limit of the instrument, the calibration capability, and the potential drift of the setpoint between calibration checks.

Instrument accuracy can be specified, and qualified to meet the specification. A calibration margin can be allocated based on generally available "state of art" equipment to be used by the operator. The determination of an adequate allowance for instrument setpoint drift is more complex, and is a function of many factors. Methods of establishing an adequate drift margin may vary significantly; being largely dependent on the specific application. However, regardless of the basis for the setpoint drift allowance, its adequacy must be demonstrated empirically and consistently in the field. It follows that this essential criterion will be met when successive calibrations show that the setpoint remains within the allowable value. It is clear that with this condition satisfied, the precise contributions from individual factors to the overall drift are only of academic interest.

Another point to be considered relative to establishing adequate protective instrumentation setpoints is the danger of believing that a common methodology can be applied. A good example is afforded by the BWR Reactor Protection System, which, depending on the product line, has some ten or eleven instrumented functions which may cause reactor scram. An examination of these functions with an emphasis on instrument drift, demonstrates the individual nature of the issue.

The IRM scram function is a backup to the APRM scram outside the "RUN" mode, ie in the less than 15% power range. The design basis is essentially to provide a monitoring facility which overlaps with the SRM and APRM systems. This overlap is checked (tech specs) during plant startup and shutdown. A nominal scram setpoint of 120/125 is used and applies to all ranges of the instrument as power is increased. An instrument drift (electronics only) of 2/125 is used to monitor electronic performance between successive surveillance checks. (Instrument full scale is 125 divisions). No attempt is made to calibrate the IRMs in terms of a power measurement, due to the large variations which result whenever a control rod is moved near to the sensor. It follows that the setpoint drift from this source far outweighs any other drift considerations. As stated, electronic drift is checked, and clearly sensor drift is of little concern in this application.

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The APRMs use the LPRMs as the source sensors. It is well known that the LPRM sensitivity varies with exposure and that these sensors are affected by changing control rod pattern. To offset these effects the APRMs are calibrated at least weekly against a heat balance. Thus, these major drift effects are satisfactorily accounted for without the requirement for evaluation of LPRM sensor drift. As in the case of the IRMs, the APRM electronics are allocated a drift allowance, in this case 2%. The high frequency of calibration of the overall measurement removes any significant concern for drift.

In the case of Main Steam Line Isolation Valve Closure, a mechanically attached position switch must function within the first- 10% of main valve movement towards closure. Examination of the mechanical design shows that drift is virtually impossible. However, a 1% drift allowance is made, which is in reality an allowance for measurement differences when successive surveillance checks are made. No electronics are involved.

For the Main Steam Line Radiation High Scram it should be noted that no credit is taken for this scram function in the plant safety analysis. The setpoint for this function is more correctly related to the detection of a rapid and significant fission product release from the fuel to the coolant, such as might result from the postulated and highly improbable rod drop accident. For this accident condition, the safety analysis assumes a scram from the APRM. The design drift allowance for the Main Steam Line Radiation monitors was chosen to ensure that the trip setpoint would remain within the allowable value over the period between surveillance tests. This allowance is based on field experience with the same measurement application over many years.

The Turbine Stop Valve Closure scram is derived in most cases from position switches, which are mechanically coupled to follow main stop valve movement. Because of the mechanical nature of the measurement, drift is not expected, although an allowance is provided. No electronics are involved.

The Turbine Control Valve Fast Closure scram is obtained from pressure switches which measure the loss of oil pressure at the main turbine control valve actuator disc dump valves. The design basis (Safety analysis) requirement is the scram shall be initiated within 20 or 30 milliseconds after main control valve initial movement, depending upon product line. As a matter of fact, the scram obtained in this way results in scram initiation in advance of main control valve initial movement. Furthermore, a wide range of the pressure switch setpoint is available from which the scram is initiated. Consequently, drift in this setpoint is of little concern because excessive drift would still allow the scram to occur before it is actually required.

The Scram Discharge Volume- Water Level High scram is based on measuring water level in the scram discharge volume by means of float switches or analog pressure transmitters. For float switches, drift is not applicable due to the mechanical nature of the measurement. The analog transmitters are treated in the same way as other water level measurements mentioned below. Two points relative to this measurement may be noted. Firstly, considerable margin exists in the setpoints to be used on account of the excess discharge volume available, thus drift is not a significant concern. Secondly, earlier indications are given at lower levels (alarm, followed by rod block) which alert the operator, and this scram function does not have a setpoint which is used in the transient analysis.

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For Reactor Vessel Steam Dome Pressure-High, Reactor Water Level and Drywell Pressure similar considerations are made with regard to instrument setpoint drift. Many reactor years of operational experience exist for each application in identical situations and environments. This cumulative experience is used to establish overall drift allowances which, in conjunction with appropriate surveillance (calibration) intervals, ensure that allowable setpoint values are not violated.

The reactor protection system is a major safety system which involves protective instrumentation setpoints, and is called upon to operate not infrequently. General Electric believes that basing drift allowances largely on operating experience has been amply validated. Also, that each application should be examined on its merits when considering the significance of setpoint drift. All other setpoints for BWR safety systems are based on these principles.

Tables 1, 2 and 3 are provided on the following pages. These tables show typical accuracy, calibration and drift margins together with setpoints ~~with~~ and allowable values (tech spec limit) which fall within GE's scope of supply. Some setpoints depend on parametric values which are supplied by the applicant.

TABLE 1 REACTOR SCRAM INSTRUMENT SETPOINTS

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Design Drift Allowance
			Reactor Protection System				
1	Source Range Monitor Neutron Flux - Upscale	2×10^5 cps	4×10^5 cps	Design basis	0.2%[a]	1.0%[a]	2.0%[a]
2	Intermediate Range Monitor Neutron Flux - Upscale	120 Divisions	122 Divisions	Design basis	4.0 Divisions	1.0 Divisions	2.0 Divisions
3	Average Power Range Monitor Neutron Flux - Upscale (Not Run Mode)	15%	20%	Design basis	0.2%	1.0%	2.0%
4	Average Power Range Monitor Simulated Thermal Power - Upscale						
	a. Flow referenced	0.66W + 48%	0.66W + 51%	0.66W + 54%	2.0%	2.0%	3.0%
	b. High flow clamped	111%	113%	114%	0.2%	1.0%	2.0%
5	Average Power Range Monitor - Upscale (Run Mode)	118%	120%	122%	0.2%	1.0%	2.0%

See Footnotes at end of Table.

TABLE 1 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Design Drift Allowance
			Reactor Protection System (Continued)				
6	Reactor Vessel Steam Dome Pressure - High	1064.7 psig	1079.7 psig	1095 psig	15 psi	3 psi	15 psi
7	Reactor Vessel Water Level - Low, Level 3	11.4 in.	10.8 in.	10.2 in.	0.6 in.	0.12 in.	0.6 in.
8	Main Steam Line Isolation Valve - Closure (Run Mode Only)	94% Open	93% Open	90% Open	2%	2%	1%
9	Main Steam Line Radiation - High	2.5 x full power background	3 x full power background	Design basis	20%	20%	20%
10	Drywell Pressure - High	1.73 psig	1.93 psig	2.00 psig	0.05 psi	0.04 psi	0.2 psi
11	Scram Discharge Volume Water Level - High	(b)	(b)	(b)	1.5 in.	0.3 in.	1.5 in.
12	Turbine Stop Valve - Closure	(c)	(c)	(c)	—	—	—
13	Turbine Control Valve - Fast Closure, Trip Oil Pressure - Low	(c)	(c)	(c)	—	—	—

See Footnotes at end of Table.

TABLE 1 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
			Reactor Protection System (Continued)				
14	Turbine Control Valve Fast Closure/Turbine Stop Valve Closure (TCVFC/TSVC) Trip Scram Bypass	27% of span(d)	28.5% of span(d)	≤ 30% of span (d)	1.0% of span(d)	0.6% of span(d)	1.5% psi of span(d)
15	Reactor Vessel Water Level - High, Level 8 (Run Mode Only)	83.2 in.	83.8 in.	84.4 in.	0.6 in.	0.12 in.	0.6 in.

Footnotes for Table 1

(a) Equivalent linear full scale.

(b) This value is based on data to be determined during installation.

(c) To be supplied by Customer.

(d) The span of the transmitter and trip units shall be 0 to 100 percent of the value of the turbine first stage pressure in psia at turbine valves wide open (VWO) steamflow. This value is to be supplied by A/E.

(e) All reactor vessel water levels are referenced to instrument zero which is 529.75 inches above vessel zero.

TABLE 2 ISOLATION ACTUATION INSTRUMENT SETPOINTS

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
Reactor Core Isolation Cooling (RCIC)							
1	RCIC Steam Line Flow - High	318 in. H_2O	324 in. H_2O	(300%) 330.15 in. H_2O	6 in. H_2O	1.2 in. H_2O	6 in. H_2O
2	RCIC Steam Supply Pressure - Low	60 psig	53 psig	Design basis	2 psi	0.4 psi	2 psi
3	RCIC Turbine Exhaust Diaphragm Pressure - High	10 psig	20 psig	Design basis	0.3 psi	0.06 psi	0.30 psi
4	Main Steam Line (MSL) Tunnel Ambient Temperature - High	(a)	(a)	(a)	4°F	2°F	6°F
5	MSL Tunnel Differential Temperature - High	(a)	(a)	(a)	6°F	1°F	3°F
6	MSL Tunnel Temperature Timer	(a)	(a)	(a)	—	—	—
7	RCIC Equipment Area Ambient Temperature - High	(a)	(a)	(a)	4 °F	2°F	6°F

See Footnotes at end of Table.

TABLE 2 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
			Reactor Core Isolation Cooling (Continued)				
8	RCIC Equipment Area Differential Temp. - High	(a)	(a)	(a)	6°F	1°F	3°F
9	Residual Heat Removal (RHR) Equipment Area Ambient Temp. - High	(a)	(a)	(a)	4 °F	2°F	6°F
10	RHR Equipment Area Differential Temp. - High	(a)	(a)	(a)	6°F	1°F	3°F
			Shutdown Cooling Isolation				
11	Reactor Vessel Water Level 3 - Low	11.4 in.	10.8 in.	10.2 in.	0.6 in.	0.12 in.	0.6 in.
12	Shutdown Cut-in Pressure Permissive - High	135 psig	150 psig	165 psig	15 psi	3 psi	15 psi

See Footnotes at end of Table.

TABLE 2 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
			Shutdown Cooling Isolation (Continued)				
13	RHR Equipment Area Ambient Temperature - High	(a)	(a)	(a)	4°F	2°F	6°F
14	RHR Equipment Area Differential Temperature - High	(a)	(a)	(a)	6°F	1°F	3°F
			Residual Heat Removal (RHR) (Steam Condensing Mode)				
15	RHR/RCIC Steam Line Flow - High	144.8 in. H_2O	150.8 in. H_2O	Design basis	6 in.	0.12in.	6 in.
16	RHR Equipment Area Ambient Temperature - High	(a)	(a)	(a)	4°F	2°F	6°F
17	RHR Equipment Area Differential Temperature - High	(a)	(a)	(a)	6°F	1°F	3°F
			Containment Isolation				
18	Plant Exhaust Plenum Radiation - High	≤ 30% analytic limits	≤ 50% analytic limits	(a)	20%	20%	20%

See Footnotes at end of Table.

TABLE 2 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
			Main Steam Line Isolation				
19	Reactor Vessel Water Level - Low Level 2	-38.8 in.	-38.7 in.	-40.9 in.	2.2 in.	0.44 in.	2.2 in.
20	Drywell Pressure - High	1.88 psig	1.93 psig	2.00 psig	0.06 psi	0.02 psi	0.05 psi
21	Main Steam Line Radiation - High	2.5 x full power background	3 x full power background	Design basis	20%	20%	20%
22	Main Steam Line Pressure - Low	849 psig	837 psig	825 psig	12 psi	2.4 psi	12 psi
23	Main Steam Line Flow - High	169 psid	176.5 psid	178.99 psi (140%)	1.5 psi	1.2 psi	7.42 psi
24	Main Steam Line Tunnel Ambient Temperature - High	(a)	(a)	(a)	4°F	2°F	6°F
25	Main Steam Line Tunnel Differential Temperature - High	(a)	(a)	(a)	6°F	1°F	3°F
26	Condenser Vacuum - Low	9 in. Hg	8.7/9.3 in. Hg	8.1/10.0 in. Hg[c]	0.6 in. Hg	0.2 in. Hg	0.3 in. Hg

See Footnotes at end of Table.

TABLE 2 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Spcification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
			Reactor Water Clernup System				
27	Reactor Vessel Water Level - Low, Level 1	-149.8 in.	-152.0 in.	-154.8 in.	2.2 in.	0.44 in.	[illegible] in.
28	Differential Flow - High	79 gpm	88 gpm	95.6 gpm	4.8 gpm	4.8 gpm	9.6 gpm
29	Differential Flow Timer (Seconds)	45 sec.	57.5 sec.	60 sec.	2 sec.	1 sec.	2 sec.
30	Reactor Water Cleanup Unit Equipment Area Ambient Temperature - High	(a)	(a)	(a)	4°F	2°F	6°F
31	Reactor Water Cleanup Unit Equipment Area Differential Temperature - High	(a)	(a)	(a)	6°F	1°F	3°F
32	Reactor Vessel Water Level - Low, Level 2	-36.8 in.	-38.7 in.	-40.9 in.	2.2 in.	0.44 in.	2.2 in.

See Footnotes at end of Table.

TABLE 2 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
			Reactor Water Cleanup System (Continued)				
33	Main Steam Line Tunnel Ambient Temperature - High	(a)	(a)	(a)	4°F	2 °F	6°F
34	Main Steam Line Tunnel Differential Temperature - High	(a)	(a)	(a)	6°F	1°F	3°F

Footnotes for Table 2

(a) To be supplied by Customer.
(b) All water levels are referenced to instrument zero which is 529.75 inches above vessel zero.

TABLE 3 EMERGENCY CORE COOLING SYSTEMS ACTUATION INSTRUMENT SETPOINTS

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
			High Pressure Core Spray (HPCS)				
1	Reactor Water Level - Low, Level 2	-38.5 in.	-38.7 in.	-40.9 in.	2.2 in.	0.44 in.	2.2 in.
2	Drywell Pressure - High	1.88 psig	1.94 psig	2.00 psig	0.06 psi	0.02 psi	0.05 psi
3	Condensate Storage Tank Level - Low	C + 3.5 in.[a]	C + 0.5 in.[a]	C in.[a]	0.2 in.	0.2 in.	0.2 in.
4	Suppression Pool Water Level - High	P - 1.1 in.[d]	P - 0.5 in.[d]	P in.[d]	0.2 in.	0.2 in.	0.2 in.
5	Reactor Vessel Water Level - High, Level 8 (Shutoff)	53.2 in.	53.8 in.	54.4 in.	0.6 in.	0.12 in.	0.6 in.

See Footnotes at end of Table.

TABLE 3 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
			Automatic Depressurization System (ADS)				
6	Drywell Pressure - High	1.88 psig	1.94 psig	2.00 psig	0.06 psi	0.02 psi	0.05 psi
7	Reactor Vessel Water Level - Low, Level 1	-149.8 in.	-152.0 in.	-154.5 in.	2.2 in.	0.44 in.	2.2 in.
8	ADS Timer (Seconds)	115 sec.	117 sec.	120 sec.	2 sec.	1 sec.	2 sec.
9	Low Pressure Core Spray Pump Discharge Pressure Permissive	145 psig	140/150 psig	Design basis	3 psi	0.5 psi	2.5 psi
10	Residual Heat Removal (Low Pressure Coolant Injection Mode) Pump Discharge Pressure - Permissive	125 psig	122 psig	Design basis	3 psi	1 psi	3 psi
11	Reactor Vessel Water Level - Low, Level 3	11.4 in.	10.8 in.	10.2 in.	0.6 in.	0.12 in.	0.6 in.

See Footnotes at end of Table.

TABLE 3 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
		Low Pressure Core Spray and Low Pressure Coolant Injection - Loop A					
12	Reactor Vessel Water Level - Low, Level 1	-149.8 in.	-152.0 in.	-154.2 in.	2.2 in.	0.44 in.	2.2 in
13	Drywell Pressure - High -	1.88 psig	1.94 psig	2.00 psig	0.06 psi	0.02 psi	0.05 psi
14	Not Applicable						
15	Pump Start Time Delay	(b)	(b)	(b)	—	—	—
		Low Pressure Coolant Injection - Loops B and C					
16	Reactor Vessel Water Level - Low, Level 1	-149.8 in.	-152.0 in.	-154.2 in.	2.2 in.	0.44 in.	2.2 in.
17	Drywell Pressure - High	1.88 psig	1.94 psig	2.00 psig	0.06 psi	0.02 psi	0.05 psi

See Footnotes at end of Table.

TABLE 3 (Continued)

Item Number	Trip Function	Nominal Trip Setpoint	Technical Specification Limit	Analytic or Design Basis Limit	Accuracy	Calibration	Maximum Design Drift Allowance
		Low Pressure Coolant Injection - Loops B and C (Continued)					
18				Not Applicable			
19	Pump Start Time Delay	(b)	(b)	(b)	—	—	—

Footnotes for Table 3

(a) C = Condensate volume which will allow time to switch to pool suction without cavitating the HPCS pump.

(b) To be supplied by Customer

(c) All water levels are referenced to instrument zero which is 529.75 inches above vessel zero.

(d) Pool high level

ATTACHMENT 3

EIS IDENT: EMI SUSCEPTIBILITY TEST (FOR QUESTION 421.23)

GENERAL ELECTRIC

REVISION STATUS SHEET

NUCLEAR ENERGY DIVISION

249A1238

CONT ON SHEET 2 SH NO. 1

DOCUMENT TITLE EMI SUSCEPTIBILITY TEST GUIDE

☒ SPECIFICATION ☐ DRAWING ☐ OTHER

TYPE TEST PROCEDURE

FMF GENERAL USE

MPL No. N/A

LEGEND OR DESCRIPTION OF GROUPS

| - DENOTES CHANGE

REVISIONS C

5	LJ POWELL JUN 23 1978	MPH
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PRINTS TO

MADE BY		APPROVALS		DEPT	LOCATION
D WOOLEY	7/30/73	WF SPLICHAL	7/31/73	C&I	SAN JOSE
CHKD BY RL HOLT	8/20/74	Re-ISSUED MP HURN	6-15-73	CONT ON SHEET 2	SH NO. 1

1. SCOPE

1.1 This test guide describes procedures for conductive and radiated Electromagnetic interference (EMI) tests.

2. APPLICABLE DOCUMENTS - None

3. DISCUSSION

3.1 EMI is generally propagated to instrumentation primarily by conduction and/or radiation. Inductive- or capacitive-coupled EMI from radiated electromagnetic fields are limited to "near-fields" conditions because the distance from the interfering source is usually less than $\lambda/2\pi$ where λ is the wavelength of the interference signal. EMI may also be conducted via a common impedance path such as a ground loop or mutual conductance circuit. The following types of EMI Susceptibility test procedures are outlined in this test guide:

a. Conducted EMI transients

b. Conducted rf EMI

c. Radiated transient EMI fields

d. Radiated rf EMI fields

3.2 Definitions. The EMI susceptibility tests for instrumentation were established as a result of worst-case transient and radio frequency conditions measured in actual field tests. These EMI measurements were conducted in and around nuclear reactor control rooms when various EMI generating sources were operating. Typical items associated with a nuclear power station which generate EMI when energized or deenergized include many inductive components as well as industrial electronic and electrical devices.

a. EMI Transients - EMI transients typically impressed on 110 volt ac power lines by deenergizing an inductive load (eg, relay, solenoid, or electric motor) are generally a 100 to 500 kHz damped oscillatory wave of six to seven cycles with a 300 volt maximum peak-to-peak amplitude and a characteristic impedance of 150 ohms.

b. Radio Frequency EMI - Radio frequency EMI produced by arcing contacts, fluorescent lighting, SCR-controlled circuits, etc, is usually a 0.5 to 100 MHz sine wave that is continuous, amplitude- or frequency-modulated or combination thereof. These sine wave signals can produce a maximum peak-to-peak (p-p) amplitude of 5 V and currents up to 100 mA.

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b. Radio Frequency EMI - Radio frequency EMI produced by arcing contacts, fluorescent lighting, SCR-controlled circuits, etc, is usually a 0.5 to 100 MHz sine wave that is continuous, amplitude- or frequency-modulated or combination thereof. These sine wave signals can produce a maximum peak-to-peak (p-p) amplitude of 5 V and currents up to 100 mA.

4. PROCEDURE

4.1 General. The following is a general procedure for performing the four EMI tests identified in Paragraph 3.1. Details vary depending upon the equipment under test and the particular EMI excitation technique employed.

4.1.1 Connect the instrument to be tested and the test equipment per the appropriate figure (Figures 1 through 6). The signal lead from the transient generator (Figure 7) and the power input lead from the isolation transformer should be 3 feet or less in length. The dc resistance to external earth ground for all instruments should not exceed 20 ohms. A satisfactory ground may be obtained by connection to two or more 20-foot copper rods driven into the ground (approximate diameter: 1 inch; distance between rods: 20 feet). Ground connections should be made of short wide conductors which have a maximum practical cross section (flat straps versus round conductors). These conductors should be of corrosion-proof high-conductivity material (copper not aluminum) to ensure the lowest inductive reactance (which varies directly with frequency) and, consequently, the minimum impedance to ground. An ideal ground lead would have a length no greater than five times its width.

4.1.2 After energizing the equipment and applying a 5%-of-full-scale input signal to the instrument under test, verify that the selected type of EMI excitation signal meets the frequency and amplitude specifications of the appropriate figure and make adjustments as required.

4.1.3 Connect both input leads of the oscilloscope to point "A" of the connection figures using a standard (3.5 ft long, x 10) test probe. The observed EMI signal should be small compared to the amplitude of Paragraph 4.1.2 (<10%). If greater than 10%, there is a common-mode problem which might be caused by ground loops which should be corrected before proceeding.

4.1.4 Observe the response of the instrument under test while applying the EMI signal; if it is susceptible to the EMI, record the frequency and type of EMI excitation, and determine the susceptibility threshold level that just initiates the out-of-specification response. The EMI signal should be applied long enough to allow for the response time of the instrument under test.

4.1.5 Repeat the steps of Paragraphs 4.1.2, 4.1.3, and 4.1.4 over the frequency range of the particular EMI excitation signal being employed.

4.1.6 For considerations in performing the foregoing tests unique to each of the four excitation techniques, see Paragraphs 4.2 through 4.5.2.

4.2 Conducted EMI Transients. This test is conducted to verify that the instrument is not susceptible to conducted electromagnetic transients injected on power input leads.

4.2.1 Requirements. No malfunction, undesired response, degradation of performance or permanent damage to the instrument shall occur when one or more damped oscillatory waves (100 to 500 kHz, six to seven cycles, 300 volts peak-to-peak amplitude*, from a bipolar wave transient generator with a 150-ohm output impedance) is applied to each ungrounded power input lead.

4.2.2 Test Setup. See Figures 1 and 2.

4.3 Conducted RF EMI. This test is conducted to verify that the instrument is not susceptible to conducted rf EMI (continuous wave, frequency- or amplitude-modulated) injected on power input leads.

4.3.1 Requirements. No malfunction, undesired response, degradation of performance, or permanent damage shall occur when a sine wave from a signal generator having a 47-ohm output impedance is applied to each ungrounded power input lead. The sine wave shall be a 0.5 to 100 MHz continuous wave (5 V p-p)**, amplitude modulated (0 to 5 V), or frequency modulated (±20 kHz).

4.3.2 Test Setup. See Figures 3 and 4.

4.4 Radiated Transient Electromagnetic Fields. This test is conducted to verify that the instrument is not susceptible to radiated transient electromagnetic fields via input and output wires and cables.

4.4.1 Requirements. No malfunction, undesired response, degradation of performance, or permanent damage shall occur when one or more damped oscillatory waves from a bipolar wave transient generator having an output impedance of 150 ohms is introduced on conductors which are parallel and in intimate physical contact with each input and output wire or cable. The waves shall be 100 to 500 kHz, six to seven cycles, 300 V p-p amplitude.

4.4.2 Test Setup. See Figure 5.

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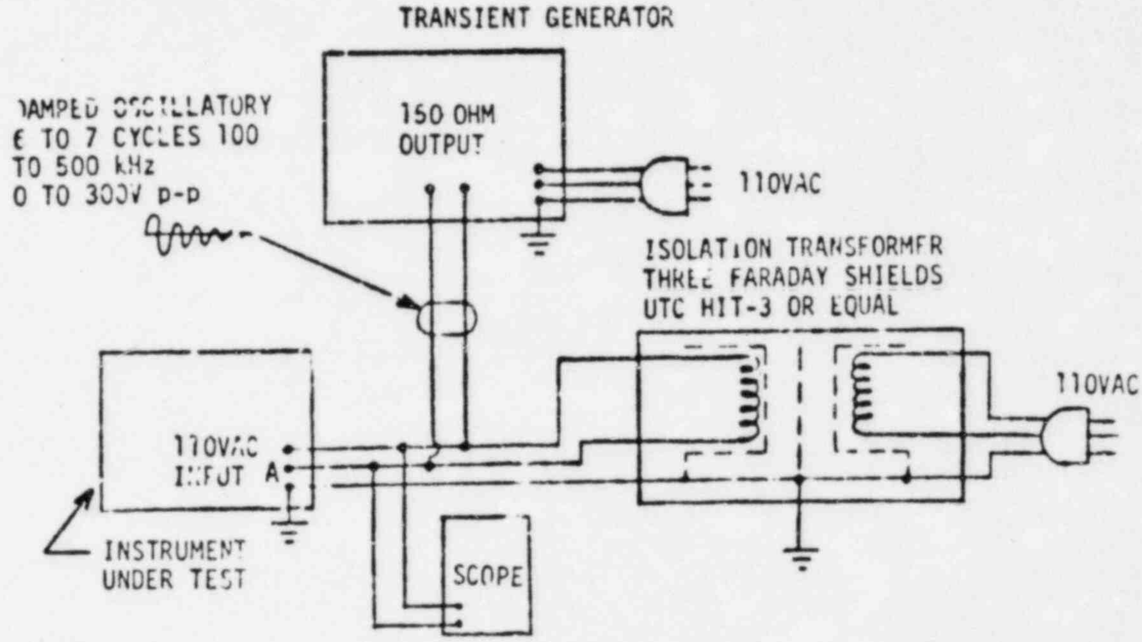
* For 110 Vac only. See Figure 2 for dc power bus transients.

** For 110 Vac and 24 Vdc power lines only; see Figure 4 for other dc power bus amplitudes.

4.5 Radiated RF Electromagnetic Fields. This test is conducted to verify that the instrument is not susceptible to radiated rf electromagnetic fields (continuous wave, frequency- or amplitude-modulated) via input and output wires and cables.

4.5.1 Requirements. No malfunctions, undesired response, degradation of performance, or permanent damage shall occur when a sine wave from a signal generator having a 47-ohm output impedance is introduced on conductors which are parallel and in intimate physical contact with each input and output wire or cable. The sine wave shall be a 0.5 to 100 MHz continuous wave (5 V p-p), amplitude modulated (0 to 5 V), or frequency modulated (±20 kHz).

4.5.2 Test Setup. See Figure 6.

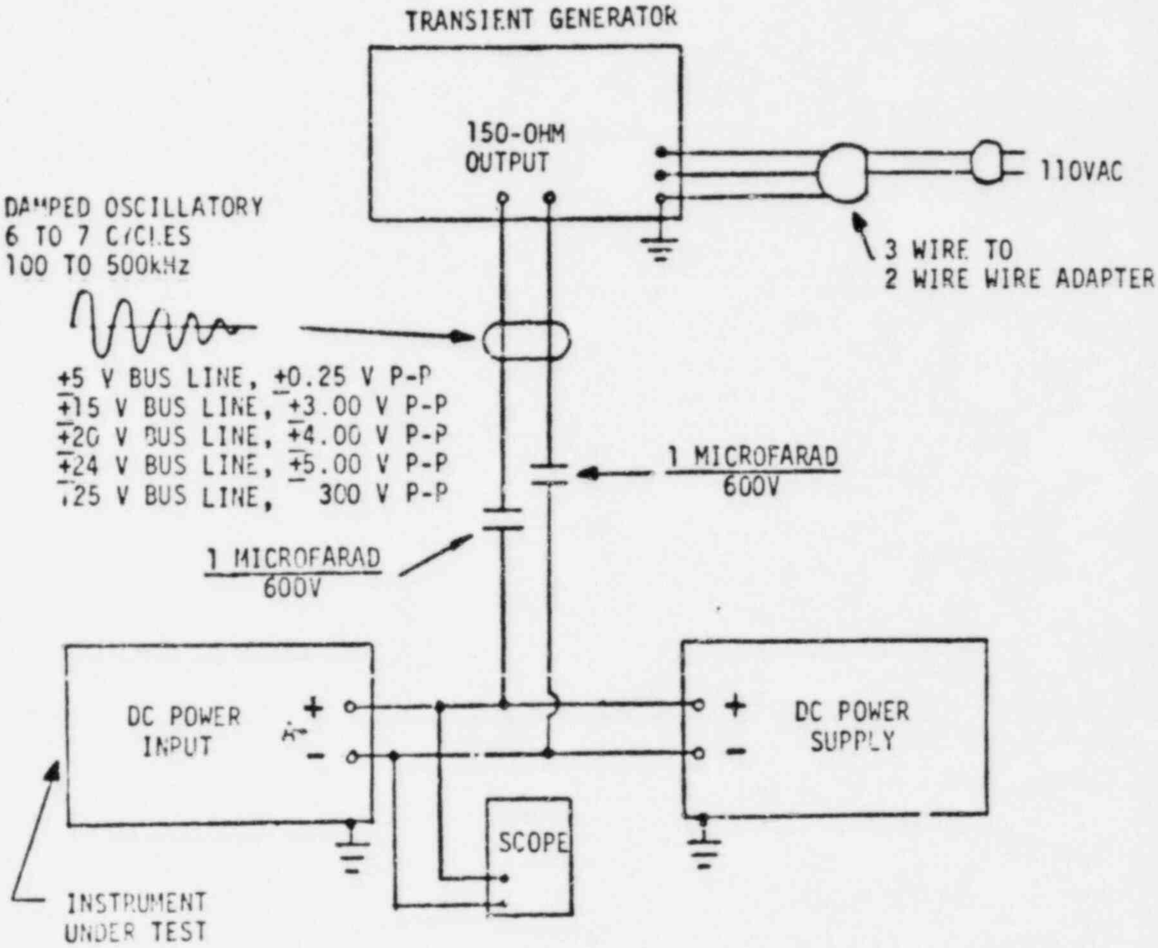


NOTES:

A. The EMI transient should be conducted over a period long enough the ensure that an EMI transient occurs at enough points throughout the 360° of the power frequency to ensure worst case conditions.

B. Damped oscillatory EMI transients shall have a repetition rate from 1/2 to 1 Hz and shall be conducted at 100, 200, 300, 400, and 500 kHz.

FIGURE 1 TEST SETUP FOR CONDUCTED EMI TRANSIENT (110 Vac POWER LINE TEST)



NOTES:

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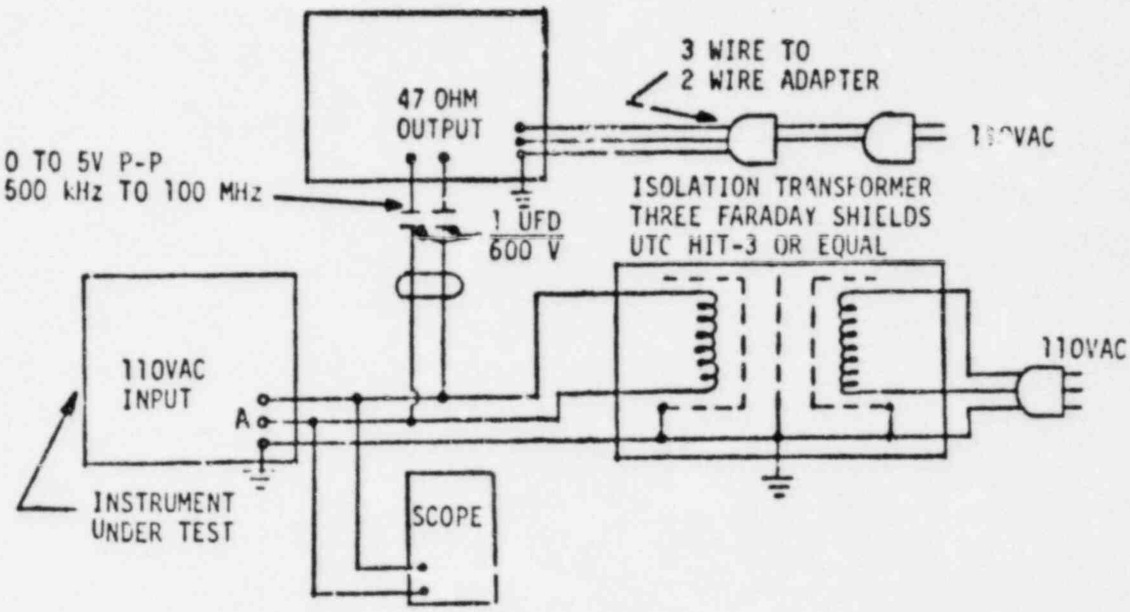
B. Damped oscillatory EMI transients shall have a repetition rate from 1/2 to 1 Hz and shall be conducted at 100, 200, 300, 400, and 500 kHz.

FIGURE 2 TEST SETUP FOR CONDUCTED EMI TRANSIENT (DC POWER LINE TEST)

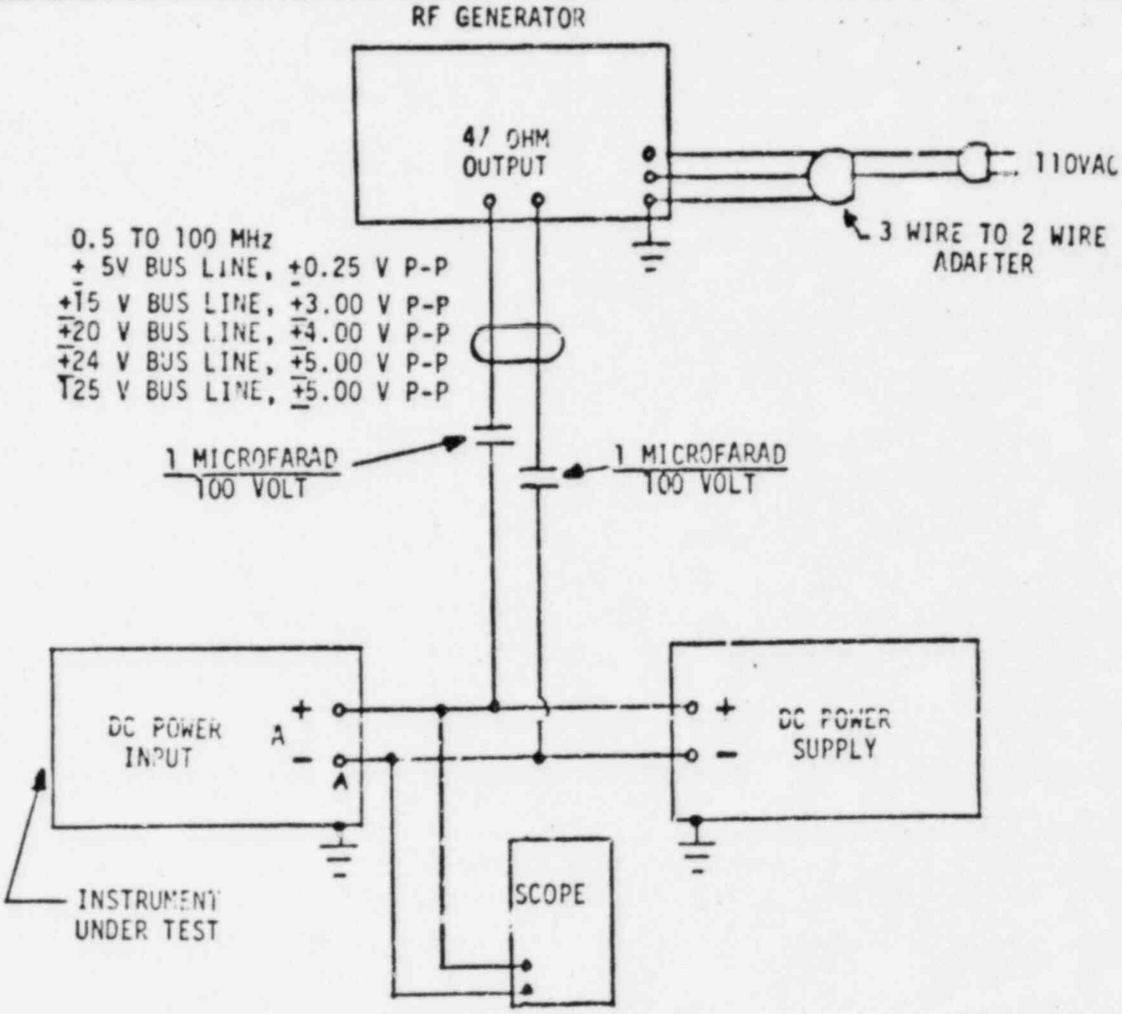


NOTES:

A. Scan the full frequency range of the rf generator from 0.5 to 100 MHz by tuning the oscillator through the required frequency range at a rate of 1 to 5 MHz per second.

B. The type of rf EMI susceptibility signals (i.e., continuous wave, frequency- or amplitude-modulated or combination thereof) and sweep rate shall be selected for the maximum anticipated effects on the instrument under test.

FIGURE 3 TEST SETUP FOR CONDUCTED RF EMI (110 Vac POWER LINE TEST)

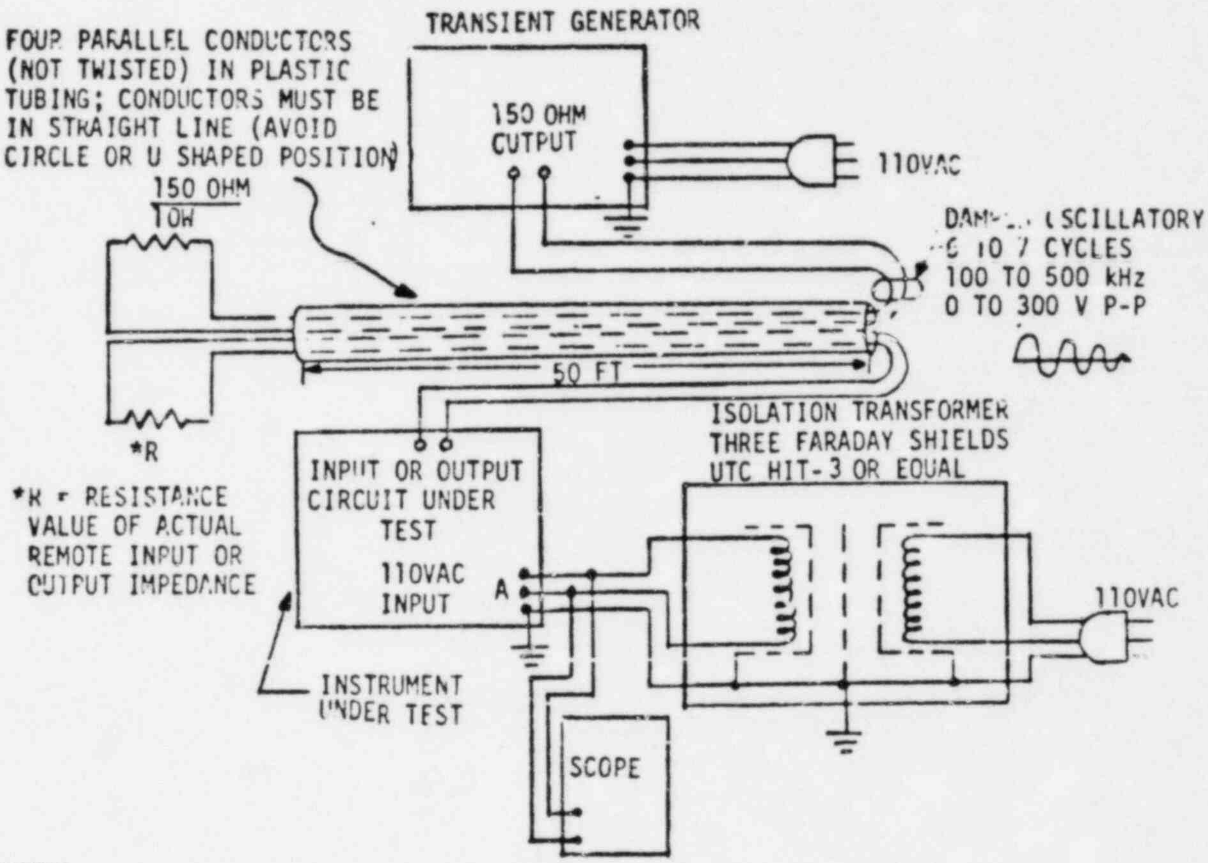


NOTES:

A. Scan the full frequency range of the rf generator from 0.5 to 100 MHz by tuning the oscillator through the required frequency range at a rate of 1 to 5 MHz per second.

B. The type of rf EMI susceptibility signals (i.e., continuous wave, frequency- or amplitude-modulated or combination thereof) and sweep rate shall be selected for the maximum anticipated effects of the instrument under test.

FIGURE 4 TEST SETUP FOR CONDUCTED RF EMI (DC POWER LINE TEST)



NOTES:

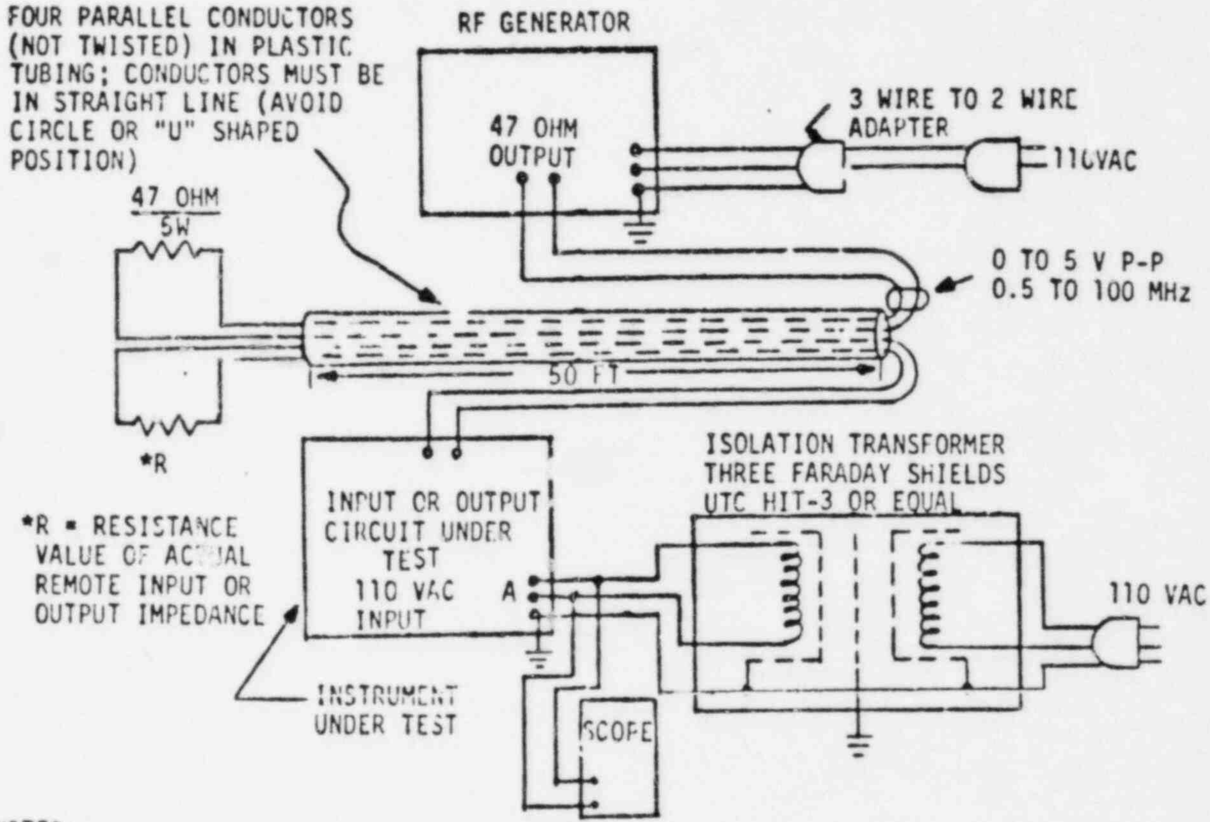
A. EMI transients with a repetition rate from 1/2 to 1 Hz shall be conducted at 100, 200, 300, and 500 kHz.

B. A purely resistive 150 ohm load is connected across the two parallel conductors in the plastic tubing connected to the transient generator (i.e., five 750-ohm, 2-watt carbon-composition resistors connected in parallel).

C. Input or output circuits which normally require a shielded cable will be tested by connecting a 50 foot length of the appropriate shielded cable to the input or output circuit in lieu of connecting the two wires inside the plastic tubing. The shielded cable shall be taped or tied in intimate physical contact with the entire 50 foot length of the plastic tubing.

D. The plastic tubing containing the four parallel conductors must be kept as straight as possible and any surplus length will not be folded, coiled or placed in a "U"-shaped position.

FIGURE 5 TEST SETUP FOR RADIATED TRANSIENT ELECTROMAGNETIC FIELDS



NOTES:

A. The plastic tubing containing the four parallel conductors must be kept as straight as possible and any surplus length will not be folded, coiled, or placed in a "U"-shaped position.

B. Input or output circuits which normally require a shielded cable will be tested by connecting a 50 foot length of the appropriate shielded cable to the input or output circuit in lieu of connecting the two wires inside the plastic tubing. The shielded cable shall be taped or tied in intimate physical contact with the entire 50 foot length of the plastic tubing.

C. Standing waves should be expected to develop on the 50 foot length of parallel conductors above 3 MHz because of the mismatch conditions which prevail for frequencies where 1/5 of the wavelength is shorter than 50 feet.

D. A purely resistive 47 ohm load is connected across the two parallel conductors in the plastic tubing connected to the rf generator (i.e., ten 470-ohm, 2-watt, carbon-composition resistors connected in parallel).

E. Scan the full frequency range of the rf generator from 0.5 to 100 MHz by tuning the oscillator through the required frequency range at a rate of 1 to 5 MHz per second.

F. The type of rf EMI susceptibility signals (continuous wave, frequency- or amplitude-modulated, or combination thereof) and sweep rate shall be selected for the maximum anticipated effects on the instrument under test.

FIGURE 6 TEST SETUP FOR RADIATED RF ELECTROMAGNETIC FIELD

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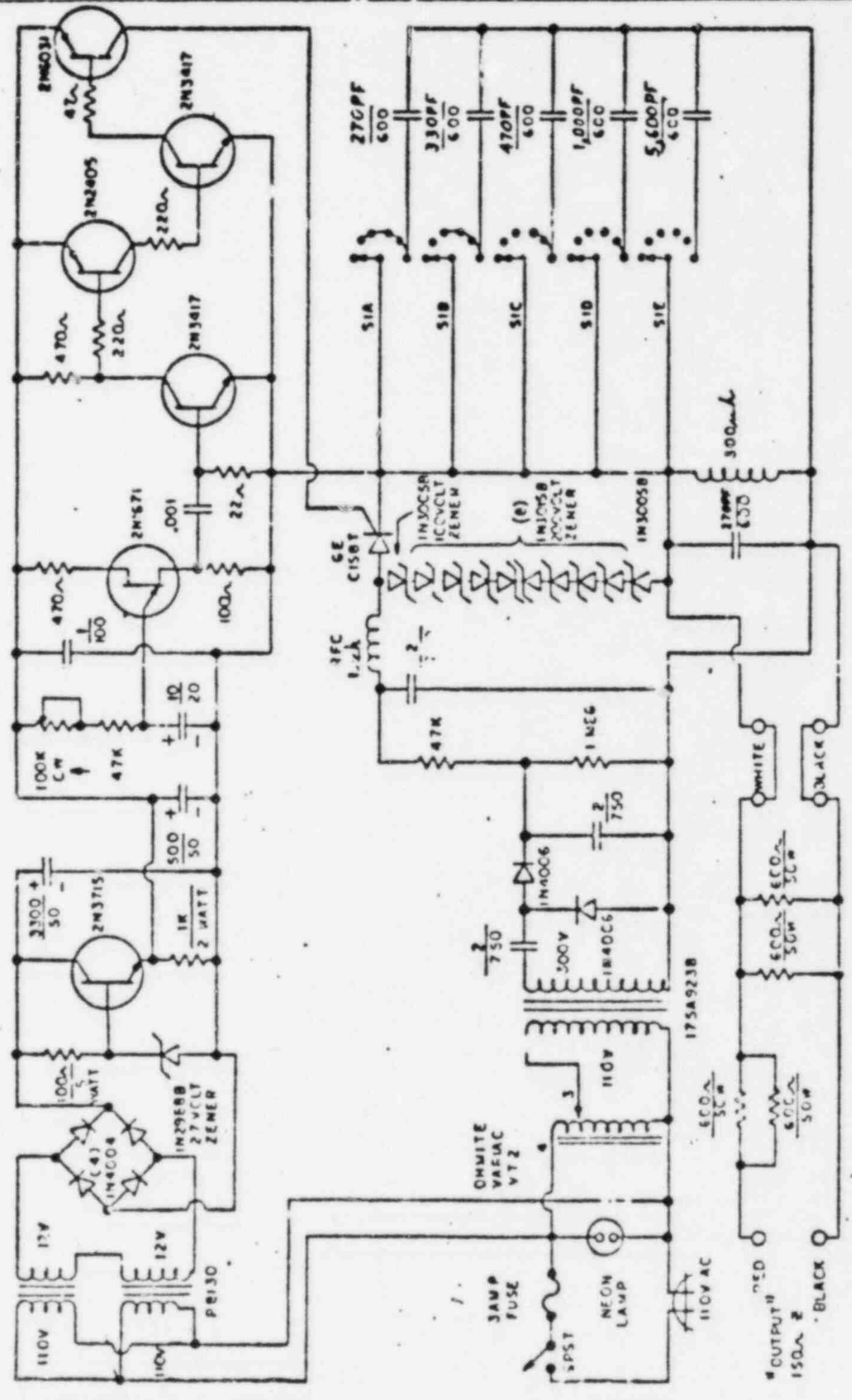

FIGURE 7 TRANSIENT GENERATOR

FINAL DRAFT

421.40 QUESTION

Provide a discussion on high pressure/low pressure interfaces and the associated interlocks in Section 7.6 of your FSAR. Discuss how each of the high pressure/low pressure interfaces in your design conforms to our positions in Branch Technical Position ICSB 3. Discuss how the associated interlock circuitry conforms to the requirements of IEEE Std. 279. Your discussion should include illustrations from applicable drawings; e.g., the reactor heat removal (RHR) system.

421.40 RESPONSE

Appendix 1E contains a full discussion of HP/LP interlocks with specific reference to the series MOV's of RHR under Diversity of Interlocks. Additionally, use of the self-test subsystem increases the reliability of the interlock circuitry beyond the high degree present in testability (non-NSPS) designs. The interlocking hardware (transmitters and trip units) are fully qualified as class IE components.

Clarifications and corrections of the GESSAR II text will be made in accordance with attached mark-ups.

The following additional information was requested by the NRC at the ICSB Review meeting January 11-13, 1983:

- Question

Describe what annunciation is provided for the low pressure permissive for the RHR Shutdown Cooling Mode.

- Answer

The current design as shown on the GESSAR II elementary diagrams does not include annunciation for the low pressure permissive to open RHR valves F008 and F009.

- Question

Describe the auto-reclose of RHR valves F008 and F009 (isolation valves in the let-down line from the Recirc System) on increasing pressure.

- Answer

Division 3 logic controls valve F009 and identical logic in Division 4 controls valve F008.

For each valve, either of two channels can cause automatic re-close of the valves. Each channel consists of one reactor pressure sensor and one reactor water level sensor. If reactor pressure exceeds the set-point or reactor water level remains below level 3, the valves re-close. Conversely, the valves will open automatically if pressure is below the set-point and level is above level 3.

1E.38 REDUNDANCY AND DIVERSITY OF HIGH/LOW PRESSURE SYSTEM INTERLOCKS (2-ICSB) (Continued)

LRG-II Plants include interlocks which prevent the operator from opening these valves when reactor pressure is high. The trip unit setpoints are set at 135 psig as compared to a pressure rating of 500 psig for the piping. The two isolation valves in the suction line have divisionally separated controls. These valves are manually controlled pressure-interlocked valves. Each valve control circuit has two pressure interlocks either of which will prevent the valve from being open. It would require a failure of all* 4 transmitter trip unit channels to permit operation of both valves when the reactor pressure is high.

The interlocks are controlled by analog pressure transmitters which measure reactor coolant pressure and transmit a signal proportional to the pressure to a solid state trip unit and a visual indicator. This design permits on-line monitoring of the transmitter outputs on analog indicators in the control room so that cross comparison of the output values can be made between channels and other control room pressure indicators. Technical Specifications require a channel check of these systems to be made each 12 hours. The trip units are located in the control room for ease of calibration and testing.

In addition to these automatic protection features, administrative controls do not permit placing the RHR system in the shutdown cooling mode until the reactor pressure has been reduced to less than 135 psig. The pressure indications used for determining reactor pressure when placing the system in shutdown cooling are located on the main control panel and are different from those used in the overpressure protection trip system.

GESSAR II Position:

Same as LRG-II Position (solid state design).

* For solid-state designs, it would require a failure of 1-of-2 transmitter/trip unit channels in each of 2 divisions to permit operation of both valves when the reactor pressure is high.

7.6.1.5 High Pressure/Low Pressure Systems Interlock (Continued)

B. Power Sources

The power for the interlocks is provided from the essential power supplies for the associated systems (RHR for the RHR valves and LPCS for the LPCS valves).

C. Equipment Design

The following is a list of high pressure/low pressure interfaces and rationale for valve interlock equipment:

Interlocked Process Line	Type	Valve	Parameter Sensed	Purpose
RHR shutdown (Cooling) supply	MO MO	E12-F009 E12-F008	Reactor pressure	Prevents valve opening until reactor pressure is low. *
RHR shutdown (Cooling) return	Check MO	E12-F050 E12-F053	N/A Reactor pressure	N/A Prevents valve opening until reactor pressure is low. *
RHR head spray	Check MO	E51-F066 E12-F023	N/A Reactor pressure	N/A Prevents valve opening until reactor pressure is low. *
RHR Steam condensing mode	MO AO	E12-F087 E12-F051	Steam line pressure	Prevents valve opening until pressure is low. *
LPCS system	Check MO	E21-F006 E21-F005	N/A Pressure between injection valve & check valve	N/A Maintains valve closed until ~~differential~~ pressure is low * *
~~LPCS system spray sparger~~	~~Check~~ ~~MO~~	~~E21-F006~~ ~~E21-F005~~	Reactor vessel pressure	Maintains valve closed until pressure is low (EXCEPT FOR VALVE MANUAL-RMS-CONTROL)
Feedwater containment isolation valve leakage control		P61-FF010A&B P61-FF011A&B	Reactor-to-seal air differential pressure	Prevents seal air isolation valve opening until differential pressure is low

* RECLOSES VALVE IF PRESSURE IS HIGH
* * (VALVE MANUAL-RMS-CONTROL ONLY)

7.6.1.5.C High Pressure/Low Pressure Systems Interlock (Continued)

Interlocked Process Line	Type	Valve	Parameter Sensed	Purpose
MS positive leakage control	MO MO MO MO	E32-F007 E32-F008 E32-F027 E32-F028	Reactor pressure	Prevents isolation valve opening until pressure is low. Recloses valves if pressure is high.
RHR ~~LPCI~~ LPCI MODE	CHECK	E12-F041	N/A	N/A
	MO	E12-F042	Reactor pressure	Prevents valve opening until pressure is low except for valve manual-RMS-CONTROL
			Pressure between injection valve & check valve	Prevents valve opening until pressure is low (valve manual-RMS-control only)

D. Circuit Description

At least two valves are provided in series in each of these lines. ~~except for the steam condensing mode line which has a pressure reducing status with a relief valve on the low pressure side.~~ The ~~recirculation suction~~ RHR SHUTDOWN COOLING SUPPLY valves (E12-F008 & E12-F009) have independent ~~and diverse~~ interlocks to prevent the valves from being opened when the primary system pressure is above the subsystem design pressure. These valves also receive a signal to close when reactor pressure is above system pressure.

The RHR System head spray motor-operated valve (E12-F023) is interlocked to prevent valve opening whenever the primary pressure is above the subsystem design pressure, and automatically closes whenever the primary system pressure exceeds the subsystem design pressure.

The RHR ~~System recirculation discharge~~ SHUTDOWN COOLING RETURN valve E12-F053 is interlocked to prevent valve opening whenever the primary pressure is above the subsystem design pressure, and automatically closes whenever the primary system pressure exceeds the subsystem design pressure. This valve must operate for long-term cooling, and has a remote testable check valve E12-F050 downstream. The check valve position can be confirmed at any time. Relief valve E12-F025 will handle the leakage of the closed check valve.

7.6.1.5.D High Pressure/Low Pressure Systems Interlock (Continued)

(Insert next page)

The RHR system vessel injection valve, E12-F042, must operate for short-term cooling. This valve opens upon receipt of an accident signal when the low pressure permissive is reached. This valve is the fastest opening valve available and it has a remote testable check valve downstream.

The LPCS system ~~sparger~~ INJECTION valve E21-F005 must operate for core flooding/spray. This valve opens upon receipt of an accident signal when the low pressure permissive is reached. This valve is the fastest opening valve available and it has a remote testable check valve downstream.

The feedwater containment isolation valve leakage control system valves are interlocked to close or to not open whenever the reactor-to-seal air differential pressure is high. The seal air line isolation valves are also interlocked to close when the seal air line pressure falls below the setpoint. BOP A

The main steam isolation valve leakage control system valves (E32-F007, F008, F027, F028) are interlocked to close or to not open whenever the reactor-to-seal air differential pressure is high.

E. Logic and Sequencing

The logic for the pressure sensor inputs is one-out-of-two high pressure signals for valve closure.

F. Bypasses and Interlocks

There are no bypasses or interlocks in the high pressure/low pressure interlocks.

Insert - page 7.6-35

In the steam condensing mode, the air-operated pressure reducing valve E12-F051 is in series with motor operated valve E12-F052. Both are opened and closed manually by remote manual switches. A LOCA signal prevents valve opening and will cause the valves to close if they are already open. Valve E12-F051 senses supply pressure (reactor pressure) and adjusts the degree of opening to provide pressure reduction on the low pressure side. If valve E12-F052 is wide open, a bypass line can be used to increase steam flow by opening bypass valve E12-F087. The bypass valve is interlocked to remain closed, or to close if already open, on high reactor pressure. A relief valve on the low-pressure side of the line provides final protection.

7.6.1.5 High Pressure/Low Pressure Systems Interlock (Continued)

G. Redundancy and Diversity

Each process line has two valves in series which are redundant in assuring the interlock. The shutdown cooling ~~and discharge suction~~ SUPPLY & RETURN valves have independent ~~and diverse~~ interlocks to prevent the valves from being opened when the primary system pressure is above the subsystem design pressure.

H. Actuated Devices

The motor-operated valves and air-operated valve listed in Subsection 7.6.1.5.C are the actuated devices.

I. Separation

Separation is maintained in the instrumentation portion of the high pressure/low pressure interlocks by assigning the signals for the electrically controlled valves to ESF separation divisions. The sensors and cabling are in separate ESF divisions.

J. Testability

The actuated devices can (except those valves kept closed by reactor pressure interlocks) be tested during reactor operation. The sensors can be tested during reactor operation in the same manner that the RPS sensors are tested. Refer to Subsection 7.2.1.1.D.8 for a discussion of typical RPS testing.

K. Environmental Considerations

The instrumentation and controls for the high pressure/ low pressure interlocks are qualified as Class 1E equipment. The sensors are mounted on local instrument panels and the control circuitry is housed in control panels in the control room.

FINAL DRAFT

421.44 QUESTION

In Section 7.4.1.1 of your FSAR, you identify conditions which are monitored and which can trip the RCIC turbine stop valve and isolate the system if their setpoints are exceeded. Discuss the details of this design.

421.44 RESPONSE

The RCIC turbine trip logic is designed to provide equipment (RCIC turbine and turbine pump) protection for the system. If a trip occurs, the operator has an opportunity to correct the situation and restart the system manually. Without the trip protection, the equipment could be seriously damaged resulting in loss of its functional capability. The trip function, while potentially causing short term loss of system operability, does provide for long term availability.

The RCIC turbine will automatically trip for the following conditions:

a. High RCIC turbine exhaust pressure (one out of two)
b. Low RCIC pump suction pressure (one out of one)
c. RCIC turbine overspeed (one out of one)
d. RCIC isolation (one out of two)

The RCIC isolation logics (A orB), which monitor for pipe breaks in the system, will cause automatic RCIC turbine trips for the following conditions:

a. High RCIC turbine exhaust diaphram pressure (two out of two)
b. High area ambient temperature (one out of seven from LDS)
c. High steam line differential pressure (one out of two)
d. Low RCIC steam supply pressure

To maintain system availability, trip setpoints are selected far enough away from normal operating ranges to prevent spurious trips yet well within necessary ranges to protect the environs and equipment. Selection of reliable, safety related (where required)instrumentation and controls provides additional assurance of system availability.

Recent changes, as a result of TMI, also improve system availability. A time delay has been added to the high steam line differential pressure isolation function to alleviate potential inadvertent isolation and hence RCIC turbine trips, during system startup. Vessel high water level no longer trips the RCIC turbine but instead closes the turbine steam supply valve. This allows for automatic RCIC system restart subsequent to a high water level signal if vessel level returns to the low level trip point.

FINAL DRAFT

The RCIC system is not required nor designed based to meet single failure at the system level. Loss of its function because of a turbine trip (authentic or false) will not impede core cooling since HPCS provides redundancy to RCIC for all present design base requirements.

The TMI upgrades discussed in this response are presently not included in Chapter 7 of GESSAR or GESSAR drawings. Modifications will be done at a later time.

Safety-related components and sensors used for the RCIC, including interlocks, are qualified consistant with the requirements of a Class IE system. The interlocks associated with the turbine trip circuitry are the ~~pressure~~ transmitter trip unit type. The transmitter trip units are nuclear safety related Class IE and fully testable. They are equipped with meter and trip point calibration so that their proper operation can be checked by the station operators. Equipment test frequencies are supplied as part of the plant Technical Specifications. Typically, recommended test intervals are once each month for the trip units and once per fuel cycle for transmitters (See NEDO-21617-A).

FINAL DRAFT

421.50 QUESTION

In Section 7.4.1.4 of your FSAR, you provide information on the remote shutdown system (RSS). Attachment 2 provides the Instrumentation and Control Systems Branch guidance for remote shutdown capability (i.e., guidance for meeting the requirements of GDC 19). Indicate the extent to which your proposed design of the RSS conforms to the guidance provided in Attachment 2.

421.50 RESPONSE

(See Attached)

FINAL DRAFT

-10CFR50 Appendix A, GDC 19 (As interpreted in S.R.P. Section 7.4)

ICSB POSITION	GESSAR II RSS DESIGN
o Provide redundant safety grade capability for remote shutdown assuming no fire damage or accident has occured	o The RSS is not considered a safety system and is therefore not completely redundant nor safety grade of itself. However, portions which interface with safety-related systems meet the design criteria for those systems (See GESSAR II, Section 7.4.2.4.1). Some redundancy is provided through operator action at local panels.
o RSS equipment should be seismically qualified.	o The RSS panel itself and the transfer switches are seismically qualified. The control switches and display instrumentation can be seismically qualified.
o Provide redundant instrumentation (indicators) for verification of safe shutdown conditions.	o See Figure 7.4-3 (RSS-IED) and 7A.4-3 (RSS-Elementary). Sufficient instrumentation is provided to verify safe shutdown condition. However, such instruments are single channel and are not redundant.
o Loss of offsite power should not negate shutdown capability from RSS	o See Figure 7A.4-3 (RSS Elementary). RSS derives its power from essential busses and is therefore functional during loss of offsite power.
o Transfer of control to RSS should not disable any automatic actuation of ESF functions unless such systems can be manually placed in service from the RSS.	o Only LPCI in one RHR loop and RCIC are disabled in transfer to RSS panel. However, these equipments can be manually placed in service from the RSS panel. All other automatic actuations of ESF functions operate normally. Therefore, the GESSAR II RSS design satisfies Appendix K.
o RSS access via keys or keylock switches shall be administratively controlled and shall not be precluded by the event necessitating evacuation of the control room.	o See Figure 7A.4-3b. Keylock switches are not used on the RSS panel. Administrative controls are the responsibility of the applicant (See Response 421.50e).

FINAL DRAFT

ICSB POSITION (continued)

o The design should comply with the requirements of Appendix R to 10CFR50.

GESSAR II RSS DESIGN (continued)

o GESSAR II control room design includes necessary separation and fire protection. However, the RSS is not considered a safety system and fire damage is not within the existing RSS design base. Barriers inside the RSS panel will prevent the propagation of fire from one division to another. It is the applicant's responsibility to locate panel and provide fire protection.

FINAL DRAFT

421.50 a QUESTION

Provide the following additional information in your discussion using drawings as appropriate:

a. Design Criteria for the remote control station equipment including the transfer switches and separation requirements for redundant functions.

421.50 a RESPONSE

The Remote Shutdown System (RSS) provides remote manual control of normal and nuclear safety-related systems necessary for prompt shutdown and subsequent cooldown of the reactor from outside the control room.

The remote shutdown capability in itself does not perform any safety related function. Those RSS components that interface with safety related systems maintain the integrity and channel separation of those systems.

(also see part d)

FINAL DRAFT

421.50b QUESTION

Discuss the separation arrangement between safety-related and non-safety-related instrumentation and controls on the auxiliary shutdown panel.

421.50b RESPONSE

Inside the remote shutdown panel physical barriers between redundant divisions, and between safety related and non-safety related equipments prevents the propagation of fire or effects of electrical faults from one division to another.

FINAL DRAFT

421.50 c QUESTION

Discuss the location of the transfer switches and the remote control stations.

421.50 c RESPONSE

The transfer switches are located at the Remote Shutdown panel.

The RS panel shall be located by the ~~utility~~ ~~customer~~ applicant so that access to and function of the panel will not be affected by the event causing the control room evacuation. It is suggested that the panel be located near a local RHR system control board where convenient communication can be maintained with the RHR switch gear and where failure of any other equipment will not damage the equipment on the remote shutdown panel. The panel shall be located in a controlled environment similar to that of the control room.

FINAL DRAFT

421.50 d QUESTION

Provide a description of your isolation, separation and transfer override provisions. This should include the provisions for preventing electrical interaction between the control room and the remote shutdown equipment.

421.50 d RESPONSE

The functions needed for the remote shutdown control are provided with manual transfer switches located at the remote shutdown panel, which defeat the controls from the control room and transfer the controls to the remote shutdown control. Remote shutdown is not possible without actuation of the transfer switches.

FINAL DRAFT

421.50 e QUESTION

Provide a description of the administrative and procedural control features to restrict and to assure access, when necessary, to the displays and controls located outside the control room.

421.50 e RESPONSE

It is the ~~utility/~~applicant's responsibility to describe administrative and procedural control on access to remote shutdown panel.

FINAL DRAFT

421.50 f QUESTION

Provide a description of any communication systems required to coordinate operator actions, including redundancy and separation.

421.50 f RESPONSE

It is the ~~utility/~~ applicant's responsibility to describe communication systems.

FINAL DRAFT

421.50 g QUESTION

Discuss the means for ensuring that cold shutdown can be accomplished.

421.50 g RESPONSE

The RSS design includes a panel and associated controls, indicators, and monitors for interfacing with the RHR, RCIC, Main Steam, and Condensate and Feedwater Systems. In the event the reactor vessel is isolated, the feedwater supply is unavailable, the normal heat sinks (turbine and condenser) are lost, and evacuation of the control room is necessary, remote manual control of normal reactor cold shutdown sytems is taken as follows:

Reactor pressure will be controlled and core decay and sensible heat will be rejected to the suppression pool by releasing steam through the safety relief valves. Reactor water inventory will be maintained by the RCIC system. The suppression pool will be cooled as required by operating the RHR system in the suppression pool cooling mode. This procedure will cool the reactor and reduce its pressure at a controlled rate. The RHR system will than be operated in the shutdown cooling mode to bring and maintain the reactor to the cold shutdown condition.

FINAL DRAFT

421.50 h QUESTION

Provide a description of the control room annunciation of the status of remote control or override status of devices under local control.

421.50 h RESPONSE

Operation of any of the transfer switches causes an annunciator alarm in the control room.

FINAL DRAFT

421.50 i QUESTION

Discuss your proposed startup test program to demonstrate remote shutdown capability in accordance with the guidance provided in Regulatory Guide 1.68, Revision 2.

421.50 i RESPONSE

The startup test program for the RSS shall be performed after the completion of the preoperational testing of the RSS, and the establishment of remote shutdown operating procedures and test procedures, and the communications between the control room and remote shutdown locations.

The reactor shall be scrammed and the MSIV's closed from outside the control room while the reactor is in a normal steady state condition.

Reactor water level and pressure shall be controlled from outside the main control room.

Data shall be obtained and recorded at locations outside the control room to verify that the plant has achieved hot shutdown conditions and can be maintained at stable hot shutdown for at least 30 minutes.

Manual operation of the safety relief valve (s) and the suppression pool cooling mode of the RHR system from outside the control room shall be demonstrated. From outside the control room, water level shall be controlled in the normal range and reactor pressure shall be lowered at a rate not to exceed the technical specification limits.

The reactor coolant temperature shall be reduced 50°F by controlling the shutdown cooling mode of the RHR and/or the Reactor Core Isolation Cooling Systems from outside the control room at a rate not to exceed technical specification limits.

A test report shall document the results of all tests performed and a summary of any significant deviations from the required system performance.

FINAL DRAFT

421.50 j QUESTION

Discuss the testing to be performed during plant operation to verify the capability of maintaining the plant in a safe shutdown condition from outside the control room.

421.50 j RESPONSE

It is the ~~utility/~~ applicant's responsibility to discuss testing performed during plant operation in accordance with their plant technical specifications.