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1881 - 1981

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JUL 18 1983

Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Docket Nos. 50-352
50-353

Subject: Limerick Generating Station, Units 1&2
Open Items from NRC Instrumentation and Control Systems Branch (ICSB)

Reference: July 11, 1983 Meeting with ICSB in Bethesda, MD

File: GOVT 1-1 (NRC)

Dear Mr. Schwencer:

During the reference meeting, information was requested by ICSB to resolve several open items. Enclosed are marked up FSAR pages to provide the requested information. This information will be incorporated in the August revision to the FSAR. Where the information requested is not appropriate for incorporation into the FSAR, it is provided in this letter.

The following information is provided for the items discussed:

Item 1 - Instrumentation Setpoints

Philadelphia Electric will propose Limerick unique Technical Specifications for instrumentation and controls consistent with the approved methodology employed in development of instrument setpoints.

Item 2 - At Power Testability of Actuation Instrumentation

The Limerick design includes on-line testing capability for the actuation instrumentation channels, logic and actuation devices associated with the PCRVICS, REIS, RAIS, HCRI, RCIC and ESW systems. Surveillance testing of instrumentation will include testing of all the logic components. Attached are marked up FSAR pages to reflect the details of Limerick at power testability.

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Item 3 - Lifting of Leads to Perform Surveillance Testing

Lifting of leads are not required to perform surveillance tests. The response to question 421.36 is changed to reflect this and is attached.

Item 4 - Engineered Safety Features Reset Controls

Attached is the revised response to Question 421.7 which provides the requested information.

Item 5 - Manual Initiation of Safety Systems

Additional information on logic arrangement, sensor assignment and power supply for RHR and core spray instrumentation to supplement the response to Question 421.48 will be provided in a separate letter.

Item 6 - Capability for Safe Shutdown Following Loss of Electrical Power

For all instrumentation and controls needed for safe shutdown, a loss of power is annunciated directly or indirectly in the control room. Operating procedures will be provided to instruct the operators to take appropriate actions.

Item 7 - Remote Shutdown System

Within eighteen months of the scheduled fuel load date for Unit 1, design changes will be made to eliminate the need for jumpering, rewiring, or disconnecting circuits to achieve and maintain hot shutdown from a location or locations remote from the control room. Instruments on the remote shutdown panel are seismic grade (will operate after an SSE). A preoperation test performed after the modification is completed will demonstrate that redundant remote shutdown capability exists.

Item 8 - Post Accident Monitoring Instrumentation

This remains under staff review. No additional information is required.

Item 9 - Bypassed and Inoperable Status Indication

Attached is the revised response to Question 421.33 which provides the requested information.

Item 10 - High Energy Line Breaks and Consequential Control System Failures

Item 11 - Multiple Control Systems Failures

Studies for these items will be completed in August and submitted at that time.

Sincerely,

John S. Kemper

JLP/gra/18&19

Copy to: See Attached Service List

cc: Judge Lawrence Brenner (w/o enclosure)
Judge Richard F. Cole (w/o enclosure)
Judge Peter A. Morris (w/o enclosure)
Troy B. Conner, Jr., Esq. (w/o enclosure)
Ann P. Hodgdon (w/o enclosure)
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Docket and Service Section (w/o enclosure)

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the normal ventilation system. See Figure 7.3-23 for the logic diagram.

7.3.1.1.9.6 REIS Bypasses and Interlocks

The hand switch of each isolation system, when in the "reset" position, provides input to a control room alarm. The isolation system is interlocked with the standby gas treatment system and the reactor enclosure recirculation system.

7.3.1.1.9.7 REIS Redundancy and Diversity

To maintain the redundancy of the mechanical equipment, controls and instrumentation are provided on a one-to-one basis with the mechanical equipment they serve.

The diversity of the NSSS-furnished LOCA signal is used.

7.3.1.1.9.8 REIS Actuated Devices

The standby gas treatment system, reactor enclosure recirculation system, and the reactor enclosure isolation valves are actuated by this system. See Sections 7.3.1.1.7 and 7.3.1.1.8, respectively, for descriptions of the actuated systems.

7.3.1.1.9.9 REIS Separation

The controls, instruments, and power supplies of the isolation system are physically separated and electrically independent for each of the redundant trip channels. See Section 8.1.6.1 for a discussion of electrical system separation.

7.3.1.1.9.10 REIS Testability

Verification of the operability of the initiating circuits may be made as follows:

a. By tripping the individual radiation monitor circuits

b. By tripping the differential pressure input circuits

c. By manually initiating the channels with hand switches located in the control room

d. By tripping the LOCA signal circuits (reactor enclosure isolation system only)

THE REIS SYSTEM MAY BE TESTED DURING PLANT OPERATION. AS DISCUSSED ABOVE

7.3.1.1.17.5 RAIS Logic and Sequencing

Each channel of the redundant isolation system is normally held in an energized (failsafe) mode so that an initiating signal or loss of power activates the channel and starts all the related systems. The isolation signal seals-in upon initiation, and removal of the initiating signal does not deactivate the channel. The channel may be reset to a normal condition only if the initiating condition, other than low building differential pressure, is no longer present. A keylock reset is provided to bypass low building differential pressure to re-establish it with the normal ventilation system. Figure 7.3-23 shows the logic diagram.

7.3.1.1.17.6 RAIS Bypasses and Interlocks

The hand switch of each isolation system, when in the "reset" position, provides input to a control room alarm. The isolation system is interlocked with the standby gas treatment system.

7.3.1.1.17.7 RAIS Redundancy and Diversity

To maintain the redundancy of the mechanical equipment, controls and instrumentation are provided on a one-to-one basis with the mechanical equipment they serve.

7.3.1.1.17.8 RAIS Actuated Devices

The standby gas treatment system and the refueling area isolation are actuated by this system. Section 7.3.1.1.7 gives a description of the actuated system.

7.3.1.1.17.9 RAIS Separation

The controls, instruments, and power supplies o the isolation system are physically separated and electrically independent for each of the redundant trip channels. Section 8.1.6.1 gives a discussion of electrical system separation.

7.3.1.1.17.10 RAIS Testability

Verification of the operability of the initiating circuits may be made as follows:

a. By tripping the individual radiation monitor circuits

b. By tripping the differential pressure input circuits

c. By manually initiating the channels with hand switches located in the control room

THE RAIS SYSTEM MAY BE TESTED DURING PLANT OPERATION. ~~AT POWER~~ AS DISCUSSED ABOVE

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7.3.1.1.10.7 HCRI Redundancy and Diversity

To maintain the redundancy of the mechanical equipment, controls and instrumentation are provided on a one-to-one basis with the mechanical equipment they serve.

7.3.1.1.10.8 HCRI Actuated Devices

The associated control enclosure chilled water system pumps are actuated by the control room HVAC supply fans. See Section 7.3.1.

7.3.1.1.10.9 HCRI Separation

The controls, instrumentation, and power supplies of the isolation system, emergency fresh air system, and control room HVAC are physically separated and electrically independent for each of the redundant trip channels. See Section 8.1.6.1.14 for a discussion of the electrical system separation.

7.3.1.1.10.10 HCRI Testability

Verification of the operability of the initiating circuits of the isolation system may be made as follows:

a. By tripping the individual radiation monitor circuits

b. By tripping the individual chlorine monitor circuits

c. By manually initiating the channels by hand switches located in the control room. Verification of the operability of the initiating circuits of the emergency fresh air system may be made as follows:

   1. By putting each fan in the "auto" mode and tripping the isolation channel

   2. By putting each fan in the "standby" mode and tripping the isolation channel when the other fan is shut down

   Verification of the operability of the initiating circuits of the control room HVAC fans may be made by putting each fan in the "auto" mode when the other fan of the pair is shut down. In addition, all fans may be manually tested by hand switches from the control room.

THE HCRI SYSTEM MAY BE TESTED ~~AT POWER~~ DURING PLANT OPERATION, AS DISCUSSED ABOVE

7.3.1.1.2.11 PCRVICS Testability

PCRVICS is capable of complete testing in overlapping portions during power operation. Operation of the level, pressure, flow, differential flow, and vacuum sensors may be verified by cross-comparison of instrument channels. In addition, these transmitters may be valved out of service one at a time and functionally tested using a test pressure source. The channel trip units and trip relays can be calibrated and tested by injecting a calibration signal.

The main steam line radiation measuring amplifier is provided with a test switch and internal test source by which operability can be verified. The operation of the isolation temperature sensors can be verified by cross-comparison of instrument channels. They can also be functionally tested by applying a heat source to the temperature sensing elements. Control room indications of logic trip include annunciation, panel lights, and computer printout. The condition of each sensor is indicated by at least one of these methods in addition to annunciators common to sensors of one variable.

The MSIV logic relays can be tested either by tripping a transmitter or trip unit or by actuating the manual isolation switch in a given logic division. The MSIV indicator lights and trip annunciators indicate a logic trip. Other isolation valve logic can be likewise tested in conjunction with logic test switches provided for this purpose. Actuated devices can be individually tested. Motor-operated and solenoid-operated isolation valves can be manually closed individually for testing. The main steam line valves can be slowly exercised (individually) from fully open to closed. The actual trip function at full speed can be tested at reduced power by placing individual MSIV selector switches in the closed position. Valve position indicator lights indicate valve closure.

The MSIVs mechanical components can be tested manually to any position at full power in a "slow test" mode. This "slow test" is used to exercise the valve mechanical components only. Full closure simulating actual auto isolation conditions can be performed on individual MSIVs at reduced power by placing the MSIV selector switch in the closed position. This tests the isolation solenoids and valve mechanical components at full isolation speed and actual auto-isolation conditions. In either test, the valve closure can be verified by valve position indicator lights.

Other PCRVICS valve testing must be split into two sections. The motor controls and mechanical components for motor-operated valves that are isolated under normal reactor conditions may be tested only at shutdown. Motor controls and valves that are not

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normally isolated can be tested by tripping the control logic and verifying valve closure by valve position indicator lights.

7.3.1.1.2.12 PCRVICS Environmental Considerations

The physical and electrical arrangement of the PCRVICS was selected so that no single physical event can prevent achievement of isolation functions. Motor operators for valves inside the drywell are of the totally-enclosed type; those outside the containment have weatherproof-type enclosures. Solenoid valves, whether used for direct valve isolation or as an air pilot, are provided with watertight enclosures. All cables and operators are capable of operation in the most unfavorable ambient conditions anticipated for normal operations. Temperature, pressure, humidity, and radiation are considered in the selection of equipment for the system. Cables used in high-radiation areas have radiation-resistant insulation. Shielded cables are used where necessary to eliminate interference from magnetic fields.

Special consideration has been given to isolation requirements during a LOCA inside the drywell. Components of the PCRVICS that are located inside the drywell and must operate during a LOCA are the cables, control mechanisms, and valve operators of isolation valves inside the drywell. These isolation components are required to be functional in a LOCA environment Section 3.11. Electrical cables are selected with insulation designed for this service. Closing mechanisms and valve operators are considered satisfactory for use in the PCRVICS only after completion of environmental testing under LOCA conditions or submission of evidence from the manufacturer describing the results of suitable prior tests.

7.3.1.1.2.13 PCRVICS Operational Considerations

7.3.1.1.2.13.1 PCRVICS General Information

The PCRVICS is not required for normal operation. This system automatically isolates the appropriate pipeline when one of the monitored variables exceeds preset limits. No operator action is required for at least 10 minutes following automatic initiation. The operator can manually close all other isolation valves.

All automatic isolation valves can be closed by manual operation of switches in the control room.

7.3.1.1.2.13.2 PCRVICS Reactor Operator Information

In general, once isolation is initiated, the valve continues to close even if the condition that caused isolation is restored to normal. The reactor operator must manually reset the tripped logic and operate switches in the control room to reopen a valve

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7.3.1.1.2.11

Testability is discussed in Sections ~~7.3.2.2.2.3.1.9 and 7.3.2.2.2.3.1.10~~.

7.3.1.1.2.4.6.8 Environmental Considerations

This subsystem is designed and has been qualified to meet the environmental conditions indicated in Section 3.11. In addition, this subsystem has been seismically qualified as described in Section 3.10.

7.3.1.1.2.4.7 PCRVICS - Reactor Enclosure Ventilation Exhaust Radiation Monitoring System - Instrumentation and Controls

The purpose of this system is to indicate when excessive amounts of radioactivity exist in the reactor enclosure ventilation exhaust and to provide signals for initiation of appropriate action so that the release of radioactive gases to the environment is limited to levels below the guidelines of published regulations. The radiation monitoring system is shown in Figure 7.3-11, and its specifications are given in Table 7.6-1 The system consists of four independent channels monitoring the reactor zone.

See Section 7.6.1.1.2 for a detailed description of this system.

7.3.1.1.2.4.8 PCRVICS - Refueling Area Ventilation Exhaust Radiation Monioring System - Instrumentation and Controls

The purpose of this system is to indicate when excessive amounts of radioactivity exist in the refueling area ventilation exhaust and to provide signals for initiation of appropriate action so that the release of radioactive gases to the environment is limited to levels below the guidelines of published regulations. The radiation monitoring system is shown in Figure-7.3-11, and its specifications are given in Table 7.6-1. The system consists of independent channels, monitoring the refueling area.

See Section 7.6.1.1.3 for a detailed description of this system.

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ECCS (CS and RHR), is considered a backup for HPCI. A complete description of the physical independence between divisions is given in Section 7.1.2.2.

RCIC
7.3.1.1.1.1.9 HPCI Testability

RCIC
The HPCI instrumentation and control system is capable of being tested during normal unit operation to verify the operability of each system component. Testing of the initiation sensors that are located outside the drywell is accomplished by valving out each sensor, one at a time, and applying a test pressure source. This verifies the operability of the sensor. Trip units located in the auxiliary equipment room are calibrated individually by a calibration source with verification of setpoint by a digital readout located on the calibration module.

a. Calibration and test controls for the sensors are located in the reactor enclosure. Calibration and test controls for the trip units are located in the auxiliary equipment room. To gain access to the calibration points of each sensor, a cover plate must be removed. The control room operator is responsible for granting access to the calibration points. Only properly qualified plant personnel are granted access for testing or calibration adjustments.

   In addition to the above tests, operability of the sensors can be verified by cross-checking instrument readouts in the auxiliary equipment room at any time during operation.

b. Test jacks are provided to test the logic. Annunciation is provided in the control room whenever a test plug is inserted in a jack to indicate to the control room operator that the HPCI (RCIC) system is in the test status. Operation of the test plug switches initiates the HPCI (RCIC) system. Injection into the reactor is prevented by an interlock, actuated only when the test plug is inserted, which prevents the opening of one of the HPCI (RCIC) discharge valves. The test can be repeated with the other discharge valve interlocked closed. The manual initiation switch can also be tested at this time. This sequence of tests ensures that all components are tested. A logic test of the HPCI (RCIC) does not interfere with the operation of other (the) ECCS equipment if required by an initiation signal.

c. The functional performance of the HPCI (RCIC) system can be verified by pumping water from the condensate storage tank, through the full flow test lines, and back to the

condensate storage tank. If a ~~LOCA~~ INITIATION were to occur during this mode of operation, the valve line-up would automatically be changed so that water can be pumped to the reactor.

During the above testing, the operation of the ~~HPCI~~ RCIC system can be observed in the control room by panel lamps, indicators, recorders, annunciators, and computer printout.

7.3.1.1.1.1.10 HPCI Environmental Considerations

The only HPCI system control component located inside the primary containment that must remain functional in the environment resulting from a LOCA is the control mechanism for the inboard isolation valve on the HPCI system turbine steam line. The environmental capabilitites of this valve are discussed in Section 7.3.1.1.2.13. The HPCI system control and instrumentation equipment located outside the primary containment is selected in consideration of the normal and accident environments in which it must operate. These conditions are discussed in Section 3.11.

7.3.1.1.1.1.11 HPCI Operational Considerations

7.3.1.1.1.1.11.1 HPCI General Information

The HPCI system is not required for normal operations. Under abnormal or accident conditions, initiation and control are provided automatically for at least 10 minutes when they are required. After that time, operator action can assist the automatic controls to sustain core cooling.

7.3.1.1.1.1.11.2 HPCI Reactor Operator Information

A detection system continuously confirms the integrity of the HPCI injection piping to the reactor vessel. The HPCI discharge to the reactor vessel is through a CS system line and sparger. A differential pressure sensor measures the pressure difference between the two CS sensor system injection lines. If the CS piping is sound, the pressure difference is very small between these lines. If integrity is lost, increasing differential pressure initiates an alarm in the main control room. Pressure in the HPCI pump suction line is monitored by pressure transmitters, which initiate alarms in the control room on high

MEMORANDUM ITEM #2

TO ______ LOCATION ______

FROM ______ DATE ______ 19 ______

JOB NO. ______

SUBJECT ______ FILE ______

7.3.1.1.11.10 ESW TESTABILITY

VERIFICATION OF OPERABILITY OF INITIATION CIRCUITS IS MADE, WHEN THE ASSOCIATED DIESEL-GENERATOR IS OPERATIONALLY TESTED. THIS ~~WILL~~ INCLUDES THE SUPPLY TO THE D/G AND OTHER CIRCUITS THAT ARE ACTUATED BY THE INITIATION. THE ESW SYSTEM CAN BE TESTED AS DISCUSSED ABOVE DURING PLANT OPERATIONS. THE SYSTEM PUMPS AND VALVES CAN BE MANUALLY TESTED BY HAND SWITCHES IN THE CONTROL ROOM.

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7.3.1.1.11.8 ESW Actuated Devices

The devices actuated by the initiation of the ESW pumps are the loop valving and the water source and return valving and/or sluice gates.

7.3.1.1.11.9 ESW Separation

The controls and instrumentation are physically and electrically separated for each of the four ESW pumps. ESW pump A controls and instruments are in Division I; ESW pump B is in Division II; ESW pump C is in Division III; and ESW pump D is in Division IV.

The controls for the ESW valves are assigned to various divisions so that a single active failure cannot disable a complete ESW loop. In cases where two valves are in series to shut off a flow path, the valves are assigned to two different divisions. Likewise, in cases where two valves are used to provide redundant flow paths in a single loop, the valves are assigned to two different divisions.

Loop A valves are in Divisions I and III, and loop B valves are in Divisions II and IV. The manual control loop selection valves for each diesel-generator are in the same division as the associated diesel-generator.

Loop A pressure and differential flow indication are in Division I, and the Loop B instruments are in Division II.

7.3.1.1.11.10 ESW Testability

Verification of operability of initiation circuits is made when each of the diesel-generators is operationally tested. Also, pumps and valves can be manually tested via hand switches in the control room.

7.3.1.1.11.11 ESW Environmental Considerations

The control equipment for the ESW system is located in the reactor enclosure, diesel-generator enclosures, spray pond pump house, and the control room. See Section 3.11 for environmental considerations.

7.3.1.1.11.12 ESW Operational Considerations

7.3.1.1.11.12.1 ESW General Information

The ESW system is not required for normal operation. The system is initiated automatically on a signal based on the status of the diesel-generators.

QUESTION 421.36

The FSAR information which discusses conformance to Regulatory Guide 1.118 and IEEE 338 is insufficient. Further discussion is required. As a minimum, provide the following information:

a) Section 7.1.2.5.26 of the FSAR states that the removal of fuses and other equipment not hard-wired into the protection system will be used only for the purpose of deactivating I&C circuits. Identify where procedures require such operation. Provide further discussion to describe how the Limerick procedures for the protection systems conform to Regulatory Guide 1.118 (Rev. 1) Position C.6 guidelines. Identify and provide justification for any exceptions.

b) Discuss response time testing, including sensors, for the NSSS and BOP supplied instruments and systems in relation to the guidance provided in R.G. 1.118 and IEEE 338, Section 6.3.4. Include in your discussion the effects of thermo wells, restrictions, orifices, or other interfaces with the process variable and the sensor or instrument in relation to the overall response.

c) Provide examples and descriptions of typical response time tests for RPS and ESF systems.

RESPONSE

Evaluation of the systems to be surveilled tested has determined that the actions required will include ~~the lifting of leads and~~ opening of circuit breakers. This action is required in a limited number of cases. ~~The leads will be lifted only during a test conducted during a refueling outage and will bring up an out-of-service alarm that will not clear with the lead lifted~~. The circuit breakers will be opened during monthly testing but will also bring up an out-of-service alarm that will not clear with the breaker open. LEADS are not lifted TO PERFORM SURVEILLANCE TESTS.

Sensor response time testing for pressure and differential pressure (level) sensors for the reactor protection system will be performed using a precise hydraulic pressure signal as the input. Response of the sensor output and the final actuation device will be measured. Neutron detectors are exempt from response time testing; response time will be measured from the input of the first electronic component in the channel. Except for the MSIVs, individual sensor response times and logic system response times are not required for isolation systems because the signal delay (sensor response) is concurrent with the 13-second

QUESTION 421.7 (Sections 7.1 and 7.7)

Some of the primary methods the Staff uses to convey information to licensees and applicants based on operating experience are Office Of Inspection and Enforcement (IE) Bulletins, Circulars and Information Notices. Although only the IE Bulletins require written responses, the staff expects licensees and applicants to take appropriate action(s) on the information provided in the Circulars and Information Notices applicable to their design. Included in Attachment 1 is a list of IE Bulletins, Circulars and Information Notices that are applicable to BWRs. Provide a discussion which includes the following:

1. Procedures for determining the applicability of the IEB, IEC, and IEIN to your facility.

2. Procedures or methods for factoring the applicable information or criteria into the Limerick design.

3. Details of specific design modifications and their implementation resulting from items 1 and 2.

4. Detailed analysis and results for IEB 79-27 and IEB 80-06.

5. Detailed analysis and results for IEIN 79-22 to assure that consequential control system failures following a high energy line break do not result in event sequences more severe than those shown in the FSAR accident analyses (Chapter 15).

RESPONSE

1. The procedure that is used for evaluating and processing IEBs, IECs, and IEINs at Limerick is given in Appendix X to the Limerick Quality Assurance Plan.

2. As noted in Section X-4.2.1 of the Quality Assurance Plan, the responsible group determines what actions are required to address the concerns of each IEB, IEC or IEIN. These actions are noted in the response to the Project Manager. In accordance with Section X-4.2.7, the Project Manager indicates in a log the corrective action needed to close out each item. That item is closed only when the final action is complete.

3. The actions taken by PECo for Limerick, in regards to the IE Bulletins, Circulars and Info Notices are listed in Table 421.7-1.

4. The detailed response and analysis for IEB 79-27 is contained in the response to SRAI(15).

The following is the detailed analysis and results for IEB 80-06.

IEB 80-6 requires that safety-related equipment remain in its emergency mode on reset of an engineered safety features actuation signal.

To determine whether or not all safety-related equipment remains in its emergency mode on isolation signal reset, schematic drawings for all Limerick systems serving safety-related functions were reviewed. The review showed that a number of valves were subject to reverting to their normal mode on isolation signal reset. All continuous duty loads were found to remain in their emergency mode on isolation signal reset.

In general, control schemes of safety-related valves found not to remain in their emergency mode on reset of an isolation signal were revised to provide a control switch interlock with the isolation signal reset circuit (Figure 421.7-1). To reset an isolation signal, every valve subject to reverting to normal mode on reset of the isolation signal must have its control switch placed in the closed position. A normally open contact of each of the valve control switches is wired in series with the isolation signal reset contact. On manual placement of all of the subject control switches in the closed position, the permissive series of control switch contacts will all be closed, thus allowing the isolation signal reset contact to complete the reset circuit.

On the bases of the design review, the following systems and valve control schemes were modified as described above:

System	Valve No.	
Containment Atmospheric Control	HV57-117	SV57-133
	HV57-118	SV57-183
	HV57-104	SV57-191
	HV57-114	SV57-181
	HV57-123	SV57-132
	HV57-124	SV57-134
	HV57-121	SV57-150
	HB57-131	SV57-141
	SV57-184	SV57-142
	SV57-185	SV57-143
	SV57-186	SV57-144
	SV57-190	SV57-145
	SV57-195	SV57-159

Primary Containment Instrument Gas System	HV59-129A HV59-102 HV59-129B	HV59-131 HV59-135
Nuclear Steam Shutoff System	HV41-1F084 HV41-1F085 HV43-1F019 HV43-1F020	HV51-1F079A HV51-1F079B HV51-1F080A HV51-1F080B
Liquid Radwaste Collection	HV61-110 HV61-111	HV61-130 HV61-131

In addition to the foregoing valves, drywell purge exhaust fan inlet isolation valves HV76-030 and HV76-031 were found to revert to their normal mode on isolation signal reset. Thus, if the valves were in their open purge mode on receipt of an isolation signal, the valves would revert to the open purge mode isolation signal reset. To ensure that these valves remain in their closed emergency mode on isolation signal reset, the valve control schemes were modified to the configuration shown on Figure 421.7-2. The auxiliary relay (95-2) is picked up by the normally closed isolation signal contacts and by the placement of the valve control switch in the "CLOSE" position. Once picked up, the auxiliary seals itself in with a contact around the valve control switch "CLOSE" contact. The valves are placed in the "OPEN" purge position through a contact from the auxiliary relay and the placement of the valve control switch in the "OPEN" position. On receipt of an isolation signal, the normally closed isolation signal contacts open, thus dropping out the auxiliary relay, which in turn opens the auxiliary relay seal in circuit and de-energizes the valve "OPEN" circuit, thus closing the valve. Resetting the isolation signal will not re-energize the auxiliary relay because the valve control switch is in the "OPEN" position. Thus, the valve "OPEN" circuit will remain de-energized and the valves will remain closed.

The following are exceptions to IE Bulletin 80-06 guidance:

a. Reactor Core Isolation Cooling System (RCIC)

   All actuated equipment remains in its abnormal condition, except for the RCIC system inboard and outboard steam line isolation valves, E51-F007 and E51-F008.

b. High Pressure Coolant Injection System (HPCI)

   All actuated equipment remains in its abnormal condition, except for the HPCI system inboard and

If the isolation logics are reset with the valve control switch in the open position the isolation valves will open

outboard steam line isolation valves, E41-F002 and E41-F003.

The reset control for the HPCI/RCIC isolation logics do not strictly meet the intent of IE Bulletin 80-06, but we believe the design is acceptable. There are two completely independent isolation logics for the HPCI and RCIC. Each of these logics consists of two logic channels, one for the inboard valves and one for the outboard valves. Each of these logic channels is sealed in until a reset switch in that logic is depressed. Therefore activation of the reset switch only affects one logic channel and will only cause the inboard or outboard valves to open on the system being reset. The line will remain isolated, i.e., in its safe mode, until both the isolation logics for each system are reset. In addition, the logic reset has no effect if the initiation signal is still present.

The results of this review will be verified as part of the system preoperational testing.

5. The analysis performed in response to IEIN 79-22 is given in Exhibit 421.7-1.

Administrative procedures will instruct the operator to place the control switches in the closed position before resetting the isolation logic. In addition to this procedural caution, a caution tag will be added to the control board next to the reset switch. This tag will instruct the operator to place the control switches for the associated valves in the closed position before resetting the logic. Insert (A)

Insert (A) for 421.7

Even if the HPCI or RCIC isolation valves were inadvertently reopened before the pipe break condition was corrected, due to both isolation logics being reset after the isolation parameters have cleared, the pipe break condition would be detected again and the isolation valves would reclose. The offsite radiological doses due to the released steam would be a small fraction of the 10CFR, Part 100 limits.

QUESTION 421.33 (Section 7.1 and 7.6)

Section 7.1.2.5.5 and 7.1.2.5.11 of the FSAR provide conflicting information in relation to bypass and inoperable status indication. Discuss in detail the design of the bypassed and inoperable status indication using detailed schematics. Include the following information in the discussion:

1. Compliance with the recommendations of R. G. 1.47 and R. G. 1.22 Position D.3a and 3b,

2. The design philosophy used in the selection of equipment/systems to be monitored, including auxiliary and support systems,

3. How the design of the bypass and inoperable status indication systems comply with positions B1 through B6 of ICSB Branch Technical Position No. 21, and

4. The list of system automatic and manual bypasses within the BOP and NSSS scope of supply as it pertains to the recommendations of R. G. 1.47.

5. Include details relating to the general information provided in Section 7.2.2.1.2.3.1.14 of the FSAR during the discussion.

RESPONSE

The design of the bypassed and inoperable status indication is described below.

a. Compliance to Regulatory Guide 1.47 is discussed in revised Section 7.1.2.5.11 and in the analysis sections of the systems to which Regulatory Guide 1.47 is applicable (listed below).

D.3a The indications of system inoperability provided under the guidelines of Regulatory Guide 1.47 are used by the operator to prevent, through administrative procedures, the bypassing of a redundant channel of a protection system. The conditions that render the system inoperable during test are annunciated. The conditions that automatically bring up the out-of-service alarm are identifiable to the operator in the control room by means of the out-of-service status light.

D.3b A manual out-of-service switch is provided to annunciate any bypass condition that does not automatically energize the system out-of-service annunciator. A single status light indicates that the annunciator has been manually actuated. Individual indication for each manually-induced inoperability is not provided.

b. In accordance with the requirements of Regulatory Guide 1.47, bypassed and inoperable status indication has been provided for all plant protection systems. These systems are listed below. Also listed are the conditions that cause annunciation of system inoperability.

All auxiliary and supporting systems to protection systems are monitored as part of the protection system availability in accordance with Regulatory Guide 1.47. The inoperability of these support systems causes the actuation of the out-of-service annunciator for the protection system that these systems support. A status light is provided to indicate that the inoperability of the support system is the cause of inoperability of the protection system.

Equipment monitored within a protection system is that equipment which, when bypassed or removed from service, will cause inoperability of a redundant (one division) portion of the protection system. Bypass or removal of equipment will automatically initiate the system level out-of-service annunciator and illuminate a status light on the system control panel indicating the cause of the out-of-service condition.

Equipment that is bypassed or removed from service not more than once per year is not monitored. A manual out-of-service switch is provided for this equipment and for other equipment that cannot be monitored.

c. Conformance to BTP ICSB 21 is discussed below, by position:

B1. Individual indicator lights are arranged together on a control room panel to indicate what function of the system is out of service, bypassed, or otherwise inoperable. All bypass and inoperability indicators both at a system level and component level are grouped only with items that will prevent a system from operating if needed.

B2. Limerick has only one control room. When a protective function of a shared system is bypassed,

it is annunciated on the annunciator panel for the shared system, and status indication for the system is provided on the control panel for the shared system.

B3. As a result of design, preoperational testing, and startup testing, no erroneous bypass indication is anticipated. Capability for cancelling bypass indications is not provided.

B4. These indication provisions serve to supplement administrative controls and to aid the operator in assessing the availability of component and system level protective actions. This indication does not perform a safety function.

B5. All circuits are electrically independent of the plant safety systems to prevent the possibility of adverse effects.

B6. The out-of-service annunciators can be tested by depressing the annunciator test switches on the control room benchboards. Each status indicating light can be tested by depressing the light assembly.

d. The individual out-of-service condition that initiates a system level out-of-service alarm is listed below.

1. Pump breaker control power undervoltage
2. Pump breaker not connected
3. Pump breaker locked out
4. Loss of power to relay logic
5. Loss of power to control valve or valve motor overload
6. System logic in test
7. Trip unit in calibration or failure
8. Loss of power to trip unit or trip unit out of file
9. Manual out of service
10. Loss of system support HVAC
11. Valves operated from the control room that are not automatically positioned by the initiation signal

12. Transfer switch out of position

For the specific alarms that are associated with a system, refer to the functional control diagram for that system as listed in Chapter 7 figures and to the schematics E-648 as listed in Table 1.7-1.

Systems monitored as discussed above are as follows:

	System	FSAR Figure
1.	Reactor Protection System	7.2-1
2.	Core Spray System	7.3-9
3.	Primary Containment & Reactor Vessel Isolation Control System	7.3-8
4.	High Pressure Coolant Injection System	7 3-7
5.	Residual Heat Removal System	7.3-10
6.	Emergency Service Water System	Table 1.7-1
7.	Standby AC Power System	Table 1.7-1
8.	Reactor Core Isolation Cooling	7.4-1
9.	Residual Heat Removal System - Shutdown Cooling Mode	7.3-10
10.	Reactor Enclosure Isolation System	7.3-8 & 7.3-23
11.	Standby Gas Treatment System	7.3-23
12.	Reactor Enclosure Recirculation System	7.3-23
13.	Control Enclosure HVAC Systems	7.3-24
14.	Neutron Monitoring System	7.6-1
15.	Standby Liquid Control System	Table 1.7-1
16.	MSIV Leakage Control System	7.3-8
17.	Combustible Gas Control System	Table 1.7-1

Regulatory Guide 1.47 compliance for Items 11, 12, and 13 above is through the use of a trouble alarm in the control room that will direct the operator to a local control panel in the control enclosure for more information. For items 14 through 17, alarms are provided in the control room that provide the cause of the out-of-service condition. No status lights are provided.

INSERT (A)

e. Details of the administrative procedures that control access as a means for bypassing are contained in Section 7.2.2.1.1.1.8.

INSERT (A)

The following four systems do not have system level out of service alarms in the Control Room: Neutron Monitoring System (NMS), Standby Liquid Control (SLC), MSIV Leakage Control (MSIV-LCS) and Containment Combustion Gas Control (CGCS). The following conditions which can make these systems out of service are specifically annunciated in the Control Room:

NMS (DRAWING E-620)

SRM Downscale
SRM Upscale / Inop
IRM Retracted When Not Permitted
IRM Upscale / Inop
IRM Downscale
IRM Upscale
RBM Downscale
APRM/RBM Flow Reference Off Normal
RBM Upscale / Inop
APRM Downscale
APRM Upscale
LPRM Downscale
LPRM Upscale
APRM Upscale Trip / Inop

SLC (DRAWING E-620)

SLC Pump A/B/C Overload / Loss of Power
SLC Tank Hi/Lo Level
SLC Tank Hi/Lo Temperature
SLC Squib Valve Loss of Continuity

SLC Isolation Valves Not Fully Open

MSIV - LCS (DRAWING E-625)

Inboard System Dilution Lo Flow
Outboard System Dilution Lo Flow
Leakage Hi Flow
Outboard System Steam Line High Pressure
Logic Power Failure
Trip Unit Racked Out / Power Failure
Trip Unit In Test / Inop
Valve / Heater / Blower Overload / Power Failure

CGCS (DRAWING E-622)

Drywell H_2 Recombiner System Trouble 1A
Drywell H_2 Recombiner System Trouble 1B
The following alarms are provided on the recombiner control panels which are located in the Control Room behind the main control boards:

Loss of Power to Cooling Water Valve
Loss of Trickle Heat Power
Loss of Main Power
Return Gas High Temperature
Reaction Chamber Shell High Temp.
Inlet Pressure High
Reaction Chamber Gas Temp High
Blower Discharge Temp High
Thru Gas Flow Low
Reaction Chamber Gas Temp Low
Heater Wall Temp. High

The above alarms for these four systems represent all conditions which can prevent the system from performing its safety function. The requirements of Reg. Guide 1.47 for these systems are therefore satisfied. Any other conditions can be annunciated by manually causing one of the above annunciators to light.

[illegible] ANNUNCIATOR PANEL 1AC303

SCHEME NO. [illegible]

([illegible] FOR [illegible] UNITS)

[illegible] VALVE CLOSURE TRIP (2) 1	TURBINE CONTROL VALVE FAST CLOSURE TRIP (2) 6	SCRAM DISCHARGE VOLUME HI LEVEL TRIP (2) 11	REACTOR HI LEVEL TURBINE/RFPT TRIP 16	MSIV NOT FULLY OPEN TRIP (2) 21	DRYWELL HI PRESS TRIP (2) 26	REACTOR HI PRESS TRIP (2) 31	REACTOR WATER BELOW LEVEL 3 TRIP 36	MAIN STEAM LINE HI RADIATION TRIP
TURBINE CONTROL VALVE/STOP VALVE SCRAM BYPASSED (A) 2	7	SCRAM DISCH VOLUME HI LEVEL SCRAM BYPASSED (A) 12	RPV HEAD SEAL LEAKAGE 17	MSIV CLOSURE SCRAM BYPASSED (A) 22	DRYWELL HI/LO PRESS 27	REACTOR HI PRESS 32	REACTOR HI/LO LEVEL 37	VIBRATION ALARM ALERT
A RFP LO FLOW 3	B RFP LO FLOW 8	C RFP LO FLOW 13	FEEDWATER HI TURBIDITY 18	SPOTMOS TROUBLE ALARM DIV. 1 23	IRM UPSCALE (A) 28	IRM DOWNSCALE [illegible] 33	IRM UPSCALE / INOPERATIVE 38	VIBRATION ALARM DANGER
A RFPT TURNING GEAR FAILED TO ENGAGE/OUT OF SERVICE 4	B RFPT TURNING GEAR FAILED TO ENGAGE/OUT OF SERVICE 9	C RFPT TURNING GEAR FAILED TO ENGAGE/OUT OF SERVICE 14	FEEDWATER TURBIDITY MONITOR LO FLOW 19	SPOTMOS TROUBLE ALARM DIV. 2 24	SRM PERIOD (A) 29	SRM DOWNSCALE 34	SRM UPSCALE INOPER[illegible] 39	SRM RETRACTED WHEN NOT PERMITTED
A RFPT [illegible] OVERLOAD 5	B RFPT [illegible] OVERLOAD 10	C RFPT [illegible] OVERLOAD 15	RFPT [illegible] FAILURE 20	TIP SHEAR VALVE [illegible] INOPERATIVE (A) 25	DIV 1 [illegible] DET SYS HI TEMP 30	DIV 2 [illegible] DET SYS HI TEMP 35	DIV [illegible] STEA[illegible] DET HI T[illegible]	[illegible]

DRAWING - E-620

REACTOR CONTROL ANNUNCIATOR PANEL 1BC803

NEUTRON MONITORING SYSTEM TRIP	AUTO SCRAM CHANNEL A1 6	AUTO SCRAM CHANNEL B1 11	MANUAL SCRAM SYSTEM A 16	MANUAL SCRAM SYSTEM B 21	CRD ACCUMULATOR TROUBLE 26	1A CRD WATER PUMP TRIP 31	1B CRD WATER PUMP TRIP	[illegible] LIQUID [illegible] MOTOR OVERLOAD
SHUTDOWN MODE SCRAM BYPASSED	AUTO SCRAM CHANNEL A2	AUTO SCRAM CHANNEL B2 12	MANUAL SCRAM SWITCH ARMED A B 17	SCRAM DISCH VOLUME NOT DRAINED 22	ROD & DETECTOR DISPLAY MODULE HI-TEMP 27	1A CRD WATER PUMP MOTOR OVERCURRENT 32	1B CRD WATER PUMP MOTOR OVERCURRENT	STANDBY LIQUID TANK HI/LO LEVEL
APRM UPSCALE TRIP/INOP 3	APRM UPSCALE 8	APRM DOWNSCALE 13	APRM/RBM FLOW REF OFF NORMAL 18	ROD OUT BLOCK 23	RSCS INOPERATIVE 28	1A/1B CRD PUMP SUCTION LO PRESS 33	CRD PUMP SUCTION FILTER HI ΔP	STANDBY LIQUID TANK PIPE HI/LO TEMP
LPRM UPSCALE	LPRM DOWNSCALE 9	RBM UPSCALE/ INOPERATIVE 14	RBM DOWNSCALE	RDCS INOPERATIVE 24	ROD DRIFT 29	CRD DRIVE WATER FILTER HI ΔP 34	CRD CHARGING WATER HI PRESS	STANDBY LIQUID SQUIB VALVE LOSS OF CONTINUITY
RPS SYSTEM A OUT OF SERVICE 5	RPS SYSTEM B OUT OF SERVICE 10	SCRAM VALVE PILOT AIR HEADER HI PRESS 15	SCRAM VALVE PILOT AIR HEADER LO PRESS 20	RPIS INOPERATIVE 25	ROD OVERTRAVEL 30	CRD HYDRAULIC HI TEMP 35	CRD TRIP UNIT OUT OF SER	STANDBY LIQUID [illegible] VALVE [illegible]

DRAWING E620

TYPICAL FOR [illegible]

DIV [illegible] MSIV INITIATED Ⓡ 1	DIV 3 NSSS MSIV INITIATED Ⓡ 6	DIV 2 NSSS MSIV INITIATED Ⓡ 11	DIV 4 NSSS MSIV INITIATED Ⓡ 16	[illegible] DRYWELL H RECOMBINER WATER IN DISCH LINE 21	DRYWELL [illegible] OXYGEN 26	[illegible] VACUU[illegible] RELIEF VA[illegible] OPEN
NSSS MANUAL ISOLATION Ⓡ 2	MAIN CONDENSER LO VACUUM Ⓡ 7	REACTOR LO-LO LEVEL Ⓡ 12	MAIN STEAM LINE HI FLOW Ⓡ 1[illegible]	1A DRYWELL H_2 RECOMB SYS TROUBLE 2[illegible]	DRYWELL HI HYDROGEN 27	1A DRYWELL INSTR GA[illegible] RECEIVER LO PRESS 3[illegible]
DIV 1/3 MANUAL ISOLATION SWITCH ARMED Ⓐ 3	MAIN CONDENSER LO VACUUM BYPASS 8	STEAM TUNNEL HI TEMP Ⓡ 13	MAIN STEAM LINE LO PRESS Ⓡ 1[illegible]	1B DRYWELL H_2 RECOMB SYS TROUBLE 2[illegible]	SUPPRESSION POOL HI OXYGEN 28	1B DRYWELL INSTR GA[illegible] RECEIVER LO PRESS 3[illegible]
DIV 2/4 MANUAL ISOLATION SWITCH ARMED Ⓐ 4	NSSS OUTBOARD ISOLATION VALVE OVLD/ POWER FAILURE 9	TRAIN "A" PIPING FILL PMP AP256 LO PMP DISCH 14	TRAIN "B" PIPING FILL PMP BP256 LO PMP DISCH 19	1B DRYWELL H_2 RECOMBINER WATER IN DISCH LINE 24	SUPPRESSION POOL HI HYDROGEN 29	1A DRYWELL INSTR GA[illegible] COMPRESS[illegible] TROUBLE 3[illegible]
DIV 1/2 REACTOR LEVEL/PRESS RECORDER IN HI SPEED 5	NSSS INBOARD ISOLATION VALVE OVLD/ POWER FAILURE 10	TRAIN "A" PIPING FILL MOV OVLD/PWR FAILURE 15	TRAIN "B" PIPING FILL MOV OVLD/PWR FAILURE 20	DRYWELL EQUIP/FLOOR DRAIN SUMP MOV OVLD/ POWER FAILURE 25	BYPASS LEAKAGE BARRIER MOVS OVLD/ POWER FAILURE 30	1B DRYWELL INSTR GA[illegible] CO[illegible] T[illegible]

Ⓐ = AMBER LIGHTS

Ⓡ = RED LIGHTS

PANEL 1BC801 WINDOW LAYOUT

(FRONT VIEW)

DRAWING E-622

ADS A[illegible] MSIV LC ANNUNCIATOR [illegible]NEL [illegible]

SCHEME NO. 10KQ08
(TYPICAL FOR 1 & 2 UNITS)

DIV 1 ADS OUT OF SERVICE (A)	ADS/SAFETY VALVE LEAKING 6	DIV 3 ADS OUT OF SERVICE (A) 1	[illegible] INBOARD SYS DILUTION AIR LO FLOW 16	[illegible] OUTBOARD SYS DILUTION AIR LO FLOW 2
DIV 1 ADS MANUAL INITIATION SW ARMED/ RELAYS SEALED IN 2	SAFETY/ RELIEF VALVE BONNET VENT LEAKING 7	DIV 3 ADS MANUAL INITIATION SW ARMED/ RELAYS SEALED IN 1	MSIV LC LEAKAGE HI FLOW 17	MSIV LC OUTBOARD SYS STEAM LINE HI PRESS 2
DIV 1 ADS RELAYS ENERGIZED (R) 3	FAULTY ADS TEST PROCEDURE 8	DIV 3 ADS RELAYS ENERGIZED (R) 1	MSIV LC LOGIC POWER FAILURE 18	MSIV LC TRIP UNIT RACKED OUT/ POWER FAILURE 2
DIV 1 ADS TIMER INITIATED (R) 4	DIV 1 REACTOR LEVEL 3 ADS PERMISSIVE 9	DIV 3 ADS TIMER INITIATED (R) 14	DIV 3 REACTOR LEVEL 3 ADS PERMISSIVE 15	MSIV LC TRIP UNIT IN TEST/INOP 2
DIV 1 DRYWELL HI PRESS SIGNAL SEALED IN 5	1A/1C CORE SPRAY/ RHR PUMP RUNNING 10	DIV 3 DRYWELL HI PRESS SIGNAL SEALED IN 15	1B/1D CORE SPRAY/ RHR PUMP RUNNING 2	MSIV LC VALVE/HEATER BLOWER [illegible] FAILURE

(A) = AMBER LIGHTS (R) = RED LIGHTS

PANEL [illegible]826 W[illegible] LA[illegible]

Drawing E-625