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Docket Nos.: 50-352/353

Mr. Edward G. Bauer, Jr.
Vice President & General Counsel
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Dear Mr. Bauer:

Subject; Request for Additional Information - Limerick (Instrumentation and Controls)

The Instrumentation and Control Systems Branch has reviewed the Limerick FSAR and has identified a need for the additional information delineated in Enclosure 1. In this regard, we would like to hold a series of meetings, beginning in late September or early October 1982, with the appropriate members of your staff to discuss this material. We request that you arrange the items contained in the enclosure into convenient groupings, such that each grouping forms the agenda for an individual meeting. Please provide us with these groupings within 10 days from receipt of this letter so that we may plan appropriately. Additionally, indicate which items (if any) in Enclosure 1 are not applicable to the Limerick design and which items require clarification. Your staff should also be prepared to discuss details of the fluid systems and mechanical equipment which interface with the instrumentation and controls. In addition, please provide us with the drawing numbers of drawings to be referred to by your staff at least two weeks in advance of each meeting. If any of these drawings have not yet been submitted, please provide them as well.

Any questions concerning this information request should be directed to Dr. Harvey Abelson (301) 492-9774, the Licensing Project Manager.

/S/

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

Enclosure:
As stated

cc: See next page

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Limerick

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ENCLOSURE 1

LIMERICK GENERATING STATION

UNITS 1 AND 2

REQUEST FOR ADDITIONAL INFORMATION

421.1 (7.1 thru 7.7) Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, indicates that duplication of information should be avoided and that information required be provided in the principal section and referenced in other portions. Several incorrect references are included in Chapter 7 of the FSAR (i.e., Sec. 7.2.2.1.2.3.1.4 ref. 7.1.2.6.6, Sec. 7.4.2.4.2.1.2 ref. 7.1.2.6.19, Sec. 7.1.2.5.13 ref. 7.7.2.8.3, etc.). Review all references in Chapter 7 of the FSAR, provide a list of corrected references and correct the FSAR in a subsequent amendment. In addition, Sec. 7.1 of the FSAR indicates that detailed discussions are provided in Sec. 7.2 thru 7.7 relating to the degree of conformance to applicable design criteria (e.g., Sec. 7.1.2.5.5 references Sec. 7.6.); these detailed discussions are in fact not provided. Identify all areas where details are not provided in the list of corrected references and include the detailed information in a subsequent amendment to the FSAR.

421.2 (1.7) FSAR Table 1.7.3, "Control and Instrumentation Drawings", indicates several drawings which are to be issued. Provide the following drawings:

M-09FD (SH 2, 4 & 5)	Circulating Water
M-10FD (SH-1)	Service Water
M-11FD	Emergency Service Water
M-12FD (SH 3 & 4)	RHR Service Water
M-81FD (SH 4)	Miscellaneous Structures - HVAC
M-83FD	Admin Complex Guard Station - HVAC
M-765 (SH 3)	Inst. Installation Water Treatment Building

421.3 (7.1) FSAR Section 7.1 does not address the Branch Technical Positions (BTP) relating to instrumentation and control systems listed in the SRP Table 7.1 and provided in Appendix 7-A to Chapter 7 of the SRP. Provide a detailed discussion using drawings (schematics, PI&Ds, etc.) to demonstrate that the Limerick design conforms to the guidance provided in the BTP applicable to the Limerick design or the basis for the alternate solution provided for the particular design problem identified in the BTP.

421.4 (7.1) Several previously reviewed BWR installations (e.g., Grand Gulf, Perry) included a start-up transient monitoring system to provide recordings of selected parameters during the start-up and warranty testing. There is no information in the FSAR which describes this type of system. If this system, or any similar system, is intended for use in the Limerick units, provide the following information:

a. Identify all safety-related parameters which will be monitored with the transient monitoring system during initial operation.

b. For each safety parameter identified above, provide a concise description of how its associated circuitry connects (either directly, or indirectly by means of isolation devices) with the transient monitoring system circuitry. Where appropriate, supplement this description with detailed electrical schematics.

c. Describe provisions of the design to prevent failures of the transient monitoring system from degrading safety-related systems.

421.5 (7.3) (7.5) Standard Review Plan, Table 7-2, TMI Action Plan Requirements for Instrumentation and Control Systems Important to Safety, provides an applicability matrix to various sections of Chapter 7 and referenced NUREGs. General information is provided in Section 1.13 of the FSAR. Discuss the details using drawings as appropriate, of proposed design modifications, status of effort to date and projected schedules for completion of the following TMI action items:

a. II.D 3 Relief and safety valve position indication (7.5)

b. II.E.4.2 Containment isolation dependability Positions (4), (6) and (7) (7.3)

c. II.F.1 Accident monitoring instrumentation - Positions (4), (5) and (6) (7.5)

d. II.F.3 Instrumentation for monitoring accident conditions (RG 1.97 Rev 2) (7.5)

e. II.K.1.23 Reactor Vessel Level Indication (7.5)

f. II.K.3.13 HPCI and RCIC initiation levels (7.3)
II.K.3.15 Isolation of HPCI and RCIC
II.K.3.18 ADS actuation
II.K.3.21 Restart LPCS and LCPI
II.K.3.27 RCIC automatic switchover

421.6 (7.1) (7.7) Section 7.1.2.5 and 7.1.2.6 of the FSAR indicate, that the applicability of the conformance statements provided for each system is included in Table 7.1-3 for GDCs, RGs and other standards. Table 7.1-3 is inconsistent with Table 7-1 of the SRP (e.g., the ECCS does not include GDC-24, remote shutdown systems do not include GDC 34, 35, 38, RG 1.22, RG 1.47). Identify and provide the rationale for all deviations between FSAR Table 7.1-3 and SRP Table 7.1.

421.7 (7.1) (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).

ATTACHMENT 1

BWR APPLICABLE LAST FIVE YEARS

IE Bulletin No. 78-01 January 16, 1978

FLAMMABLE CONTACT-ARM RETAINERS IN G.E. CR120A RELAYS

IE Bulletin No. 78-05 April 14, 1978

MALFUNCTION OF CIRCUIT BREAKER AUXILIARY CONTACT MECHANISM - GENERAL ELECTRIC MODEL CR105X

IE Bulletin No. 79-09 April 17, 1979

FAILURES OF GE TYPE AK-2 CIRCUIT BREAKER IN SAFETY RELATED SYSTEMS

IE Bulletin No. 79-12 May 31, 1979

SHORT PERIOD SCRAMS AT BWR FACILITIES

IE Bulletin No. 79-24 September 27, 1979

FROZEN LINES

IE Bulletin No. 79-27 November 30, 1979

LOSS OF NON-CLASS-IE INSTRUMENTATION AND CONTROL POWER SYSTEM BUS DURING OPERATION

IE Bulletin No. 79-28 December 7, 1979

POSSIBLE MALFUNCTION OF NAMCO EA 180 LIMIT SWITCHES AT ELEVATED TEMPERATURES

IE Bulletin No. 80-06 March 13, 1980

ESF RESET CONTROLS

IE Bulletin No. 80-09 April 17, 1980

HYDRAMOTOR ACTUATOR DEFICIENCIES

IE Bulletin No. 80-14 June 12, 1980

DEGRADATION OF BWR SCRAM DISCHARGE VOLUME CAPACITY

IE Bulletin No. 80-16 June 27, 1980

OPERATIONAL DEFICIENCIES IN ROSEMOUNT MODEL 510DU TRIP UNITS AND MODEL 1152 PRESSURE TRANSMITTER

IE Bulletin No. 80-17 July 3, 1980

FAILURE OF 76 OF 185 CONTROL RODS TO FULLY INSERT DURING A SCRAM AT A BWR

IE Bulletin No. 80-17 Supplement No. 1 July 18, 1980

FAILURE OF 76 OF 185 CONTROL RODS TO FULLY INSERT DURING A SCRAM AT A BWR

IE Bulletin No. 80-17 Supplement No. 2 July 22, 1980

FAILURES REVEALED BY TESTING SUBSEQUENT TO FAILURE OF CONTROL RODS TO INSERT DURING A SCRAM AT A BWR

IE Bulletin No. 80-23 Nobember 14, 1980

FAILURE OF SOLENOID VALVES MANUFACTURED BY VALCOR ENGINEERING CORP.

IE Bulletin No. 80-17 Supplement No. 4 December 18, 1980

FAILURE OF CONTROL RODS TO INSERT DURING A SCRAM AT A BWR

IE Bulletin No. 80-17 Supplement No. 5 February 13, 1981

FAILURE OF CONTROL RODS TO INSERT DURING A SCRAM AT A BWR

IE Circular 79-07 May 2, 1978

UNEXPECTED SPEED INCREASE OF REACTOR RECIRCULATION MG SET RESULTED IN REACTOR POWER INCREASE

IE Circular 79-24 November 26, 1979

PROPER INSTALLATION AND CALIBRATION OF CORE SPRAY PIPE BREAK DETECTION EQUIPMENT ON BWRS

IE Circular No. 80-08 April 18, 1980

BWR TECHNICAL SPECIFICATION INCONSISTANECY RPS RESPONSE TIME

IE Circular No. 81-01 January 23, 1981

DESIGN PROBLEMS INVOLVING INDICATING PUSH-BUTTON SWITCHES MFGRD. BY HONEYWELL INC.

IE Circular No. 81-03 March 2, 1981

INOPERABLE SEISMIC MONITORING INSTRUMENTATION

IE Circular No. 81-06 April 14, 1981

POTENTIAL DEFICIENCY AFFECTING CERTAIN FOXBORO 10 TO 50 MILLIAMPERE TRANSMITTERS

IE Circular No. 81-11 July 24, 1981

INADEQUATE DECAY HEAT REMOVAL DURING REACTOR SHUTDOWN

IE Circular No. 81-14 November 5, 1981

MAIN STEAM ISOLATION VALVE FAILURE TO CLOSE

IE Circular No. 81-13 September 25, 1981

TORQUE SWITCH ELECTRICAL BYPASS CIRCUIT FOR SAFEGUARD SERVICE VALVE MOTORS

IE Notice No. 79-13 May 29, 1979

INDICATION OF LOW WATER LEVEL IN THE OYSTER CREEK REACTOR

IE Notice No. 79-22 September 14, 1979

QUALIFICATION OF CONTROL SYSTEMS

IE Notice No. 79-32 December 21, 1979

SEPARATION OF ELECTRICAL CABLES FOR HPCI AND ADS

IE Notice 80-11 March 14, 1980

GENERIC PROBLEMS WITH ASCO VALVES IN NUCLEAR APPLICATIONS INCLUDING FIRE PROTECTION SYSTEMS

IE Notcie 80-13 April 2, 1980

GENERAL ELECTRIC TYPE SBM CONTROL SWITCHES DEFECTIVE CAM FOLLOWERS

IE Notice 80-30 August 19, 1980

POTENTIAL FOR UNACCEPTABLE INERACTION BETWEEN THE CONTROL ROD DRIVE SCRAM FUNCTION AND NON-ESSENTIAL CONTROL AIR AT CERTAIN GE BWR FACILITIES

IE Notice 80-31 August 25, 1980

MALOPERATION OF GOULD-BROWN BOVERI 480 VOLT-TYPE K600S AND K-DON 600S CIRCUIT BREAKERS

IE Notice No. 80-39 October 31, 1980

MALFUNCTION OF SOLENOID VALVES MANUFACTURED BY VALCOR ENGINEERING CORPORATION

IE Notice No. 80-34 December 5, 1980

FAILURE OF THE CONTINUOUS WATER LEVEL MONITOR FOR THE SCRAM DISCHARGE VOLUME AT DRESDEN UNIT NO.2

IE Notice No. 80-45 December 17, 1980

POTENTIAL FAILURE OF BWR BACKUP MANUAL SCRAM CAPABILITY

IE Notice No. 81-01 January 16, 1981

POSSIBLE FAILURES OF GENERAL ELECTRIC TYPE HFA RELAYS

IE Notice No. 81-06 March 11, 1981

FAILURE OF ITE MODEL K-600 CIRCUIT BREAKER

IE Notice No. 81-11 March 30, 1981

ALTERNATE ROD INSERTION FOR BWR SCRAM REPRESENTS A POTENTIAL PATH FOR LOSS OF PRIMARY COOLANT

IE Notice 81-16 April 23, 1981

CONTROL ROD DRIVE SYSTEM MALFUNCTIONS

IE Notice 81-25 August 24, 1981

OPEN EQUALIZING VALVE OF DIFFERENTIAL PRESSURE TRANSMITTER CAUSES REACTOR SCRAM AND LOSS OF REDUNDANT SAFETY SIGNALS

421.8 (7.1) FSAR Table 1.11-1 references section 7.1 for details of the Limerick design in relation to control room position indication of manual (handwheel) valves in the ECCS. Discuss the provisions of your design to determine proper positioning of manual valves.

421.9 (7.1) thru (7.7) Provide an overview of the plant electrical distribution system, with emphasis on vital buses and divisional separation, as background for addressing chapter 7 concerns. Use one-line diagrams or other drawings as appropriate.

421.10 (7.7) The analyses reported in Chapter 15 of the FSAR are intended to demonstrate the adequacy of safety systems in mitigating anticipated operational occurrences and accidents.

Based on the conservative assumptions made in defining these "design bases" events and the detailed review of the analyses by the staff, it is likely that they adequately bound the consequences of single control system failures. To provide assurance that the design basis event analysis for Limerick adequately bounds other more fundamental credible failures, provide the following:

(1) Identify those control systems whose failure or malfunction could seriously impact plant safety.

(2) Indicate which, if any, of the control systems identified in (1) receive power from common power

sources. The power sources considered should include all power sources whose failure or malfunction could lead to failure or malfunction of more than one control system and should extend to the effects of cascading power losses due to the failure of higher level distribution panels and load centers.

(3) Indicate which, if any, of the control systems identified in (1) receive input signals from common sensors. The sensors considered should include common Taps, hydraulic headers and impulse lines feeding pressure, temperature, level or other signals to two or more control systems.

(4) Provide justification that any malfunctions of the control systems iden ified in (2) and (3) resulting from failures or malfunctions of the applicable common power source or sensor including hydraulic components are bounded by the analyses in Chapter 15 and would not require action or response beyond the capability of operators or safety systems.

421.11 (7.7) Section 7.7.1.1.3.1.5 of the FSAR indicates that the RPV pressure and water level instruments use the same instrument lines. Identify all other cases where instrument sensors or transmitters supplying information to more than one protection channel are located in a common instrument line or connected to a common instrument tap. Verify that a single failure in a common instrument line or tap (such as break or blockage) cannot defeat required protection system redundancy. Identify where instrument sensors or transmitters supplying information to both a protection channel and one or more control channels are located in a common instrument line or connected to a common instrument tap. Verify that a single failure in a common instrument line or tap cannot defeat required separation between control and protection.

421.12 (7.1) Figure 7.1-1 of the FSAR indicates that RPS sensors A & C or B & D must not be connected to a common process tap. Verify that this requirement has been implemented in your design using detailed drawings.

421.13 (7.3) Section 7.3.1.1.1.2.3 of the FSAR indicates that the pressure and level sensors used to initiate ADS are separated from those used to initiate other trip systems. Verify the adequacy of the separation using detailed drawings.

421.14 (7.3) Section 7.3 indicates the HPCI and ADS are redundant to each other. Identify all the instruments which provide initiating or permissive signals to the HPCI and ADS systems. Verify the adequacy of the separation using detailed drawings.

421.15 (7.7) Section 7.7.1.1.3 of the FSAR identifies design criteria for the Reactor Pressure Vessel instrument sensing lines to prevent trapping of air or noncondensable gas. Discuss the applicability of this criteria to safety-related instrument sensing lines.

421.16 Provide an evaluation of the effects of high temperatures on the
(7.1) reference legs of the water level measuring instruments resulting
(7.7) from exposure to high energy line breaks in your design.

421.17 Table 3.2-1 of the FSAR provides a "Q-List" of structures, systems
(7.1) and components whose safety functions require conformance to appli-
(7.6) cable quality assurance requirements of 10 CFR Part 50, Appendix B. Verify that all safety-related (I&C) instrumentation and controls described in Section 7.1 thru. 7.6 and other safety-related I&C equipment used in safety-related systems are subject to your Appendix B QA program. In addition, indicate conformance to this requirement by annotation of Table 3.2.1.

421.18 Section 7.4.1.1 and Section 7.4.1.2.1.2 of the FSAR provides de-
(7.4) tails on the design criteria and classification of the RCIC and Standby Liquid Control System (SLCS). It is not clear if the RCIC is classified as safety-related. However, the SLCS is considered as not being required to meet the safety design basis requirements of the plant safety systems.

Recent BWR application (e.g., Shoreham and Perry) have indicated that all portions of the SLCS required for the injection of fluid including the switch used to initiate the system are safety-related and the heaters, indicator lights and alarms are not safety related.

It is further indicated that all the equipment required for the RCIC system to perform its safety function of injecting water is safety-related. Even though the RCIC is not part of the ECCS network, the staff has considered it a safety-related system similar to that of the auxiliary feedwater system in a PWR.

Considering the information provided above, discuss in detail the design criteria and classification of the RCIC and SLC systems in your design.

421.19 (7.7) Section 7.7 of the FSAR indicates that the Rod Sequence Control System (RSCS) is utilized to restrict rod worths for the design basis rod drop accident and the Rod Block Monitor (RBM) is utilized to prevent erroneous withdrawal of control rods to prevent local fuel damage. Discuss the rationale and basis for not including these systems or portions of these systems as safety-related. Also discuss their interfaces with safety-related portions of your design (e.g., APRM, refueling interlocks, etc.).

421.20 (7.1) Identify any "first-of-a-kind" instruments used in or providing inputs to safety-related systems. Also include any microprocessors, multiplexers or computer systems which are used in or interface with safety-related systems.

421.21 (7.1) (7.7) Section 7.1.2.5.19 of the FSAR provides information in relation to your design's conformance with the guidance provided in R.G. 1.75. It is indicated that the Limerick design was significantly developed prior to issuance of R.G. 1.75. Discuss the details of the Limerick separation criteria for protection channel circuits, protection logic circuits and non-safety-related circuits based on the guidance provided in R. G. 1.75, using one lines, schematics or other drawings as appropriate.

421.22 (7.1) (7.2) Section 7.1.2.2.3.2 of the FSAR identifies the electrical separation criteria, requirements and the general rules which are applicable to the Reactor Protection System (RPS). 7.1.2.2.3.2.1(f) indicates that power supplies to systems that de-energize to operate (fail safe) require only separation that is deemed prudent to give reliability. Further, it is indicated that the RPS power supplies and load circuit breakers are not required to comply with the separation requirements for safety reasons even though the load circuits go to separated panels.

Discuss the details of the separation that is deemed prudent for the motor-generator sets and details of how the design conforms to the guidance given in RG 1.75 for the interface of the motor-generator sets with the Class 1E circuit breakers and their safety related loads. In addition, a postulated single undetected failure of an output voltage sensor for either motor-generator set could result in damage to the reactor protection system components and, consequently, potential loss to scram. This concern was identified during the review of the Hatch 2 and WNP-2 applications for an operating license. Provide details of your design which protect the RPS from these potential failure modes. Use electrical one-lines, schematics and other drawings necessary to address these concerns.

421.23 (7.2) Section 7.2.2.1.2.3.1.7 of the FSAR indicates that the reactor system mode switch is used for protective functions, restrictive interlocks and refueling equipment movement. Discuss how the mode switch is incorporated into the overall design such that the single failure criterion and separation requirements are satisfied. Use detailed drawings and schematics as appropriate.

421.24 (7.3) Section 7.3.1.1.6.1.1.2 of the FSAR indicates that the solenoid valves used for testing the Primary Containment Vacuum Relief System (PCVR) are powered from non-Class 1E power sources. Using appropriate drawings demonstrate that the separation criteria is maintained in this portion of your design.

421.25 (7.6) Section 7.6.2.6 of the FSAR describes the requirements for the Containment Instrument Gas System (CIGS)-ADS control. It is indicated that the CIGS-ADS provides a backup supply of instrument gas to the safety-related ADS valves in case the non-safety portion of the CIGS is unable to do so and may be required for long term operation. Discuss the operation, functional components, interfaces and design criteria using detailed drawings as appropriate. Include the following in your discussion:

a) Separation requirements and implementation at the safety/non-safety interfaces.

b) Basis for not meeting the single failure criterion.

c) Details of conformance to R.G. 1.89.

d) Details of conformance to R.G. 1.47.

421.26 (7.1) (7.7) Section 7.1.2.2.3.2.2(a) of the FSAR indicates that interconnections between redundant safety divisions are allowable through isolating devices. These isolating devices are used to maintain the independence between safety-related circuits and between safety-related and non-safety circuits. Provide the following information:

a. Identify the types of isolation devices used.

b. Provide the details of the testing performed and the results to ensure the isolation devices provide adequate protection against EMI, microphonics, short-circuit failures, voltage faults and surges.

c. Discuss the applicability of the tests performed in item (b) above for both NSSS and BOP portions of your design.

421.27 (7.1) (7.7) Section 7.1.2.2.3.2.2(d) of the FSAR states that the instrumentation and control equipment and components for the safety-related systems identified in Section 7.1.1.2 are not located in a steam leakage zone "insofar as is practicable" or are designed for "short-term exposure to the high temperature and humidity associated with a steam leak."

a) Identify the specific systems and the electrical equipment or components which are located in a steam zone and/or subjected to an abnormal temperature, pressure, humidity or other environmental stress.

b) Discuss the safety-related function of the equipment and components.

c) Confirm that the equipment and components are included in the environmental qualification program.

421.28 (7.2) Section 7.2.1.1.4.7 of the FSAR indicates that pilot solenoids for the scram valves "are not part of the RPS" and that the RPS interfaces with the pilot solenoids. Discuss the interface area using detailed schematics and drawings as appropriate. Include in the discussion the backup scram valves, their classification and their interaction or interface with the RPS.

421.29 (7.2) Section 7.2.2.1.1.1.9 indicates that the condensing chambers and all essential components of the control and electrical equipment are either similar to those that have been qualified by tests for other facilities or additional qualification tests have been conducted. The FSAR also indicates special precautions are taken to ensure the operability of the condensing chambers and the inboard MSIV position switches for a reactor coolant boundry pressure (RCPB) break, inside the drywell. Confirm that the condensing chambers and MSIV position switches are included in the environmental qualification program. Discuss the differences between the qualified control and electrical equipment which are similar to those used in your design and the additional tests that have been conducted. In addition, provide the details of the precautions taken to ensure the operability of condensing chambers and the MSIV position switches.

421.30 (7.7) Verify that there is sufficient redundancy in the water level instrumentation to prevent a sensing line failure (i.e., break, blockage or leak) concurrent with a random single electrical failure from defeating an automatic reactor protection or engineered safety feature actuation.

421.31 (7.3) Section 7.3.1.1.2.12 of the FSAR indicates that the Primary Containment and Reactor Vessel Isolation Control System (PCRVICS) is capable of operation during unfavorable ambient conditions anticipated during normal operation. Discuss the capability of the PCRVICS functioning during abnormal and accident conditions such as high energy line breaks.

421.32 (7.1) (7.3) Provide a detailed discussion on the methodology used to establish the trip setpoint and allowable value for each Reactor Protection System (RPS) and Engineered Safety Feature (ESF) channel. Include the following information:

a) The trip value assumed in the FSAR Chapter 15 analyses.

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

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, instrument rack drift) the basis for these values, and the methodology used to sum these errors.

d) The degree of conformance to the guidance provided in R.G. 1.105 Positions C.1 thru C.6.

421.33 (7.1) (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 by passed 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.

421.34 (7.4) Section 7.4.1.1.3.1 and 7.4.1.1.3.2 of the FSAR provide descriptions of automatic initiation during test and conditions resulting in system isolation for the Reactor Core Isolation Cooling (RCIC) System. Concerns in these areas have been identified in items 421.38 and 421.40 for the HPCI system. Address the concerns identified in the above referenced items for the RCIC system.

421.35 (7.6) Discuss the methodology and considerations used to determine the setpoint values associated with the various leak detection systems included in Section 7.6 of the FSAR. Discuss details of the manual bypass switch used during testing of the RCIC-LDS and its conformance to the guidance provided in R.G. 1.47 and the applicability of this response to other LDS in Section 7.6 of the FSAR.

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 insturments 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.

421.37 (7.2) Section 7.2.2.1.2.3.1.5 of the FSAR states that the turbine stop valve closure trip and the turbine control valve closure trip are not guaranteed to function during an SSE event. The NRC staff recognizes that full conformance to IEEE 279 and associated standards is not possible in those plants where the turbine building is not a seismic category I structure. The acceptability of these limitations is subject to the implementation of a system which is as reliable as reasonably achievable. To assure adequate reliability, verify that the design up to the trip solenoids conforms to those sections of IEEE 279 concerning single failure (Section 4.2), Quality (Section 4.3), Channel Integrity (Section 4.5 excluding seismic), Channel Independence (Section 4.6), and Testability (Section 4.10). Further:

a) Verify that the design includes a highly reliable power source which assures availability of the system.

b) Using detailed drawing, describe the routing and separation for this trip circuitry from the sensor in the turbine building to the final actuation in the reactor trip system RTS).

c) Discuss how the routing within the non-seismically qualified turbine building is such that the effects of credible faults or failures in this area on these circuits will not challenge the reactor trip system and thus degrade the RPS performance. This should include a discussion of isolation devices.

d) Section 7.2.2.1.2.3.1.19 of the FSAR indicates that the position indicator lights for the turbine stop valves are not part of the RPS. Provide details of the design interface areas using appropriate drawings and basis to assure conformance to IEEE 279-1971, Section 4.20.

e) Provide justification for the exception taken in Section 7.2.2.1.2.3.9 of the FSAR to IEEE 384-1974 and R.G. 1.75 for the turbine stop valve and control valve fast closure trips.

f) Identify any other sensors or circuits used to provide input signals to the protection system or perform a function required for safety which are located or routed through non-seismically qualified structures. This should include sensors or circuits providing input for reactor trip, emergency safeguards equipment such as safety-grade interlocks. Discuss the degree of conformance to IEEE 279 and associated standards.

421.38 (7.3) Section 7.3.1.1.1.1.2 of the FSAR indicates that the HPCI system will automatically initiate, if required, during testing with specific exceptions. Parts of the system that are bypassed or rendered inoperable are indicated in the control room at the system level: In your discussion of item 421.33 include details relating to the HPCI system. Specifically discuss the interlock which prevents HPCI injection into the reactor when test plugs are inserted during logic testing (Section 7.3.1.1.1.9).

421.39 (7.3) Figure 7.3-7 of the FSAR indicates that the HPCI system is designed in accordance to IEEE 279-1971 insofar as practical. Identify all exceptions to IEEE 279-1971 and provide justification for each exception.

421.40 (7.3) Sections 7.3.1.1.1.1.3 & 7.3.1.1.1.1.7 of the FSAR identify conditions which are monitored and trip the HPCI turbine stop valve and isolate the system if their set points are exceeded. The logic to actuate the trips varies from one-out-of-one to two-out-of-two coincidence. Discuss the details of the design, using appropriate drawings, including the following:

a) Identify which conditions are considered equipment (turbine) protective functions.

b) In addition to your discussion in response to item 421.5(f)II.K.3.15 concerns, discuss the precautions taken in your design to preclude spurious isolation of the HPCI system for theconditions identified in (a) above.

c) Discuss design of the interlocks for valve F011 with the suppression pool suction valves for the HPCI and RCIC during testing and automatic realignment on receipt of an initiating signal. Include the automatic re-alignment from the condensate storage tank to the suppression pool.

421.41 (7.3) Section 7.3.1.1.1.37 of the FSAR indicates that the containment Spray (CS) pump motors are provided with over-load and under voltage protection. Discuss the concerns identified in item 421.40 for equipment protective functions which may preclude the operation of a safety-related system when required for these items and any others (equipment or component protection) where automatic (safety signal) and/or manual operation is precluded unless permissive conditions are satisfied.

421.42 (7.3) Section 7.3.1.1.1.2.4 of the FSAR indicates that the ADS can be manually reset after initiation and its delay timers recycled. The operator can delay or prevent subsequent automatic opening of the ADS valves if such delay or prevention is prudent. Discuss details of the manual reset capability, using appropriate drawing, and include the following:

a) The conditions and information which the operator utilizes to exercise the manual over-ride of a subsquent automatic signal.

b) Address the concerns identified in item 421.7.

421.43 (7.3) Section 7.3.1.1.1.2.9 of the FSAR does not address testing of the ADS solenoid valves. Provide a discussion on method and frequency for integrated testing of these valves and circuits. Identify other engineered safety feature systems where either a portion of the actuation circuitry or the actuated device is not routinely tested with the actuation circuits, and discuss the method and frequency for integrated testing of the circuits and components.

421.44 (7.3) The Standard Review Plan, Section 7.3.2 requires that a failure mode and effects analysis (FMEA) be provided. The information provides a detailed analysis to demonstrate that the regulatory requirements have been met, however it is not clear if a FMEA addressing all credible failures has been performed. Verify that a FMEA has been performed and address the following:

a) The FMEA is applicable to all ESF equipment within NSSS and BOP scope of supply

b) The FMEA is applicable to all design changes and modifications to date.

c) Provisions which exist to assure that future design changes or modifications are included in the FMEA

421.45 Section 7.3.2.11 of the FSAR indicates that no <u>active</u> failure can
(7.1) impair the capability of the Emergency Service Water (ESW) system
(7.2) to perform its safety-related function. 10CFR-Part 50, Appendix
(7.3) A, indicates in (footnote 2) the definition of single failure
(7.4) that "single failures of passive components in electrical systems
(7.5) should be assumed in designing against single failures." Discuss the
(7.6) considerations given to passive failures in all safety-related instrumentation and control systems in your facility. Provide assurance that passive failures were included in the FMEA performed in response to the concerns identified in item 421.44.

421.46 Section 7.6.2.7.2.2.10 of the FSAR indicates that the Safeguard
(7.6) Piping Fill System (SPFS) instrumentation and controls are designed to tolerate a single failure. Address the concerns identified in 421.45.

421.47 Section 7.4.1.4 of the FSAR provides information on the Remote
(7.4) Shutdown System (RSS). Attachment 2 provides the Instrumentation and Control Systems Branch (ICSB) Guidance for Remote Shutdown Capability. The attachment provides guidance for meeting the requirements of GDC 19. Provide supplemental information to identify the extent your design of the RSS conforms to the guidance provided in Attachment 2. Include the following 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.

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

c) Location of transfer switches and the remote control stations.

d) Description of isolation, separation and transfer/override provisions. This should include the design basis for preventing electrical interaction between the control room and remote shutdown equipment.

e) Description of the administrative and procedural control features to both restrict and to assure access, when necessary, to the displays and controls located outside the control room.

f) Description of any communication systems required to coordinate operator actions, including redundancy and separation.

g) Means for ensuring that cold shutdown can be accomplished.

h) Description of control room annunciation of remote control or override status of devices under local control.

i) Discuss the proposed start up test program to demonstrate remote shutdown capability in accordance with the guidance provided in R.G. 1.68.2

j) 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.

ATTACHMENT 2

ICSB GUIDANCE FOR THE INTERPRETATION OF GENERAL DESIGN CRITERIA 19 CONCERNING REQUIREMENTS FOR REMOTE SHUTDOWN STATIONS

A. BACKGROUND

GDC 19 requires that equipment at appropriate locations outside the control room be provided to achieve a safe shutdown of the reactor. Recent reviews of remote shutdown station designs have demonstrated that some designs cannot accommodate a single failure in accordance with the guidance of SRP Section 7.4 (Interpretation of GDC-19). The following provides supplemental guidance for the implementation of the requirements of GDC-19 concerning remote shutdown stations. Requirements for remote shutdown capability following a fire are detailed in Appendix R to 10 CFR 50. It should be noted that although GDC 19 and Appendix R requiremer s are complementary, the potential exists that modifications to bring a design into conformance with GDC 19 will violate Appendix R criteria and vice versa. For example, remote manual control devices for a second division of instrumentation and controls added to satisfy single failure requirements would not be acceptable if the added devices were located in the same fire area as existing transfer switches in the redundant division. In addition, transfer switches added to isolate the remote shutdown equipment from the control room fire area would not be acceptable if they disable ESF actuation, unless this is done in accordance with item B6 below. The acceptability of remote shutdown station designs given a fire is determined by the Auxiliary Systems Branch (ASB) as outlined in Section 9.5.1 of the SRP.

B. ICSB GUIDANCE

To Meet GDC-19 (As Interpreted in SRP Section 7.4)

1) The design should provide redundant safety grade capability to achieve and maintain hot shutdown from a location or locations remote from the control room, assuming no fire damage to any required systems and equipment and assuming no accident has occurred. The remote shutdown station equipment should be capable of maintaining functional operability under all service conditions postulated to occur (including abnormal environments such as loss of ventilation), but need not be environmentally qualified for accident conditions unless environmental qualification is required for reasons other than remote shutdown. The remote shutdown station equipment, including indicators, should be seismically qualified.

2) Redundant instrumentation (indicators) should be provided to display to the operator(s) at the remote shutdown location(s) those parameters which are relied upon to achieve and verify that a safe shutdown condition has been attained.

3) Credit may be taken for manual actions (exclusive of continuous control) of systems from locations that are reasonably accessible from the Remote Shutdown Stations. Credit may not be taken for manual actions involving jumpering, rewiring, or disconnecting circuits.

4) The design should provide redundant safety grade capability for attaining subsequent cold shutdown through the use of suitable procedures.

5) Loss of offsite power should not negate shutdown capability from the remote shutdown stations. The design and procedures should be such that following activation of control from the remote shutdown location, a loss of offsite power will not result in subsequent overloading of essential buses or the diesel generator. Manual restoration of power to shutdown loads is acceptable provided that sufficient information is available such that it can be performed in a safe manner.

6) The design should be such that if manual transfer of control to the remote location(s) disables any automatic actuation of ESF equipment, this equipment can be manually placed in service from the remote shutdown station(s). Transfer to the remote location(s) should not change the operating status of equipment.

7) Where either access to the remote shutdown station(s) or the operation of equipment at the station(s) is dependent upon the use of keys (e.g., key lock switches), access to these keys shall be administratively controlled and shall not be precluded by the event necessitating evacuation of the control room.

8) The design should comply with the requirements of Appendix R to 10 CFR 50.

421.48 (7.3) From a review of the FSAR it appears that the logic for manual initiation for several engineered safety feature systems is interlocked with permissive logic from various sensors. In some cases it appears that the permissive logic is dependent upon the same sensors as those used for automatic initiation of the system. The staff's position is that the capability to manually initiate each safety system should be independent of permissive logic, sensors, and circuitry used for automatic initiation of that system. (See Section 4.17 of IEEE-279). Identify each Safety System which is interlocked as described above and provide proposed modifications or justification for the existing design.

421.49 (7.6) Section 7.6.1.1.2.4 of the FSAR indicates that if one channel in both A and B trip logic is downscale in the Reactor Enclosure Ventilation Exhaust Radiation Monitoring System (REVE-RMS), system isolation is not possible. It is further indicated that a downscale trip is present during calibration and whenever instrument trouble occurs. Any one downscale trip sounds an alarm in the control room. Discuss the design details implemented to preclude downscale trips in one channel in each logic from occurring simultaneously and required actions and procedures taken if a channel in one or both logics is downscale. Indicate if the details provided in this discussion are applicable to other RMS identified in Section 7.6 of the FSAR. Identify the location of the detectors which provide the inputs for the RMS included in Section 7.6 of the FSAR.

421.50 (7.6) Section 7.6.1.2.3.6 of the FSAR indicates that for the high pressure low pressure system interlocks (HPLPSI), separation is maintained by assigning signals for electrically-controlled valves to separate electrical divisions. Discuss how the overall separation of the HPLPSI complies with the guidance provided in R.G. 1.75 without compromising systems in different divisions. This can be discussed in conjunction with item 421.21. Discuss the degree of conformance to the guidelines provided in ICSB, BTP-3, for the HPLPSI as implemented in your design.

421.51 Section 7.6.1.2.3 of the FSAR indicates that at least two valves are in series in each line where a high-pressure low-pressure (HPLP) interface exists except for the RHR steam condensing mode line. Discuss the HPLP design for the steam condensing mode of the RHR and the degree of conformance to the guidelines provided in ICSB-BTP3 using detailed schematics and P&IDS.

421.52 (7.6) Section 7.6.1.2.5.3 of the FSAR indicates the HPLPSI setpoints for the RHR and CS systems are included in Tables 7.3-4 and 7.3.3 respectivly. These tables do not include the setpoint requirements for the RHR and CS system HPLPSI. Revise the FSAR tables accordingly.

421.53 (7.6) Section 7.6.2.5.1.4 of the FSAR discusses the Safety Relief Valve Position Indication (SRVPI) degree of conformance to R.G. 1.97, however, the information refers to R.G. 1.89 instead of R.G. 1.97. Revise the FSAR reference accordingly.

421.54 (7.7) Figure 7.7-14 of the FSAR which provides details of the RBM circuit is not included. It is indicated the information will be provided later. Discuss the status of your design of the RBM and projected availability of Figure 7.7-14.

421.55 (7.1) (7.2) (7.3) (7.4) (7.5) (7.6) (7.7) Section 1.12 of the FSAR indicates that the concern of Anticipated Transients without Scram (ATWS) has been resolved by isuance of NUREG-0460, Volume 4. However, no description of the instrumentation or controls are addressed in chapter 7 of the FSAR relating to the requirements for recirculation pump trip (RPT) for BWRs. Discuss your design and its conformance to NUREG-0460 for the ATWSRPT. Identify all non-safety related equipment utilized in the design.

421.56 Identify any safety systems that are shared by both units. Discuss design criteria for instrumentation.

421.57 Demonstrate that the Safety/Relief Valve (SRV) low-low set point
(7.1) function is adequate given a single failure which could cause an additional SRV to open during the time for which only one valve is permitted to be open (i.e., on second and subsequent valve pops).

421.58 Amend Section 7 of the FSAR to include a discussion of the process computer system.

421.59 The staff has recently issued Revision 2 to Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident." This revision reflects a number of major changes in post-accident instrumentation. Discuss compliance with this Regulatory Guide.

421.60 Identify non-safety related electrical equipment which is assumed to successfully operate to mitigate the consequences of anticipated operational occurrences and accidents shown in Chapter 15 of the FSAR. For each item identified above provide the corresponding anticipated operational occurrence(s) and accident(s) for which the equipment is expected to function.