Q040.76 Your response to Q040.13 says that all electrical penetrations for Units 1 are being procured from Conax Corporation while Units 2 penetrations are procured from Amphenol-Sams Div. of Bunker Ramo Corp. However, Tables 3.10-1 and 3.11-1 list Amphoenol-Sams penetrations only. Resolve this inconsistency. Also provide the final values of maximum short circuit currents available through the containment penetrations for both the Conax (Units 1) and the Amphenol (Units 2) pentration assemblies. It is our position that revision 1 of RG 1.63 (May 1977) is applicable to the B/B design. Verify that your design is in accordance with this Regulatory Guide. Describe the provision for periodic testing of overload protective devices used for the protection of penetrations.

Q040.77 The FSAR Tables that identify the operational requirements of equipment which must function during and subsequent to the design basis accidents are general and do not provide sufficient information for the review of equipment qualification. Therefore, provide a table listing of all Class IE safety-related equipment and appropriate qualification related data for each as noted in the attached sample table. This table should include all equipment located both inside and outside of containment, including balance-of-plant and nuclear steam system supplied equipment.

Where components have been qualified by an equipment system test, identification of the equipment is sufficient, i.e., individual components need not be listed. Equipment components should be identified where qualified by separate tests or analysis. Where more than one item of a given type is used, it is only necessary to present the required information for one representative item of that type for the worst case environment.

For equipment located outside containment which may not have been qualified to abnormal environmental conditions, the environmental design requirements for this equipment should be provided and noted as such in column 5. For each area of the plant where such equipment is located the normal operating extremes in environmental conditions should be provided and noted as such in column 4. A footnote should be provided for each such area to provide the basis that the normal operating extremes in environmental conditions will not be exceeded. Such basis should include the quality of environmental control systems, their redundancy, sources of power and cooling, and operating requirements to maintain suitable environmental conditions during all modes of plant operation. The monitoring of environmental conditions in such areas and of the equipment controlling such environments should also be addressed to provide assurance that such conditions are maintained.

EXAMPLE TABLE
ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

1	2	3	4	5	6	7	8	9	10
Type of quipment/ ocation (8)	Manufacturer	Model No. or Identification No. (9)	Abnormal or Accident Environment (1)	Environment to Which Qualified (2)	Operability Requirements (3)	Operability Demonstrated (4)	Accuracy Requirements (3)	Accuracy Demonstrated (6)	Qualification Report and Method (7)

1) Temperature and pressure as a function of time, time interval for containment sprays, and total integrated radiation dose for equipment location. Include submergence if applicable. Reference may be made to figures in FSAR or other docketed material for pressure and temperature envelope. Other information should be listed in this table.

2) Temperature and pressure, as a function of time, time interval containment sprays simulated, and total integrated raidation dose for which equipment was qualified. If the same piece of equipment was not subjected to all environmental conditions, describe separate effects testing and justify. Include submergence test if applicable. Reference may be made to figures for qualification envelopes or actual test conditions for pressure and temperature conditions noted in qualification reports submitted for staff review. Other information should be listed in this table.

3) Time that equipment is required to operate during and subsequent to a design basis event consistent with plant safety analysis. Distinguish between trip functions and post accident monitoring for sensors and transmitters if accuracy requirements differ for these functions.

4) Time that equipment operability was demonstrated by qualification method. Distinguish between trip functions and post accident monitoring for sensors and transmitters if accuracy requirements differ for these functions.

5) Provide the accuracy requirements for sensors and transmitters for trip functions and post accident monitoring as used in plant safety analysis. Note applicability of each if they differ.

6) Accuracy for sensors and transmitters should distinguish between trip functions and post accident monitoring if requirements differ for these functions.

7) Method should indicate test, analysis or combination as applicable. If qualification considered aging include in this column the qualified life and accelerated aging time and temperature conditions used.

8) For ICE condenser containments, specify upper or lower compartment.

9) Model or identification number should be adequate to define specific equipment identity (do not provide plant specific tag item number).

It is our intent to review the data submitted, determine the degree to which your equipment qualification program complies with NUREG-0588, "Interim Staff Position for Environmental Qualification of Safety-Related Electrical Equipment," and establish the bases to justify differences between this position and your qualification programs. Therefore, you are requested to independently conduct a similar review and report your conclusions as to the adequacy of your equipment qualification program for each item required to be qualified. Your review should identify the degree to which your qualification program complies with the staff's position described in NUREG-0588, and where there are deviations, provide your basis for concluding that your program demonstrates qualification for its service environment. Should you conclude that your qualification program does not adequately demonstrate that an item is qualified for its service conditions, your proposed action to resolve such concerns should be outlined.

The information requested above will serve as a basis for our audit of your qualification documentation.

Q040.78 (8.3) Please supply drawings 6/20E-1-4010 series and 6/20E-2-4010 series, "125 V dc Key Diagrams." With reference to the statement made in Section 8.3.1.1.2 (page 8.3-8) that "non-safety related loads are fed from 120 V distribution panels....", identify these loads including their magnitude.

Q040.79 (8.3) DC bus overvoltage alarms are not shown on drawing 6E-1-5002F. Verify that these alarms are provided and revise the drawing accordingly. In connection with Table 8.3-5, provide the design capacity rating of the 125V dc battery.

Q040.80 (8.3) Loads for lower cable spreading room vent fan are listed in the loading Table 8.3.1. Is there a vent fan for the upper cable spreading room, if so provide the loads for upper cable spreading room vent fan.

Q040.81 (8.3) Explain why the breakers 1411, 1412, 1413 and 1431 on 4160V ESF bus 141 are not interlocked with each other. This also applies to the similar breakers serving 4160V ESF buses 142, 241 and 242.

Q040.82 (8.3) On drawings 6E-0-4001 and 20E-0-4001 the breakers for non-ESF loads on ESF supplies are shown outside of the Class IE envelope. Correct the discrepancy.

Q040.83 (8.3) Your response to Q040.61 is not acceptable. We require that the system design include automatic emergency override of the test mode which would require disconnecting the D/G from the bus while it is on test at full load. emonstrate proper operation during D/G load shedding including a test of loss of the largest single load and of complete loss of lead per RG 1.108 position C.2.a(4).

Q040.84 (8.3) Item 19 of Table 3.2.1 lists 120V ac inverters 111, 112, 113, 114, and the corresponding four units for Unit 2. These inverters are shown on drawings 6E-1-4002E and F and the corresponding 20E drawings as independent, free standing pieces of equipment. Their locations are shown in drawing M-6. However, these inverters are not included in Table 3.11-1, and this table is the only source of information, at this point, on the vendor and model number of the equipment.

Add the above inverters to table 3.11-1. Supply an index of the part or equipment numbering system that is used on the drawings or indicate where in the SAR this may be found.

Q040.85 (8.3) The following discrepancies and corrections apply to Figure 8.3.2, "Block Diagram, Relay and Control Logic 4160V ESF Bus 141," which requires extensive revision.

a) Section 8.3.4 line 9 states "In all cases, power will be supplied to the 4160V ESF buses either normally through the units SAT or by automatic transfer to the D/G on loss of SAT." Logic on Figure 8.3.2 shows that D/G breaker can not be closed if the SAT breaker trips and locks out (device $\frac{486}{1412}$) due to a transformer (or associated equipment) fault. Revise Fig. 8.3.2 accordingly.

In the D/G breaker closing and tripping circuits, you show lockout relay contacts of $\frac{486}{1412}$ and $\frac{486}{1413}$, which is not correct. This interlock should utilize breaker auxiliary and cell contacts. The problem would arise, when one of the two breakers described earlier is "stuck closed." Under this condition the D/G breaker would be closed even when the feeder breaker is stuck closed without synchronizing. This would make the system unstable. Correct this undesirable design feature.

b) Response to Q040.06 states: following an automatic start engine generator set will trip only if the following occur:

Generator differential

Overspeed

Logic on Figure 8.3.2 shows that the above mentioned trips are bypassed during safety injection signal. This does not conform with branch technical position ICSB 17(PSB). Revise your logic diagram Figure 8.3.2 accordingly.

c) In Figure 8.3.2, O. C. relay is referred as device 486. Device No. for O. C. relay is 450/51 and not 486; please correct.

Q040.86 (8.3) You state in section 8.3.1 "One of the unit's two SAT's is capable of furnishing startup and limiting operating conditions." State whether each of the unit's SAT and its associated switchgear is capable of handling the loads under the following condition:

During combined unit operation, when one unit is in startup mode and the other unit is tripped with its automatically transferred loads connected to the SAT.

Q040.87 (8.1) You state in section 8.1.7 line 8 "In the event of a LOP, 4KV ESF bus U/V relays automatically trip the bus's offsite supply circuit breaker and nonsafety related 4 KV bus tie breaker."

You state in section 8.1.6 line 14 "Tie breaker between 4K .ESF and 4KV non-ESF bus may be manually closed in the event of loss of both UAT & SAT to feed loads required for D/G. Identify these load and justify why they are not powered from an ESF bus. State whether the above mentioned tie breaker is tripped automatically in this event.

Q040.88 (8.3.1) Recent experience with Nuclear Power Plant Class 1E electrical system equipment protective relay applications has established that relay trip setpoint.drifts with conventional type relays have resulted in premature trips of redundant safety related system pump motors when the safety system was required to be operative. While the basic need for proper protection for feeders/equipment against permanent faults is recognized, it is the staff's position that total non-availability of redundant safety systems due to spurious trips in protective relays is not acceptable.

Provide a description of your circuit protection criteria for safety systems/equipment to avoid incorrect initial setpoint selection and the above cited protective relay trip setpoint drift problems.

Q040.89 (3.2) (9.5.4) (9.5.5) (9.5.6) (9.5.7) (9.5.8) The FSAR text and Table 3.2-1 states that the components and piping systems for the diesel generator auxiliaries (fuel oil system, cooling water, lubrication, air starting, and intake and combustion system) that are mounted on the auxiliary skids are designed seismic Category I and are ASME Section III Class 3 quality. The engine mounted components and piping are designed and manufactured to DEMA standards, and are seismic Category I. This is not in accordance with the Regulatory Guide 1.26 position that the entire diesel generator auxiliary systems be designed to ASME Section III Class 3 or Quality Group C. Provide the industry standards that were used in the design, manufacture, and inspection of the engine mounted piping and components. Also show on the appropriate P&ID's where the Quality Group Classification changes from Quality Group C.

Q040.90 (3.10) Supplement the information contained in FSAR Sections 3.2 and 3.10 concerning the Electrical Power System Equipment as follows:

1. The information contained in Table 3.10D-2 does not provide the seismic design basis at each identified location where the electrical power system equipment is located. Accordingly, revise this table so as to include the seismic design basis at the various equipment locations.

2. Page 3.10-18 of the FSAR indicates that a summary of seismic test and/or analysis results is given in Table 3.10-3. The FSAR does not contain a Table 3.10-3, therefore clarify this inconsistency.

3. Confirm that the seismic qualification testing demonstrated the capability to change states or operate during a safe shutdown earthquake (SSE) for all electrical equipment identified in item 1 above that is required to so operate in performance of its design function. Also, provide the bases for the methods of simulating the net effect of the design basis seismic event which were used in the qualification tests.

4. Table 3.10-2 indicates that additional qualification test information concerning the Class 1E control and local panels and racks was to be provided in Amendment 26. Since this information was not provided in this Amendment revise Table 3.10-2 accordingly.

5. Verify that 'e items of auxiliary equipment (local control panels, lube oil system, etc.) which are required for the operation of the emergency diesel generators and other safety-related components have been seismically qualified.

Q040.91 (3.10, 3.11) Sections 3.10 and 3.11 in your FSAR indicate that in general the safety-related equipment and components have been qualified in accordance with IEEE Standards 344-1971, 323-1971 and 334-1971. These standards do not address the general subject of "aging the equipment".

In view of this, provide any additional information which may be used to support the conclusion that the present qualification program for the safety-related electrical equipment and components is adequate.

Q040.92 (8.3) Provide a detail discussion (or plan) of the level of training proposed for your operators, maintenance crew, quality assurance, and supervisory personnel responsible for the operation and maintenance of the emergency diesel generators. Identify the number and type of personnel that will be dedicated to the operations and maintenance of the emergency diesel generators and the number and type that will be assigned from your general plant operations and maintenance groups to assist when needed.

In your discussion identify the amount and kind of training that will be received by persons in each of the above categories and the type of ongoing training program planned to assure optimum availability of the emergency generators.

Also discuss the level of education and minimum experience requirements for the various categories of operations and maintenance personnel associated with the emergency diesel generators.

Q040.93
(8.3)
RSP

Periodic testing and test loading of an emergency diesel generator in a nuclear power plant is a necessary function to demonstrate the operability, capability and availability of the unit on demand. Periodic testing coupled with good preventive maintenance practices will assure optimum equipment readiness and availability on demand. This is the desired goal.

To achieve this optimum equipment readiness status the the following requirements should be met:

1. The equipment should be tested with a minimum loading of 25 percent of rated load. No load or light load operation will cause incomplete combustion of fuel resulting in the formation of gum and varnish deposits on the cylinder walls, intake and exhaust valves, pistons and piston rings, etc., and accumulation of unburned fuel in the turbocharger and exhaust system. The consequences of no load or light load operation are potential equipment failure due to the gum and varnish deposits and fire in the engine exhaust system.

2. Periodic surveillance testing should be performed in accordance with the applicable NRC guidelines (R.g. 1.108), and with the recommendations of the engine manufacturer. Conflicts between any such recommendations and the NRC guidelines, particularly with respect to test frequency, loading and duration, should be identified and justified.

3. Preventive maintenance should go beyond the normal routine adjustments, servicing and repair of components when a malfunction occurs. Preventive maintenance should encompass investigative testing of components which have a history of repeated malfunctioning and require constant attention and repair. In such cases consideration should be given to replacement of those components with other products which have a record of demonstrated reliability, rather than repetitive repair and maintenance of the existing components. Testing of the unit after adjustments or repairs have been made only confirms that the equipment is operable and does not necessarily mean that the root cause of the problem has been eliminated or alleviated.

4. Upon completion of repairs or maintenance and prior to an actual start, run, and load test a final equipment check should be made to assure that all electrical circuits are functional, i.e., fuses are in place, switches and circuit breakers are in their proper position, no loose wires, all test leads have been removed, and all valves are in the proper position to permit a manual start of the equipment. After the unit has been satisfactorily started and load tested, return the unit to ready automatic standby service and under the control of the control room operator.

Provide a discussion of how the above requirements have been implemented in the emergency diesel generator system design and how they will be considered when the plant is in commercial operation, i.e., by what means will the above requirements be enforced.

Q040.94 (8.3) RSP The availability on demand of an emergency diesel generator is dependent upon, among other things, the proper functioning of its controls and monitoring instrumentation. This equipment is generally panel mounted and in some instances the panels are mounted directly on the diesel generator skid. Major diesel engine damage has occurred at some operating plants from vibration induced wear on skid mounted control and monitoring instrumentation. This sensitive instrumentation is not made to withstand and function accurately for prolonged periods under continuous vibrational stresses normally encountered with internal combustion engines. Operation of senstive instrumentation under this environment rapidly deteriorates calibration, accuracy and control signal output.

Therefore, except for sensors and other equipment that must be directly mounted on the engine or associated piping, the controls and monitoring instrumentation should be installed on a free standing floor mounted panel separate from the engine skids, and located on a vibration free floor area or equipped with vibration mounts.

Confirm your compliance with the above requirement or provide justification for noncompliance.

Q040.95 (9.5.2) The information regarding the onsite communications system (Section 9.5.2) does not adequately cover the system capabilities during transients and accidents. Provide the following information:

(a) Identify all working stations on the plant site where it may be necessary for plant personnel to communicate with the control room or the emergency shutdown panel during and/or following transients and/or accidents (including fires) in order to mitigate the consequences of the event and to attain a safe cold plant shutdown.

(b) Indicate the maximum sound levels that could exist at each of the above identified working stations for all transients and accident conditions.

(c) Indicate the types of communication systems available at each of the above identified working stations.

(d) Indicate the maximum background noise level that could exist at each working station and yet reliably expect effective communication with the control room using:

1. the page party communications systems, and
2. any other additional communication system provided that working station.

(e) Describe the performance requirements and tests that the above onsite working stations communication systems will be required to pass in order to be assured that effective communication with the control room or emergency shutdown panel is possible under all conditions.

(f) Identify and describe the power source(s) provided for each of the communications systems.

(g) Discuss the protective measures taken to assure a functionally operable onsite communication system. The discussion should include the considerations given to component failures, loss of power, and the severing of a communication line or trunk as a result of an accident or fire.

Q040.96 (9.5.3) Identify the vital areas and hazardous areas where emergency lighting is needed for safe shutdown of the reactor and the evacuation of personnel in the event of an accident. Tabulate the lighting system provided in your design to accommodate those areas so identified. Include the degree of compliance to Standard Review Plan 9.5.1 regarding emergency lighting requirements in the event of a fire.

Q040.97 (9.5.4) Expand your discussion of request 040.21 to describe all instruments, controls, sensors and alarms provided for monitoring the diesel engine fuel oil storage and transfer system and describe their function. Discuss the testing necessary to maintain and assure a highly reliable instrumentation, controls, sensors and alarm system and where the alarms are annunciated. Identify the temperature, pressure and level sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe what operator actions are required during alarm conditions to prevent harmful effects to the diesel engine. Discuss the system interlocks provided. (SRP 9.5.4, Part III, item 1).

Q040.98 (9.5.4) The diesel generator structures are designed to seismic and tornado criteria and are isolated from one another by a reinforced concrete wall barrier. Describe the barrier (including openings) in more detail and its capability to withstand the effects of internally generated missiles resulting from a crankcase explosion, failure of one or all of the starting air receivers, or failure of any high or moderate energy line and initial flooding from the cooling system or any other plant system so that the assumed effects will not result in loss of an additional generator. (SRP 9.5.4, Part III, Item 2)

Q040.99 (9.5.4) Your response to request 040.16 is unacceptable. The outside fill connections and lines and the vent lines of the seven diesel oil storage supply tanks are safety related components, and as such are to be designed seismic Category I and tornado missile protected. Revise your system design accordingly.

Q040.100 (9.5.4) Discuss the means for detecting or preventing growth of algae in the diesel fuel storage tank. If it were d ected, describe the methods to be provided for cleaning the affected storage tank. (SRP 9.5.4, Part III, Item 4).

Q040.101 (9.5.4) Your response to request 040.15 is incomplete. Expand the FSAR to include a more explicit description of proposed protection of underground piping. Where corrosion protective coatings are being considered (piping and tanks) include the industry standards which will be used in their application. Also discuss what provisions will be made in the design of the fuel oil storage and transfer system in the use of a impressed current type cathodic protection system, in addition to water proof protective coatings, to minimize corrosion of buried piping or equipment. If cathodic protection is not being considered, provide your justification. (SRP 9.5.4, Part II, and Part III, item 4).

Q040.102 (9.5.4) (14.2) You state in Table 14.2-6 that a "demonstration of the ability of the system (D. G. fuel oil) to supply fuel for an adequate time to the operating engine will be accomplished." This statement is general and vague. Provide a discussion on the preoperational test that will be performed on the D. G. fuel oil system and the diesel generator to demonstrate reliability and availability.

Q040.103 In Section 9.5.4 you do not state that diesel fuel oil is available from local distribution sources. Identify the sources where diesel quality fuel oil will be available and the distances required to be travelled from the source(s) to the plant. Also discuss how fuel oil will be delivered on-site under extremely unfavorable environmental conditions such as flooding. (SRP 9.5.4, Part III, Item 5b).

Q040.104 (9.5.4) (9.5.5) (9.5.6) (9.5.7) (9.5.8) Your response to request 040.19 is incomplete. Provide a discussion on the measures that will be taken in the design of the diesel generator facility to protect the safety related systems, piping and components from the effects of high and moderate energy line failure to assure availability of the design generators when needed. In addition provide a discussion on the effects of a main steam or main feed line break in the steam tunnel or a break in the circulating water line and resulting flooding of the turbine building on the operation of the diesel generators and their auxiliary systems. (SRP 9.5.4, Part III, Item 8 SRP 9.5.5, Part III, item 4, SRP 9.5.6, Part III, item 5; SRP 9.5.7, Part III item 3; SRP 9.5.8, Part III, item 6c).

Q040.105 (9.5.4) **Section 9.5.4.1 emergency diesel engine fuel oil storage and transfer system (EDEFSS) does not specifically reference ANSI Standard N195 "Fuel Oil Systems for Standby Diesel Generators". Indicate if you intend to comply with this standard in your design of the EDEFSS; otherwise provide justification for non-compliance. (SRP 9.5.4, Rev. 1, Part II, item 12).**

Q040.106 (9.5.4) RSP You state in Section 9.5.4 of the FSAR that the 500 gallon "day tank storage will provide for 72 minutes running time for each engine when loaded to its nameplate rating". The seven day storage tanks have a total capacity of 50,000 gallons per diesel with a technical specification limit of no less than 47,000 gallons in the tanks. It appears that there is insufficient supply of diesel oil for 7 days of operation at rated load as required by SRP 9.5.4. Provide the results of an analysis to show that your present seven day diesel oil storage supply system will last seven days. (SRP 9.5.4, Rev. 1, Part II, item 10; Part III, item 5.b).

Q040.107 (9.5.4) Your response to request 040.17 is incomplete. You did not fully respond to the request for procedure for testing newly delivered fuel, periodic sampling and testing of on-site fuel oil (including interval between tests), interval of time between periodic removal of condensate from fuel tanks and periodic system inspection. Provide the requested information. (SRP 9.5.4, Part III, items 3 and 4).

Q040.108 (9.5.4) Assume an unlikely event has occurred requiring operation of a diesel generator for a prolonged period that would require replenishment of fuel oil without interrupting operation of the diesel generator. What provision has been made in the design of the fuel oil storage fill system to minimize the creation of turbulence of the sediment in the bottom of the storage tank. Stirring of this sediment during addition of new fuel has the potential of causing the overall quality of the fuel to become unacceptable and could potentially lead to the degradation or failure of the diesel generator.

Q040.109 (9.5.4) (9.5.5) (9.5.6) (9.5.7) (9.5.8) Your failure modes and effects analysis for the diesel generators fuel oil system and the other diesel generator auxiliary systems is incomplete or non-existent. Expand and/or provide a failure mode and effects analysis for these systems. Inc ude in the analysis failures of pumps, tanks, instrumentation and controls. Show that a failure of the piping between subsystems (engine cooling water jacket, lube oil cooler, and engine air intercooler) does not cause total degradation of the diesel generator systems.

Q040.110 (9.5.4) Provide the source of power for the motor driven fuel oil transfer pump and diesel engine motor driven fuel oil pump and the motor characteristics, i.e., motor hp., operating voltage, phase(s) and frequency. Also include pump capacity and discharge head. Revise the FSAR accordingly.

Q040.111 (9.5.5) Section 9.5.2 indicates that the function of the diesel generator cooling water system is to dissipate the heat transferred through the: 1) engine water jacket, 2) lube oil cooler; 3) engine air water coolers, and 4) governor lube oil cooler. Provide information on the individual component heat removal rates (but/hr), flow (lbs/hr) and temperature differential (°F) and the total heat removal rate required. Also provide the design margin (excess heat removal capacity) included in the design of major components and subsystems. (SRP 9.5.5, Part III, Item 1).

Q040.112 (9.5.5) **Indicate the measures to preclude long-term corrosion and organic fouling in the diesel engine cooling water system that would degrade system cooling performance, and the compatability of any corrosion inhibitors or antifreeze compounds used with the materials of the system. Indicate if the water chemistry is in conformance with the engine manufacturers recommendations. (SRP 9.5.5, Part III, Item 1c.)**

Q040.113 (9.5.5) Describe the instrumentation, controls, sensors and alarms provided for monitoring of the diesel engine cooling water system and describe their function. Discuss the testing necessary to maintain and assure a highly reliable instrumentation, controls, sensors, and alarm system, and where the alarms are annunciated. Identify the temperature, pressure, level, and flow (where applicable) sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe what operator actions are required during alarm conditions to prevent harmful effects to the diesel engine. Discuss the systems interlocks provided. (SRP 9.5.6, Part III, item 1c).

Q040.114 (9.5.5) Describe the provisions made in the design of the diesel engine cooling water system to assure that all components and piping are filled with water. (SRP 9.5.5, Part III, Item 2).

Q040.115 (9.5.5) The diesel generators are required to start automatically on loss of all offsite power and in the event of a LOCA. The diesel generator sets should be capable of operation at less than full load for extended periods without degradation of performance or reliability. Should a LOCA occur with availability of offsite power, discuss the design provisions and other parameters that have been considered in the selection of the diesel generators to enable them to run unloaded (on standby) for extended periods without degradation of engine performance or reliability. Expand your PSAR/FSAR to include and explicitly define the capability of your design with regard to this requirement. (SRP 9.5.5, Part III, Item 7).

Q040.116 (9.5.5) You state in section 9.5.5 each diesel engine cooling water system is provided with an expansion tank to provide for system expansion and for venting air from the system. In addition to the items mentioned, the expansion tank is to provide for minor system leaks at pump shafts seals, valve stems and other components, and to maintain required NPSH on the system circulating pump. Provide the size of the expansion tank and location. Demonstrate by analysis that the expansion tank size will be adequate to maintain required pump NPSH and make up water for seven days continuous operation of the diesel engine at full rated load without makeup, or provide a seismic Category I, safety class 3 make up water supply to the expansion tank.

Q040.117 (9.5.5) Provide the source of power for the diesel engine motor driven jacket water keep warm pump and electric jacket water heater. Provide the motor and electric heater characteristics, i.e., motor hp., operating voltage, phase(s), frequency and kw output as applicable. Also include the pump capacity and discharge head. Revise the FSAR accordingly.

Q040.118 (9.5.6) Provide the source of power for the diesel engine air starting system compressors and motor characteristics, i.e., motor hp, operating voltage, phase(s), and frequency. Revise your FSAR accordingly.

Q040.119 (9.5.6) Describe the instrumentation, controls, sensors and alarms provided for monitoring the diesel engine air starting system, and describe their function. Describe the testing necessary to maintain a highly reliable instrumentation, control, sensors and alarm system and where the alarms are annunciated. Identify the temperature, pressure and level sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe any operator actions required during alarm conditions to prevent harmful effects to the diesel engine. Discuss system interlocks provided. Revise your FSAR accordingly. (SRP 9.5.6, Part III, item 1).

Q040.120 (9.5.6) Expand your description of the diesel engine starting system. The FSAR text should provide a detail system description of what is shown on Figure 9.5.3. The FSAR text should also describe: 1) components and their function, 2) instrumentation, controls, sensors and alarms, and 3) a diesel engine starting sequence. In describing the diesel engine starting sequence include the number of air start valves used and whether one or both air start systems are used.

Q040.121 (9.5.6) RSP Figure 9.5-3 in the FSAR shows that the piping between the third valve downstream of the compressor and valve just upstream of the air receiver as non-seismic. This includes the refrigerated air dryer, the precooler and the connecting piping. In the event of a seismic event this portion of piping is lost. Since there is no check valve or other type of quick acting isolation valve in this line, the air in the air receivers will be lost, and this will result in the inability to start any of the diesel generators. This is an unacceptable situation. Revise your design to eliminate this common mode failure.

Q040.122 (9.5.7) For the diesel engine lubrication system in Section 9.5.7 provide the following information: 1) define the temperature differentials, flow rate, and heat removal rate of the interface cooling system external to the engine and verify that these are in accordance with recommendations of the engine manufacturer; 2) discuss the measures that will be taken to maintain the required quality of the oil, including the inspection and replacement when oil quality is degraded; and 3) describe the capability for detection and control of system leakage. (SRP 9.5.7, Part II, Items 8a, 8b, 8c, Part III, Item 1).

Q040.123 (9.5.7) What measures have been taken to prevent entry of deliterious materials into the engine lubrication oil system due to operator error during recharging of lubricating oil or normal operation. (SRP 9.5.7, Part III, Item 1c).

Q040.124 (9.5.7) Expand your response to request 040.26 to include a description of the instrumentation, controls sensors and alarms provided for monitoring the diesel engine lubrication oil system and describe their function. Describe the testing necessary to maintain a highly reliable instrumentation, control, sensors and alarm system and where the alarms are annuniciated. Identify the temperature, pressure and level sensors which alert the operator when these parameters exceed the ranges recommended by the engine manufacturer and describe any operator action required during alarm conditions to prevent harmful effects to the diesel engine. Discuss systems interlocks provided. Revise your FSAR accordingly. (SRP 9.5.7, Part III, item 1e).

040.125 (9.5.7) Expand your description of the diesel engine lube oil system. The FSAR text should include a detail system description of what is shown on Figure 9.5.4. The FSAR text should also describe; 1) components and their function, 2) instrumentation, controls, sensors and alarms, and their set points, and 3) a diesel generator starting sequence for a normal start and a emergency start. Revise your FSAR accordingly.

Q040.126 (9.5.7) Provide the source of power for the diesel engine prelube oil pump, lube oil drain tank transfer pump, and motor characteristics, i.e., motor hp, operating voltage, phase(s) and frequency. Also provide the pump capacity and discharge head. Revise your FSAR accordingly.

Q040.127 (9.5.7) RSP Several fires have occurred at some operating plants in the area of the diesel engine exhaust manifold and inside the turbocharger housing which have resulted in equipment unavailability. The fires were started from lube oil leaking and accumulating on the engine exhaust manifold and accumulating and igniting inside the turbocharger housing. Accumulation of lube oil in these areas, on some engines, is apparently caused from an excessively long prelube period, generally longer than five minutes, prior to manual starting of a diesel generator. This condition does not occur on an emergency start since the prelube period is minimal.

When manually starting the diesel generators for any reason, to minimize the potential fire hazard and to improve equipment availability, the prelube period should be limited to a maximum of three to five minutes unless otherwise recommended by the diesel engine manufacturer. Confirm your compliance with this requirement or provide your justification for requiring a longer prelube time interval prior to manual starting of the diesel generators. Provide the prelube time interval your diesel engine will be exposed to prior to manual start.

040.128
(9.5.7)
RSP

An emergency diesel generator unit in a nuclear power plant is normally in the ready standby mode unless there is a loss of offsite power, an accident, or the diesel generator is under test. Long periods on standby have a tendency to drain or nearly empty the engine lube oil piping system. On an emergency start of the engine as much as 5 to 14 or more seconds may elapse from the start of cranking until full lube oil pressure is attained even though full engine speed is generally reached in about five seconds. With an essentially dry engine, the momentary lack of lubrication at the various moving parts may damage bearing surfaces producing incipient or actual component failure with resultant equipment unavailability.

The emergency condition of readiness requires this equipment to attain full rated speed and enable automatic sequencing of electric load within ten seconds. For this reason, and to improve upon the availability of this equipment on demend, it is necessary to establish as quickly as possible an oil film in the wearing parts of the diesel engine. Lubricating oil is normally delivered to the engine wearing parts by one or more engine driven pump(s). During the starting cycle the pump(s) accelerates slowly with the engine and may not supply the required quantity of lubricating oil where needed fast enough. To remedy this condition, as a minimum, an electrically driven lubricating oil pump, powered from a reliable DC power supply, should be installed in the lube oil system to operate in parallel with the engine driven main lube pump. The electric driven prelube pump should operate only during the engine cranking cycle or until satisfactory lube oil pressure is established in the engine main lube di:tribution header. The installation of this prelube pump should be cocrdinated with the respective engine manufacturer. Some diesel engines include a lube oil circulating pump as an intregal part of the lube o'l preheating system which is in use while the diesel engine is in the standby mode. In this case an additional prelube oil pump may not be needed.

Confirm your compliance with the above requirement or provide your justification for not installing an electric prelube oil pump.

Q040.129 (9.5.8) Describe the instrumentation, controls, sensors and alarms provided in the design of the diesel engine combustion air intake and exhaust system which alert the operator when parameters exceed ranges recommended by the engine manufacturer and describe any operator action required during alarm conditions to prevent harmful effects to the diesel engine. Discuss systems interlocks provided. Revise your FSAR accordingly. (SRP 9.5.8, Part III, item 1 & 4).

Q040.130 (9.5.8) Show by analysis that the distance of the SAT's from the D.G. Building Air Intake Structures is adequate to assure a clean air supply in case of a fire at the SAT's. Regulatory Guide 1.120 states that SAT's should be located a minimum distance of 50 feet from any safety related building, but this may not be sufficient for the diesel generator building air intakes, due to adverse environmental or meteorological conditions.

Q040.131
(9.5.8)
RSP

Your response to request 040.30 is unacceptable. A tornado missile could damage all the diesel engine exhaust piping so that the exhaust systems for all engines become restricted or blocked. This is an unacceptable situation. Provide tornado missile protection for the exposed sections of the diesel engine exhaust system.

Q040.132
(9.5.8)

Show by analysis that a potential fire in the diesel generator building together with a single failure of the fire protection system will not degrade the quality of the diesel combustion air so that the remaining diesel will be able to provide full rated power.

Q040.133
(9.5.8)

Experience at some operating plants has shown that diesel engines have failed to start due to accumulation of dust and other deliterious material on electrical equipment associated with starting of the diesel generators (e.g., auxiliary relay contacts, control switches - etc.). Describe the provisions that have been made in your diesel generator building design, electrical starting system, and combustion air and ventilation air intake design(s) to preclude this condition to assure availability of the diesel generator on demand.

Also describe under normal plant operation what procedure(s) will be used to minimize accumulation of dust in the diesel generator room, specifically address concrete dust control. In your response also consider the condition when Unit 1 is in operation and Unit 2 is under construction (abnormal generation of dust).

Q040.134 (9.5.8) Figures Q040.30-1, Q040.30-2 and Q040.30-3 show that the diesel engine combustion air intake openings start at as low as elevation 478'-9" and go the approximately elevation 500: Figure 1.2-1 shows that the safety valve room roof is at elevation 416'4", the safety valve penthouse roof is at elevation 496'-0" and the turbine building roof is at elevation 534'. A steam line break or the opening of one or more safety valves may release steam to the outside in the area of the safety valve room and/or penthouse. Since these rooms are located in close proximity to the diesel generator air intakes and below the intake openings, it appears that diesel generator operation could be degraded by steam entering the combustion intakes by flow path and/or confinement due to environmental or meteorological conditions. Show by analysis that the diesel engine combustion intake system and the diesel engine will not be affected by a discharge of steam from these structures.

Q040.135 (10.4.1) Your response to request 040.31 is incomplete. You did not provide the requested information for the NSSS supplied safety related instrumentation systems for the steam generator level and main steam line pressure. Provide this information.

Q040.136 (10.2) Expand your discussion of the turbine speed control and overspeed protection system. Provide additional explanation of the turbine and generator electrical load following capability for the turbine speed control system with the aid of system schematics (including turbine control and extraction steam valves to the heaters). Tabulate the individual speed control protection devices (normal emergency and backup), the design speed (or range of speed) at which each device begins operation to perform its protective function (in terms of percent of normal turbine operating speed). In order to evaluate the adequacy of the control and overspeed protection system provide schematics and include identifying numbers to valves and mechanisms (mechnical and electrical) on the schematics. Describe in detail, with references to the identifying numbers, the sequence of events in a turbine trip including response times, and show that the turbine stabilizes. Provide the results of a failure mode and effects analysis for the overspeed protection systems. Show that a single steam valve failure cannot disable the turbine overspeed trip from functioning. (SRP 10.2, Part III, Items 1, 2, 3 and 4).

040.137 (10.2) **The FSAR discusses the main steam stop and control, and reheat stop and intercept valves. Show that a single failure of any of the above valves cannot disable the turbine overspeed trip functions. (SRP 10.2, Part III, Item 3).**

Q040.138 (10.2) Provide the closure times for the quick acting extraction steam and motor operated stop valves installed in the extraction steam lines to the first, second, third and fourth point heaters. The fifth and sixth point heaters steam supply lines are not provided with shutoff and extraction steam valves. Show that stable turbine operation will result after a turbine trip. (SRP 10.2, Part III, Item 4).

Q040.139 (10.2) Provide a discussion of the inservice inspection program for throttle-stop, control, reheat stop and interceptor steam valves and the capability for testing essential components during turbine generator system operation. (SRP 10.2, Part III, items 5 and 6).

Q040.140 (10.2) In section 10.2.3.6 you discuss in-service inspection and exercising of the main steam turbine stop and control and reheater stop and intercept valves. You do not discuss the in-service inspection, testing and exercising of the extraction steam valves. Provide a detail description of: 1) the extraction steam valves, and 2) your inservice inspection and testing program for these valves. Also provide the time interval between periodic valve exercising to assure the extraction steam valves will close on turbine trip.

Q040.141 (10.2) Provide a complete list of turbine generator protective trips. Separate these trips into two categories, 1) those that will trip the turbine due to mechanical faults, and 2) those that will trip the turbine due to generator electric faults.

Q040.142 (10.2) Your response to request 040.32 is inadequate. The drawings are difficult to read and the description of the bulk hydrogen storage facility does not provide sufficient detail for proper evaluation. Therefore, provide a detailed description of the bulk hydrogen storage facility for each plant, including its location, distribution system and system specifications. Include in the description the protective measures considered in the design to prevent fires and explosions during operations such as filling and purging the generator as well as during normal operations. Also provide clearer, readable drawings.

Q040.143 (10.3) As explained in issue No. 1 of NUREG of 0138, credit is taken for all valves downstream of the Main Steam Isolation Valve (MSIV) to limit blowdown of a second steam generator in the event of a steam line break upstream of the MSIV. In order to confirm satisfactory performance following such a steam line break provide a tabulation and descriptive text (as appropriate) in the FSAR of all flow paths that branch off the main steam lines between the MSIV's and the turbine stop valves. For each flow path originating at the main steam lines, provide the following information:

a) System identification

b) Maximum steam flow in pounds per hour.

c) Type of shut-off valve(s)

d) Size of valve(s)

e) Quality of the valve(s).

f) Design code of the valve(s)

g) Closure time of the valve(s)

h) Actuation mechanism of the valve(s) (i.e., Solenoid operated, motor operated, air operated diagram valve, etc.)

i) Motive or power source for the valve actuating mechanism

In the event of the postulated accident, termination of steam flow from all systems identified above, except those that can be used for mitigation of the accident, is required to bring the reactor to a safe cold shut-down. For these systems describe what design features have been incorporated to assure closure of the steam shut-off valve(s). Describe what operator actions (if any) are required.

If the systems that can be used for mitigation of the accident are not available or decision is made to use other means to shut down the reactor describe how these systems are secured to assure positive steam shut-off. Describe what operator actions (if any) are required.

If any of the requested information is presently included in the FSAR text, provide only the references where the information may be found.

Q040.144 (10.4.1) Provide a tabulation in your FSAR showing the physical characteristics and performance requirements of the main condensers. In your tabulation include such items as; 1) the number of condenser tubes, material and total heat transfer surface, 2) overall dimensions of the condenser, 3) number of pauses, 4) hot well capacity, 5) special design features, 6) minimum heat transfer, 7) normal and maximum steam flows, 8) normal and maximum cooling water temperature, 9) normal and maximum exhaust steam temperature with no turbine by-pass flow and with maximum turbine by-pass flow, 10) limiting oxygen content in the condensate in cc per liter, and 11) other pertinent data. (SRP 10.4.1, Part III, item 1).

Q040.145 (10.4.1) Discuss the effect of main condenser degradation (leakage, vacuum, loss) on reactor operation. (SRP 10.4.1, Part III, Item 1).

Q040.146 (10.4.1) Discuss the measures taken to prevent loss of vacuum. (SRP 10.4.1, Part III, item 1).

Q040.147 (10.4.7) Discuss the possible mechanisms for hydrogen production in the exhaust steam side of the condenser and provide expected production rate of hydrogen in SCFM. Discuss how you prevent hydrogen buildup in the main condenser for each plant. (SRP 10.4.1, Part III, item 1).

Q040.148 (10.4.1) Indicate and describe the means of detecting and controlling radioactive leakage into and out of the condenser and the means for processing excessive amounts. (SRP 10.4.1, Part III, item 2).

Q040.149 (10.4.1) Discuss the measures taken for detecting, controlling and correcting condenser cooling water leakage into the condensate stream. (SRP 10.4.1, Part III, item 2).

Q040.150 (10.4.1) Provide the permissible cooling water inleakage and time of operation with inleakage to assure that condensate/feedwater quality can be maintained within safe limits. (SRP 10.4.1, Part III, item 2).

Q040.151 (10.4.1) In section 10.4.1 you have not discussed tests and initial field inspection nor the frequency and extent of inservice inspection of the main condenser. Provide this information in the FSAR. (SRP 10.4.1, Part II).

Q040.152 (10.4.1) Indicate what design provisions have been made to preclude failures of condenser tubes or components from turbine by-pass blowdown or other high temperature drains into the condenser shell. (SRP 10.4.1, Part III, item 3).

Q040.153 (10.4.1) Discuss the effect of loss of main condenser vacuum on the operation of the main steam isolation valves (SRP 10.4.1, Part III, item 3).

Q040.154 (10.4.1) In section 10.4.1 paragraph 2 you discuss flooding due to a circulating water line break. You state that the main steam and feedwater valve rooms could be affected depending on the rate and duration of leakage but that the auxiliary feedwater tunnels are protected by water tight hatches. Provide the following information:

a. Rates, duration and elevation of flooding for the circulating water line break, assuming no action is taken.

b. The time intervals in which the steam and feedwater valve rooms, the auxiliary feedwater tunnel, the diesel generator fuel oil storage tank rooms and any other below grade safety equipment are affected or fall below the flood level.

c. An analysis to show that the water tight hatches leading from the turbine building and/or steam and feedwater tunnels to the auxiliary building can withstand the static head of water resulting from the flooding.

d. Describe any instrumentation, controls, sensors alarms, and interlocks in the circulating water system or turbine building which indicates a circulating water line break or turbine building flooding.

e. Describe the actions that will be taken and when they will be taken to limit the amount of flooding. (SRP 10.4.1 Part III, Item 3a).

Q040.155 (10.4.4) Provide additional description (with the aid of drawings) of the turbine by-pass system (condenser dump valves and atmosphere dump valves) and associated instruments and controls. In your discussion include: 1) the size, principle of operation, construction and set points of the valves, 2) the malfunctions and/or modes of failure considered in the design of the system, and 3) the maximum electric load step change the reactor is designed to accomodate without reactor control rod motion or steam bypassing. (SRP 10.4.4, Part III items 1 and 2).

Q040.156 (10.4.4) Provide the maximum electric load step change that the condenser dump system and atmospheric dump system will permit without reactor trip.

Q040.157 (10.4.4) Provide a P & ID for the turbine by-pass system showing system components and all instrumentation. (SRP 10.4.4, Part III, Item 1)

Q040.158 (10.4.4) In Section 10.4.4 you have not discussed tests and initial field inspection nor the frequency and extent of inservice testing and inspection of the turbine by-pass system. Provide this information in the FSAR. (SRP 10.4.4, Part II).

Q040.159 (10.4.4) Provide the results of an analysis indicating that failure of the turbine by-pass system high energy line will not have an adverse effect or preclude operation of the turbine speed control system or any safety related components or systems located close to the turbine by-pass system. (SRP 10.4.4, Part III, item 4).

Q040.160 (10.4.4) Provide the results of a failure mode and effects analysis to determine the effect of malfunction of the turbine by-pass system on the operation of the reactor and main turbine generator unit. (SRP 10.4.4, Part III, item 4).

Q040.161 (10.4.4) You state in Section 10.4.4 of the FSAR that "there is a spray pipe above each turbine bypass pipe which cools the steam within the condenser exhaust necks during turbine bypass operation. A spray water control valve is automatically opened and closed each time that its corresponding turbine bypass is opened and closed." Provide the following:

a. The source of water used in the spray water lines, and a description of this system.

b. If this spray water is taken from other than the condenser, discuss the effects of thermal shock, and fatigue that the water will have on the bypass piping over the lifetime of the plant.

c. Provide a discussion on the effects of a failure of the spray valve to open or close when required on the turbine, condenser, and turbine bypass system.

212.0 REACTOR SYSTEMS BRANCH

212.87 (3.5.1.2) Section 3.5 of the FSAR discusses various potential missiles inside containment, with no discussion as to protection afforded against the missiles. Table 3.2-1 of the FSAR lists all safety Category I equipment located inside the containment "which may require protection" (FSAR Section 3.5.2). However, no discussion is made as to which of the systems listed in Table 3.2-1 are actually protected, nor the means of protection. Table Q212.1-2 lists five systems which are protected against missiles, but this list is not totally inclusive of all systems, structures, and components listed in Table 3.2-1.

Per SRP 3.5.1.2 (I.1)

a. Provide a discussion of the protection provided for each of the Safety Category I systems, structures and components listed in Table 3.2-1.

b. Discuss reasons for classifying the main feedwater system seismic I, in Table Q212.1-1 and not having any missile protection provided in Table Q212.1-2.

212.88 (3.5.1.2) Per SRP 3.5.1 (II-1), verify that the CRDM's are protected from missiles which originate from the horizontal direction.

212.89 (5.2.2) Per SRP 5.2.2 Branch Technical Position RSB 5-2, provide discussion of the low temperature overpressure protection system test program, to include at least:

a. a test to assure operability of the system electronics prior to each shutdown;

b. a test, at a minimum to be conducted as specified in the ASME Code Section XI; and

c. a test, subsequent to system, valve, or electronics maintenance, to be performed prior to declaring the system operational.

212.90 (5.2.5) Per SRP 5.2.5 (II.3), discuss reactor vessel sump level monitoring.

212.91 (5.2.5) Per SRP 5.2.5 (II.7), verify that the calibration of the containment airborne particulate radioactivity monitors account for such variables as isotope being monitored, plate out, and decay rate.

212.92 (5.2.5) Per SRP 5.2.5 (II.7), provide a discussion of the methods utilized in the calibration of flow and dewpoint measuring devices.

212.93 (5.2.5) Per SRP 5.2.5 (II.8), provide a discussion on the provisions made to permit calibration and operability tests of the entire leakage detection system during plant operation.

212.94 (5.2.5) Verify conformance with SRP 5.2.5 (III.1) with respect to reactor vessel flange leakage monitoring and leakage monitors for other vessel flanges.

212.95 (5.2.5) Per SRP 5.2.5 (III.7), discuss the back-up monitoring available if computerized monitoring fails.

212.96 (5.4.7) SRP 5.4.7 (III.8) requires essential components of the systems employed to remove residual heat be designated seismic Category I. FSAR Section 5.4.7.2.4 states "the entire RHR is designed as Seismic Category II." FSAR Table 3.2-1 lists the RHR components as Safety Category I; FSAR Section 3.2.1 states "those structures, systems, and components important to safety that must be designed to remain functional in the event of a safe shutdown earthquake ... are designated as Safety Category I." Verify compliance with SRP 5.4.7 (III.8) and discuss apparent discrepancies in the FSAR.

212.97 (5.4.7) SRP 5.4.7 requires compliance with Reg. Guide 1.68 with respect to initial test programs. Reg. Guide 1.68 Rev. 2 (1.d) lists components and systems which should be included in the initial test program for the RHRS. FSAR Table 14.2-17 is vague as to the tests to be performed on the RHRS, and does not include any methods of testing. Discuss the RHRS initial test program for the systems and components listed in Reg. Guide 1.68 Rev. 2 (1.d).

212.98 (5.4.7) RHR suction lines have the potential to normally have water trapped between the two isolation valves inside the containment during power operations. High temperature inside the containment after a LOCA could heat up this water. If this short section of pipe was filled, a pressure increase inside the short section of pipe could be high enough to interrupt valve and piping integrity. This could be of concern if the plant was planning to use this path to preclude boron precipitation during the long term. Discuss the method used to prevent this overpressurization from occurring.

212.99 (5.4.7) Recent plant experience has identified a potential problem regarding the loss of shutdown cooling during certain reactor coolant system maintenance evolutions. On a number of occasions when the reactor coolant system has been partially drained, improper reactor coolant system level control, a partial loss of reactor coolant inventory, or operating the RHR system at an inadequate NPSH has resulted in air binding of the RHR pumps with a subsequent loss of shutdown cooling. Regarding this potential problem, provide the following additional information:

(1) Discuss the design or procedural provisions incorporated to maintain adequate reactor coolant system inventory, level control, and NPSH during partial drain evolutions.

(5.4.7) (2) Discuss the provisions incorporated to ensure the rapid restoration of the RHR system to service in the event that the RHR pumps become air bound.

(3) Discuss the provisions incorporated to provide alternate methods of shutdown cooling in the event of loss of RHR cooling during shutdown maintenance evolutions. These provisions should consider maintenance evolutions during which more than one cooling system may be unavailable such as loss of steam generators when the reactor coolant system has been partially drained for steam generator inspection or maintenance.

212.100 (6.3) Update P&ID's to reflect deletion of Boron Injection Tanks.

212.101 (6.3) Per SRP 6.3 (II), supply reference or provide analysis for not considering "spurious movement of a motor operated valve due to the activation of its positioning device coincident with a LOCA" (FSAR Section 6.3.1) as credible.

212.102 (6.3) Per SRP 6.3 (II), verify that the ECCS is designed to perform its function for a simultaneous LOCA and seismic loading.

212.103 (6.3) Discuss non-compliance with Reg. Guide 1.46 paragraphs 1.d and 2.d as indicated in the FSAR, Table 1.46.

212.104 (6.3) Per SRP 6.3 (II), discuss the effects on the operation of the ECCS if any one of the steps to transfer from BWST to containment sump, listed in FSAR TAble 6.3-7, was omitted. Also, include a table to provide the time frame required for each action to preclude an undesired result, and the time allocated to the operator to perform the required step. Provide a basis for not automating these manual actions.

212.105 (6.3) Discuss long term maintenance of ECCS components with high levels of coolant radioactivity, as required by SRP 6.3 (III.7).

212.106 (6.3) List the information concerning the RHR and ECCS systems bypass/inoperability status which is displayed in the control room.

212.107 (6.3) For the ECCS flow diagram (FSAR Figure 6.3-2), a discussion should be included to show the total pumped ECCS flow rate distribution to the intact loops as well as the broken loop with the worst single failure in the ECCS.

212.108 (6.3) If sand filled bags or tanks are utilized as biological shielding inside containment, discuss the problem of a rupture of the bag/tank and the effects to the ECCS during a LOCA of the sand released to the containment. Describe the types of insulation inside containment and the potential for effecting ECCS performance.

212.109 (6.3) FSAR Figure 6.3-1 indicates that the minimum flow lines from the SI pumps branch into a single recirculation line to the RWST. There is a single motor operated valve (MO-ISI-8813-1) to secure the mini-flow line. Discuss the results if this valve fails in the closed position with the normal injection paths unavailable.

212.110 (6.3) Discuss procedures available and equipment to be activated to maintain core cooling for ECCS pipe breaks outside of containment (such as breaks or leaks in the RHR system when the plant is in a shutdown cooling mode). Included should be the following items for evaluating recovery from breaks outside the containment:

a. Identify systems outside of containment that are used for maintaining core cooling.

b. Discuss the maximum discharge rate from the systems.

c. Discuss what alarms are available to alert the operator to the event, recovery procedures available, and time available for operator action.

212.111 (3.6.2) Discuss why the Auxiliary Feedwater System is not included in Table 3.6-2 of the FSAR, "Systems which Contain High or Moderate Energy Fluid during Normal Operation."

212.112 (3.6.2) Include diagrams of postulated pipe breaks and restraint locations inside containment for the Auxiliary Feedwater System, Chemical and Volume Control System and steam generator blowdown.

212.113 (7.5) Verify that the accuracies of the safety related instruments of FSAR Section 7.5 were considered in accident analysis when manual operator actions were required.

212.114 (9.2.2) Provide a table which lists cooling requirements for safety related equipment, including the minimum operating times without cooling water, per SRP 9.2.2.

212.115 (7.4) Provide more detail as to which systems require modification to (7.4) shutdown the plant from outside the control room, as discussed in the note to FSAR Section 7.4.1.4.

212.116 (5.2.2) Recent operating experience has indicated that relief valve setpoints may be temperature sensitive. Discuss this effect on Byron/Braidwood relief valves.

212.117 (6.3) Recent operating experience has demonstrated that redundant vacuum breakers may be required on the RWST to preclude collapsing of the tank in the event that the breaker does not perform its function satisfactorily. Discuss this condition on the Byron/Braidwood design.

212.118 (15.0) Question 212.9 has not been answered adequately and remains applicable. For example, time to reach minimum DNBR has not been specified for excessive increase in Secondary Steam Flow Accidents, FSAR Section 15.1.3. Other accidents where additional detail or a sequence of events table is required are as follows:

(15.0) a. Startup of a reactor coolant pump at an incorrect temperature, FSAR Section 15.4.4.

b. Chemical and Volume Control System malfunction that results in a decrease in boron concentration in the reactor coolant.

212.119 (15.0) Certain automatic safety injection signals are blocked to preclude unwanted actuation of these systems during normal shutdown and startup operations. Describe the alarms available to alert the operator to a failure in the primary or secondary system during this phase of operation and the time frame available to mitigate the consequences of such an accident.

212.120 (15.0) Based on recent operating experience, provide an evaluation of the "Loss of Instrument Air" event, in particular as it relates to the potential for causing and compounding other more serious events.

212.121 (15.0) Are the charging pumps assumed to continue running during each of the transients and , if not, is this a conservative assumption. The concern is the increased potential for overpressurization due to the reactor coolant system being filled water solid.

212.122 (15.0) Confirm that during the preoperational or startup test phase you intend to verify the valve discharge rates and response time (such as opening and closing times for main feedwater, auxiliary feedwater, turbine and main steam isolation valves, and steam generator and pressurizer relief and safety valves) to show that they have been conservatively modeled in the Chapter 15.0 analyses.

212.123 (15.0) For all transients except those which result from a decrease in reactor coolant system flow rate, FSAR Section 15.3, provide a statement which identified four loop operation as the worst case initial condition, or discuss in detail less than four loop operation for each transient.

212.124 (15.0) Provide a discussion of long-term effects of each event in Chapter 15, particularly with regard to the need for operator action. For example, a complete assessment of the operator's role in preventing pressure-temperature limits from being exceeded after a steam line break should be presented.

212.125 (15.0) Per SRP's for each event, a discussion should be made to verify that a single operator error in combination with each incident of moderate frequency will not cause a loss of function of any barrier other than the fuel cladding.

212.126 (15.0) Identify the worst case single failure which could occur concurrent with each of the analyzed transients and verify that this has been considered in the analysis.

212.127 (15.0) A change in the Westinghouse fuel rod internal pressure design criteria is in the process of being approved. This change will permit the internal fuel rod pressure to exceed system pressure. For some Condition III and IV overpower events, this will result in an increase in the number of rods normally expected to fail as a result of these events. This is due to the probability of a

(15.0) rod simultaneously being in DNB and exceeding system pressure. Subsequent balloning and touching the adjacent rods follows, thereby causing more rods to go into DNB and fail. Therefore, for the Chapter 15 analyses of Condition III and IV events, confirm if this change in the fuel rod internal pressure design criteria has been factored into the number of rods predicted to fail.

212.128 (15.0) Reference the study from which the values in Table 15.2-2 of the FSAR, Natural Circulation Flow, are derived. Discuss the results of a single failure of a loop isolation valve on the values of natural circulation flow (i.e., discuss natural circulation with one loop isolated following operation at 100% power).

212.129 (15.0) Provide a failure modes and effects analysis (FMEA) for each accident analyzed in Chapter 15 or reference where the FMEA may be found to justify the statement that no single active failure will prevent operation of any system required to operate.

212.130 (15.0) FSAR Section 15.0.1.2, in discussing Category II events, states that "by definition, these faults do not propagate to cause a more serious fault, i.e., Condition III or IV events." Loss of non-emergency ac power is defined as a Condition II event. It is also listed in Section 15.3.2 as the initiator of the complete loss of forced reactor coolant flow transient which is classified as a Condition III event. This discrepancy should be explained or resolved.

212.131 (15.0) Assess the potential for and consequences of a LOCA during the time the accumulator injection tanks are isolated with power locked out to the valve operators (i.e., during shutdown and start-up).

212.132 (15.0) Verify that the assumptions of a low pressure heater bypassed and one string of feedwater featers isolated were used to determine the feedwater temperature reduction. FSAR Section 15.1.1.2 under "Results" discusses the heater bypass valve but not the isolation of feedwater heaters in the effect of reducing feedwater temperature, while the introduction to Section 15.1.1.2 states that both assumptions were taken into account.

212.133 (15.1.2) Discuss the effect of using "B-Train" components on the time sequences of events listed in FSAR Table 15-1 (i.e., the times for MSIV closing are listed in Part 10.3.3.1.1 as 15 sec. for Train B and 5 sec. for Train A).

212.134 (15.1.3) FSAR Section 15.1.4.1.A2 states that an inadvertent opening of a steam generator relief valve or safety valve will result in a safety injection actuation from high containment pressure. This statement does not appear to be applicable to the situation and should be deleted or additional supporting information should be supplied.

212.135 (15.1.4) Clarify the statement which states that for an accidental depressurization of main steam system the DNB design limits are exceeded (FSAR 15.1.4.4) and provide a curve for DNBR vs. time for an inadvertent opening of steam generator relief or safety valve.

212.136 (15.1.4) FSAR Figures 15.1.14 and 15.1.20 indicate that the pressurizer is emptied during the safety valve and steam line break transients. Discuss the potential effects of this condition, including the potential for and recovery from void formation in the RCS.

212.137 (15.1.4) FSAR Table 1.3-2, Design Comparison, indicates that the boron injection tank has been deleted; however, Section 15.1.4.2.C references injection of concentrated boric acid solution. Explain this apparent discrepancy and any effects on the associated analyses.

212.138 (15.1.5) Provide plot of DNBR versus time for the steam line break transient.

212.139 (15.0) FSAR Section 15.0.9 states that "the pressurizer heaters are not assumed to be energized during any of Chapter 15.0 events." Discuss this in relation to worst case analysis for each accident, or provide a reference which demonstrates that the heaters being deenergized is a worst case for each transient.

212.140 (15.1.2) Address the following discrepancies between the transient description and the sequence diagram shown in FSAR Figure 15.0-8.

a. The description states that main feedwater isolation and turbine trip occur during the transient. It would appear that this would limit the effects of the transient and thus should be shown on the sequence diagram.

b. The actions in (a) result in a need for auxiliary feedwater and secondary safety valves (assuming the non-safety grade dump valves and condenser are unavailable). These should be shown on the sequence diagram.

212.141 (15.1) SRP 15.1 requires that the maximum worth rod should be assumed to be held in the fully withdrawn position. In the FSAR, Chapter 15, several references are made to the assumption that one rod cluster remains withdrawn from the core (e.g., Section 15.1.4); however, the worth of this rod cluster is not specified. Additional information is required which will identify the stuck rod cluster as the one with the maximum worth.

212.142 (15.2.7) Provide a plot of DNBR versus time for the loss of feedwater transient.

212.143 (15.2.8) Discuss the time frame for operator emergency action following a main feed line rupture, as listed in FSAR Section 15.2.8.2.

212.144 (15.1) Provide an analysis for the loss of flow from two or more reactor coolant pumps or provide a justification, with bases, why this condition is not credible.

212.145 (15.3.3) (15.3.4) The Standard Review Plan, Section 15.3.3/4, classifies the RC pump rotor seizure and RC pump shaft break as infrequent transients. Provide a justification for your classification of the transients as limiting faults and verify that the transient results meet the acceptance criteria for an infrequent event as required by the SRP.

212.146 (15.3.3) FSAR Section 15.3.3.4 states that the core will remain in place and intact with no loss of core cooling capacity; however, Section 15.3.3.3 identifies that some fuel rods will suffer cladding damage. Discuss the extent of cladding damage which occurs, specifically with respect to the amount of flow obstruction resulting from the cladding damage. Does Figure 15.3-17, Core Flow vs. Time, include flow obstruction from potential cladding damage?

212.147 (15.5.2) Address the transient resulting from the inadvertent injection of borated water by the CVCS which results in filling the pressurizer water solid. Include the effects of pressurizer spray or other system which may tend to delay reactor trip.

212.148 (15.6.5) Discuss the transient resulting from a break of an ECCS injection line. In particular, describe the flow splitting which will occur in the event of a single failure and verify that the amount of flow actually reaching the core is consistent with the assumptions used in the analysis.

212.149 (15.4.4) Provide or reference the analysis used to obtain all times listed in FSAR Section 15.4.4 (e.g., time setting of 1-1/2 hr. ensures that isolated loop will be in equilibrium with the remainder of the RCS, Section 15.4.4.1: "it takes 84 minutes after the beginning of the dilution before the total S/D margin is lost" (Section 15.4.4.2).

212.150 (15.4.6) Provide or reference the analysis used to obtain the results in FSAR Section 15.4.6.2. A detailed discussion was presented on all dilution events with several specifics given as results (e.g., Table 15.4.1), but no reference is made as to how these results were obtained.

212.151 Recently, an operating PWR experienced a boron dilution incident due to the inadvertent injection from the NaOH tank into the reactor coolant system while the reactor was in the cold shutdown condition. This event occurred due to a single failure - misposition of the isolation valve of the NaOH tank while the decay heat removal system was lined up for reactor coolant recirculation. Discuss the potential for a boron dilution incident caused by dilution sources other than the CVCS.

212.152 (5.2.2) Provide a discussion of a direct current bus failure which would

(5.2.2) cause isolation of letdown (fail closed valves) and initiate an overpressure transient. On some recently reviewed plants, this failure would simultaneously disable a PORV. If the D.C bus failure was assumed to be the initating event the overpressure protection system would not meet the single failure criteria.

031.0 INSTRUMENTATION & CONTROL SYSTEMS BRANCH - SECTION A

031.1 The references to Chapter 7 have been found to differ from the Byron and Braidwood design, as described in the FSAR. Provide a list of all instances wherein the design differs from the descriptions in the references. In those cases where the design differences are not adequately described in the FSAR, provide a detailed design description.

Note that WCAP-8330, referenced in Chapter 15, is pertinent and should be included with the references to Chapter 7.

031.2 In a number of places in the FSAR, reference is made to drawings, such as electrical elementaries, electrical schematics, piping and instrumentation diagrams, and general arrangements. The FSAR states that drawings of these types are listed in Section 1.7.

Provide a list of all such drawings that are necessary to describe the design of the Byron and Braidwood stations, as required by RG 1.70, and amend Section 1.7 accordingly.

031.3 A number of systems and components are shared or otherwise used in common between the two units of each generating station. Provide a listing of such systems and components.

For each system or component, describe the placement of remote instrumentation and controls, and explain how the operators are assured of access and operability in a timely fashion.

For each system and component, list the associated power source used for the instrumentation and controls.

031.4 Instrument ranges are associated with a statement of accuracy in the form of an error throughout Chapter 7. The error is said to be used according to the example provided in Tables 15.0-4 and 15.0-5. What are the fiducial or confidence limits that define the associated errors?

If these limits differ in individual cases, provide a listing of the confidence limits associated with individual measurements that relate to safety setpoints leading to reactor trip and ESF activation.

031.5 Table 7.2-4 is described in subsection 7.2.2.2.1 as listing technical specifications on safety limits, allowable values and trip setpoints. Tech specs, values and setpoints are not listed in Table 7.2-4.

Provide these tech specs, values, and setpoints and amend Table 7.2-4 accordingly.

031.6 Section 7.4 describes hot standby as a stable plant condition, automatically reached following plant shutdown, which can be safely maintained for an extended period of time.

Provide a detailed description, as e.g., the corresponding plant operating procedures, of the necessary actions to maintain hot standby following control room evacuation. How long can the plant be kept at hot standby without violating technical specifications?

Supply the procedures describing the detailed actions necessary to place the plant in hot shutdown from the remote shutdown panels.

Go on to provide the procedures needed to attain cold shutdown from the remote shutdown panels. Confirm that proper procedural guidance for modification of controls and instrumentation will be prepared in advance, and upgraded as necessary.

031.7 Provide a list of the manual initiations required by IEEE 279 for the initiation of protective actions. Explain or describe how each of these manual initiations act at the system level, as opposed to the component level. Supplement the descriptions with drawings or diagrams, as needed.

031.8 Prepare a listing of logic, interlocks, and other circuitry relating Train A to Train B. Describe the methods used to assure separation and independence.

031.9 In certain cases, voltage is reduced on slave relays during periodic test, as stated in subsection 7.3.2.2.5, for example. Now certain classes of relays are known to experience large surge or pull-in currents.

Explain what steps have been taken to assure that slave relays will not be damaged or will not suffer a loss of reliability because of possible overcurrent under low voltage conditions.

031.10 Provide a description of the procedures used to obtain a power calibration of the nuclear instrumentation system. In particular, explain how the ited accuracy is obtained and the meaning of this accuracy (see question 4).

031.11 Survey Section 7.6 of the FSAR for completeness and provide descriptions of those sy as involving instrumentation and controls that are not listed. Where a sfactory description may appear in other then Chapter 7, provide a referen to the appropriate FSAR location.

031.12 For Class 1E and non-Class 1E buses supplying power to safety-related and non-safety-related instrumentation and control systems that could affect the ability to achieve a cold shutdown condition:

a. For each bus, identify the alarm or indication provided in the control room to alert the operator to the loss of power to the bus.

b. For each bus, identify the connected instrumentation and control system loads.

031.13 Subsection 7.4.2 states that "The results of the analysis . . . are presented in Table 7.1-1." These results cannot be found in Table 7.1-1. The subsection also refers to discussions not contained in Table 7.1-1.

Provide the results of the analyses and the discussions.

031.14 It is the staff's position that the information presented in FSAR Section 1.3 does not satisfy the staff's need to understand the similarity of Byron and Braidwood to other plants. The additional information in FSAR paragraph 7.1.1.4 does not alter this position. Therefore, please provide:

(1) A detailed cross reference to the specific subsections of the FSAR for the plant or plants that are similar to Byron and Braidwood.

(2) Identify each difference between the Byron and Braidwood design and cited similar designs that have been previously reviewed and approved by the staff.

031.15 Provide additional explanation of the description of FSAR paragraph 7.1.2.10 on Bypassed and Inoperable Status Indication. In particular, explain how the CRT graphic display and associated software will provide the expected degree of reliability. Justify the use of a CRT with the requirements of RG 1.47, emphasizing the intent of IEEE Standard 279 (4.13).

031.16 FSAR section 7.1.2.11 addresses conformance of the Westinghouse Protection System to IEEE Standard 379-1972. Provide the equivalent information for the Balance-of-Plant portions of the plant safety systems and the auxiliary systems required for support of the safety systems.

031.17 The staff requires that, for the reactor trip system and the engineered safety features actuation system, the bases, assumptions and results of the FMEA be available in the FSAR. Amend FSAR sections 7.2.2.1 and 7.3.2.1 to reflect this requirement.

031.18 The discussion of the consequences of instrument air failure in FSAR Section 7.3.2.3 is inadequate. Therefore:

(1) Identify all pneumatically operated valves and controls, which are required for or related to safety.

(2) Define the preferred operating position for each pneumatically operated valve and control.

(3) Identify and justify all pneumatically operated valves and controls that do not move to the safety function position upon loss of air.