UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

APR 30 1984

MEMORANDUM FOR: E. Adensam, Chief, Licensing Branch No. 2, Division of Licensing

FROM: Olan D. Parr, Chief, Auxiliary Systems Branch, Division of Systems Integration

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION - VOGTLE ELECTRIC GENERATING PLANT, UNITS 1 AND 2 - AUXILIARY SYSTEMS BRANCH

The enclosed request for additional information and branch technical positions covers those portions of the Vogtle FSAR, up to and including FSAR Amendment No. 5, for which the Auxiliary Systems Branch has primary responsibility. Attachment 1 to the enclosed request provides our guidance with respect to the fire protection associated circuits review.

The enclosure identifies areas for which we need additional information or have taken positions. The positions cover internal flooding, internally generated missiles, pipe breaks, spent fuel pool cooling, diesel generator building ventilation and water hammer.

Our review of the heavy loads handling systems and auxiliary feedwater system reliability are being performed by our consultants, EG&G Idaho and Brookhaven National Laboratory (BNL), respectively. Formal requests for additional information, if required by those labs, will be transmitted under separate cover. By letter dated February 24, 1984 we transmitted to T. M. Novak a draft technical evaluation report for heavy loads prepared by EG&G and a conference call has been held between the applicant, EG&G and ourselves to discuss the additional information required to complete the heavy loads review. The auxiliary feedwater reliability evaluation for Vogtle has not yet been completed by BNL and we do not know if additional information will be required.

J. S. Wermiel for
Olan D. Parr, Chief
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AUXILIARY SYSTEMS BRANCH
REQUEST FOR ADDITIONAL INFORMATION
VOGTLE ELECTRICAL GENERATING PLANT, UNITS 1 & 2
DOCKET NOS. 50-424/425

410.02 (SRP 3.4.1) Provide the results of an analysis to show that site flooding due to a natural draft cooling tower basin failure or a circulating water system failure in the plant yard will not cause flooding or damage to safety-related equipment. In your analysis consider the possible effects of erosion on underground safety-related piping and tunnels.

410.03 (SRP 3.4.1) In Section 3.4.1 you state that the nominal finished grade elevation is 219 feet, 6 inches. To allow us to evaluate the flooding effects from various sources also provide the minimum elevation of entrances to all safety-related structures including the ultimate heat sink pump house, and verify that the 219 feet, 6 inch grade elevation also applies to the pumphouse.

410.04(RSP) (SRP 3.4.1) In Section 3.4.1.1.2 you state that each area of the plant was reviewed to determine the failure of nonseismic Category I tanks, vessels and other process equipment that results in the most adverse flooding conditions. Provide a discussion of the larger indoor tanks that were considered in your analysis and show how it is determined that no safety-related equipment would be affected. It is our position that a single failure should also be considered coincident with the failure of these nonseismic Category I systems.

410.05(RSP) (SRP 3.5.1.1 and 3.5.1.2) It is our position that when an internally generated missile source (inside or outside containment) is a nonsafety-related system or component, then the single failure criterion should also be met. To show that your design meets this position, verify that missiles from nonsafety-related sources will not damage any safety-related equipment.

410.06 (SRP 3.5.1.1 and 3.5.1.2) In Section 3.5.1 of your FSAR you list gravity-generated missiles as externally generated missiles. Verify that gravity-generated missiles were also considered as internally generated missile sources both inside and outside containment. Also verify that nonseismic Category I gravity-generated missile sources are seismically supported, if they could affect any seismic Category I structures, systems or components.

410.07 (SRP 3.5.2) In addition to the equipment listed in Table 3.5.1-7 as having tornado missile protection also verify that tornado missile protection is provided for the nuclear service cooling tower valve house, HVAC intakes and exhausts. Also describe a typical tornado missile barrier for HVAC openings using the control building air intakes as an example.

410.08 (SRP 3.5.2) Identify any openings in safety-related structures that are not tornado missile protected and provide justification for not having such protection.

410.09(RSP) (SRP 3.6.1, BTP ASB 3-1) On sheet 2 of FSAR Table 3.6.1-2 Item B.3, you state that your design conforms to position B.3.b.(3) of BTP ASB 3-1. You further state that this criterion has also been applied to single-purpose and high-energy systems since the same quality, design, construction and inspection standards are used, as for the dual-purpose moderate energy systems. It is our position that you assume a single active failure coincident with all pipe breaks except in the dual-purpose moderate energy systems as described in our branch position, as you have indicated in the text of your FSAR (3.6.1.1.G). Verify that such single active failures have been considered and revise the FSAR accordingly.

410.10 (SRP 3.6-1) In Table 3.6.2-2 (Sheet 7) you have provided a high energy pipe break analysis for Room No. R-C83. In this table you refer to Sheets 88, 89, 90, 91, 92 and 96 of Figure 3.6.1-1 for the high energy piping in this room. We have reviewed these sheets and they do not appear to coincide with Rm R-C83 which is at the 143 ft. 6 in. elevation of the auxiliary building. The piping on the referenced sheets all appear to be above that elevation. Also on Sheet 7 of Table 3.6.2-1 you refer to Table 3F-1, Sheet 16 for the identification of safety-related equipment in Room R-C83. This also appears to be in error and Sheet 14 of Table 3F-1 should be referenced in lieu of Sheet 16. Correct these apparent discrepancies and review the contents of Table 3.6.2-2 to ensure no other errors of this nature exist. As an example for Rooms R-C88 and C89 Sheets 18 and 20 of Table 3F-1 are referenced in lieu of Sheets 16 and 18 which are the correct references.

410.11 (SRP 3.6-1) In Table 3.6.2-2 (Sheets 7 and 12) you stated that stress analysis results confirm that no breaks will occur in the high energy lines located in R-C83 and R-C95.

Identify all high energy lines in these rooms by system and line size and provide a basis for not assuming at least one intermediate break location. Also verify that all high energy lines in these rooms are designed to seismic Category I since for purpose of equipment protection we assume a break anywhere in nonseismic Category I piping.

410.12 (SRP 3.6.1) Our review of your piping isometrics and P&IDs is hampered by the fact that we do not have a legend that indicates which system identification number corresponds to what system (e.g., 1201 refers to reactor coolant system). Please provide such a legend in order that we may complete our review in the scheduled time frame.

410.13(RSP) (SRP 3.6.1 BTP ASB 3-1) In Table 3.6.2-2 (Sheet 1), your flooding analysis states that flooding from sources within the room (R-B15) will affect only equipment within the same train/subsystem and, therefore safe shutdown will not be compromised. This is not acceptable unless the only flooding source is a dual-purpose moderate energy system since otherwise an additional single active failure must be assumed. Revise your flooding analysis for this room and for all other rooms where you have made the same assumption.

410.14(RSP) (SRP 3.6.1 and SRP 3.5.1.1) In FSAR Section 3.F.2 of your hazard analysis you state that when the postulated hazard occurs and results in damage to one of two or more redundant trains, single failure of components in other trains (and supporting systems) are not assumed. Again this assumptiom is only valid when the hazard is a failure of a dual-purpose moderate energy piping system or when an internally generated missile source is a safety-related seismic Category I system. For all other failures, a coincident single active failure must be assumed. Revise your FSAR and design as necessary to meet the single failure criterion for all other hazards.

410.15(RSP) (SRP 3.6.1) In FSAR Sections 3F.2.2 and 3F.2.4 regarding pipe break and flooding assumptions you state your analysis includes the effect of flooding from the worst-case pipe crack in each room or general area. It is our position that for flooding analysis purposes, the complete failure of nonseismic Category I moderate energy piping systems should be considered in lieu of cracks in determining the worst case flooding condition. Revise your analysis and FSAR as necessary to include the worst case flooding condition for each room or area in the event of a complete failure of the most limiting nonseismic Category I moderate energy line.

410.16 (SRP 3.6.1) Table 3F-1 provides your hazards analysis for the auxiliary building, Levels B, C and D. In your pipe break analysis for the room identified in this table, you have not made any checks in the column for "moderate-energy cracks within the room do not adversely affect safety-related equipment in the room." Identify why this category has not been checked for any of these rooms since it appears that a moderate energy pipe crack evaluation was not performed in these rooms.

410.17 (SRP 3.6.1) For the flooding analysis results for each of the rooms identified in Table 3F-1, identify the worst case flooding source, and as an example of your analysis, provide all the assumptions made in arriving at the maximum flooding level of one inch for area R-C88 (Sheet 15 of Table 3F-1). The information provided should include how you arrived at the flooding rate, the flooding source and other possible sources, the level necessary to affect safety-related equipment, and a description of how the flood level is limited to one inch.

410.18 (SRP 3.6.1) In FSAR Section 3F.4.2 you state that the blowdown from a main feedwater line break results in the maximum flood level. However, you have not provided sufficient information for us to determine if the resulting flooding is acceptable. Provide an evaluation of the resulting flooding, including how the accumulated water drains from the areas and verify that flooding of other safety-related areas will not result. Your evaluation should also identify the maximum resulting flood level for each main feedwater piping area and the minimum flood level necessary to affect safety-related equipment.

410.19(RSP) (SRP 3.6.1, BTP ASB 3-1) In FSAR Section 3F and in Table 3.6.1-2 you have deviated from Position B.1.a(1) of BTP ASB 3-1 in that you have not provided for jet impingement effects from the nonmechanistic postulated steam and feedwater line breaks. Provide justification for deviating from this position or provide the results of an analysis to show that jet impingement will not prevent safe plant shutdown.

410.20 SRP 3.6.1) Table 3F-3 is intended to provide the peak values of MSIV/MFIV compartment pressure and temperature. However it only provides the design temperature conditions. Revise this table to include the calculated temperatures. Also revise the table to include the analysis for pipe breaks in areas outside the restraint wall of the auxiliary building. Fpr pipe breaks in areas outside the restraint walls of the control and auxiliary building verify that double-ended ruptures of piping were considered in the pressure and temperature analyses and identify any safety-related equipment in the areas.

410.21 (SRP 3.6.1) Verify that the safety-related Train A and Train B electrical conduits identified on Sheet 14 of Table 3F-1 are not necessary for safe shutdown.

410.22 (SRP 3.6.1) In various rooms identified in Table 3F-1 a general statement is made regarding "flooding from sources within this room will not impair the safe shutdown capability of the safety-related equipment." Provide a basis for this assumption for each of the rooms identified in Table 3F-1 that has this statement.

410.23 (SRP 3.6.1) Your pipe break analysis on Sheet 45 of Table 3F-1 indicates there are no high energy lines in the centrifugal charging pump room, train A (Room R-C115). Please correct this obvious error.

410.24 (SRP 3.6.1) With respect to your AFW pump rooms pipe break analysis, verify that a pipe break or crack in the common area of the pump house cannot result in loss of more than one AFW train. Also revise Table 3F-2 to include the calculated temperatures following a steam line break and the calculated flood levels following an AFW discharge line break.

410.25 (SRP 3.6.1 and 3.4.1) For all areas of the plant where watertight doors are relied on for flood mitigation verify that these doors will be indicated and alarmed in the control room, and that the plant technical specifications will include surveillance requirements for these doors with appropriate limiting conditions for operation.

410.26 (SRP 3.6.1 and 10.4.5) In Section 3F.1 you state that an analysis for the effects of a circulating water system failure have been provided. However, this analysis has apparently been omitted. Provide this analysis and the following information:

a. The maximum flowrate through a completely failed expansion joint.

b. The potential for and the means provided to detect a failure in the circulating water transport system barrier such as the expansion joints. Include the design and operating pressures of the various portions of the transport system barrier and their relation to the pressures which could exist during malfunctions and failures in the system (rapid valve closure).

c. The time required to stop the circulating system water flow (time zero being the instant of failure) including all inherent delays such as operator reaction time, drop out times of the control circuitry and coastdown time.

d. For the worst case postulated failure give the rate of rise of water in the associated spaces and total height of the water when the circulating water system flow has been stopped or overflows to site grade.

e. For each flooded space provide a discussion, with the aid of drawings, of the protective barrier provided for all essential systems that could become affected as a result of flooding. Include a discussion of the consideration given to passageways, pipe chases and/or cableways joining the flooded space to the spaces containing safety-related equipment.

410.27 (SRP 3.6.1) Verify that the flood levels from a main feedwater line break in the turbine building is less than that resulting from a break in the circulating water system. Otherwise provide an analysis to show that resulting flood levels will not affect safety-related equipment via interconnections between the turbine building and safety-related structures.

410.28 (SRP 3.6.1) Provide the results of a flooding analysis for a postulated moderate energy leakage crack in the CST and RWST suction lines for the various plant areas that may be affected.

410.29 (SRP 9.1.2) In Amendment 3 to the FSAR you deleted the statement that the spent fuel pool liner was seismic Category I. If the fuel pool liner is not seismic Category I provide the information identified in SRP Section 9.1.2, Item III.3.b regarding failure of the fuel pool liner.

410.30(RSP) (SRP 9.1.3) In FSAR Section 9.1.3.1 you state that the design decay heat load for the spent fuel pool cooling system was calculated following the guidance of ANS 5.1. In FSAR Section 9.1.3.7 you state that standard Westinghouse methods were used for decay heat load calculations. It is our position that either ANS 5.1, 1978 or BTP ASB 9-2 be used to calculate decay heat loads. Clarify what methodology was used to calculate the design basis heat load for the spent fuel pool cooling system.

410.31 (SRP 9.2.1) The standby nuclear service coolingwater (NSCW) pump for each train starts automatically on low pressure in the discharge manifold during accident conditions. Verify that the loss of one of the two operating pumps will result in a low enough discharge pressure to start the standby pump, and also specify if the standby pump will automatically start on loss of discharge manifold pressure during normal operating conditions.

410.32 (SRP 9.2.1) Air operated valve CV-9446 and 9447 are the seismic Category I boundaries between the NSCW system and the nonseismic Category I blowdown line. Describe what signals close CV-9446 and 9447 to prevent drainage from the NSCW system causing a loss of system function or flooding problems. If manual isolation is relied on describe the method of detecting the leakage and verify that adequate time is available for operator action.

410.33 (SRP 9.2.1) In FSAR Amendment No. 4, you revised Figure 9.2.1-1, Sheet 5, to include a two-inch intertie from the Train B NSCW discharge header to Train A (Figure 9.2.1-1, Sheet 1). Presumably, the interconnection goes to the train A discharge header. However, the interconnection is not shown on Sheet 1 of Figure 9.2.1-1. Revise Sheet 1 to be consistent with Sheet 5. Also provide a discussion of the purpose of this intertie including any safety-related function the intertie may have.

410.34 (SRP 9.2.2 and 9.2.1) For the component cooling water (CCW) system identify the minimum flow requirements and maximum allowable CCW temperature at the inlet of each component served by the CCW system. Provide the same information for equipment cooled by the NSCW system.

410.35 (SRP 9.2.3) Verify that flooding analyses have been performed for a failure of the nonseismic Category I demineralized water makeup system where the piping runs through safety-related structures such as the auxiliary building, control building, and tunnels containing safety-related equipment.

410.36 (SRP 9.2.5) Provide the component design data, including the minimum net positive suction head (NPSH) requirements for the NSCW pumps and NSCW transfer pumps, in order that we may determine that the minimum system flow requirements and NPSH requirements are met.

410.37 (SRP 9.2.5) In order to permit an evaluation of the ultimate heat sink and other heat removal systems, provide an analysis of the thirty-day period following a design basis accident listing the total heat rejected, the sensible heat rejected, the station auxiliary heat rejected and the decay heat released from the reactor.

In submitting the results of the analysis requested, include the following information in both tabular and graphical form:

1. The total integrated decay heat;

2. The heat rejection rate and integrated heat rejected by the station auxiliary systems, including all operating pumps, ventilation equipment, diesels and other sources;

3. The heat rejection rate and integrated heat rejected due to sensible heat removed from the containment and the primary system;

4. The total integrated heat due to the above;

5. The maximum allowable inlet water temperature taking into account the rate at which the heat energy must be removed, cooling water flow rate, and the capabilities of the respective heat exchangers.

6. The available NPSH to the NSCW pumps and transfer pumps at the minimum ultimate heat sink water level versus the required NPSH.

Use the methods set forth in either our BTP ASB 9-2 or ANS 5.1, 1978 to establish the input due to fission product decay and heavy element decay. Assume an initial service water temperature based on the most adverse conditions for normal operation.

410.38 (SRP 9.2.5) Atop of each cooling tower fan cell there is a debris catcher designed to prevent trash from entering the fan cells. Describe the details of these debris catchers and verify that they will not become gravitational missiles as a result of an earthquake or high winds.

410.39(RSP) (SRP 9.2.6 and 5.4.7) Verify that sufficient condensate storage tank (CST) capacity exists to cool the reactor coolant system to the RHR cut in temperature assuming the most limiting single active failure. In determining the time required to perform such a cooldown only safety-grade equipment should be assumed available in accordance with BTP RSB 5-1.

410.40 (SRP 9.2.6 and 9.2.7) With regards to the heat tracing provided for the safety-related portions of the piping systems for the condensate makeup system, and the reactor water makeup system, describe the means of detecting heat tracing system failure and whether indication and/or alarms are provided in the control room. Provide the same information for storage tank heaters.

410.41 (SRP 9.2.7 and 9.1.3) Identify the minimum gravity flow makeup rate from the reactor water makeup tank to the spent fuel pool and verify that it is sufficient to makeup for the maximum possible evaporative losses from the pool.

410.42 (SRP 9.2.2 and 9.2.1) In FSAR Section 9.2.8 you state that auxiliary component cooling water (ACCW) cooling is available irrespective of which NSCW train is in service. From the description in FSAR Section 9.2.1 it was not clear whether one or both trains of NSCW would normally be operating. Please provide a description of the normal mode of operation of these two systems.

410.43 (SRP 9.3.1) In Section 9.3.1.4 of your FSAR you state that the compressed air system conforms to the standards of ISA-S7.3. Since FSAR Section 9.3.1.4 is only related to testing and inspection, verify that the instrument air portion of the compressed air system conforms to the guidelines of ISA-S7.3 (ANSI MC 11.1-1976) regarding air quality standards as identified in III.2 of SRP Section 9.3.1.

410.44 (SRP 9.3.1) In FSAR Table 3.2.2-1, Item 19 under the instrument and service air system heading identifies safety-related piping and valves (other than containment isolation) associated with the air system. However FSAR Section 9.3.1 indicates that no safety-related piping or valves (except for containment isolation) exists in the air systems. Clarify this apparent discrepancy. If there are some safety-related piping and valves associated with safety-related accumulators identify their function and provide a typical drawing of the accumulator system. Also discuss the testing capability and frequency for such accumulator systems.

410.45 (SRP 9.3.3) Provide a drawing showing the drain system and sumps for the AFW pumphouse and CST and describe the means of preventing flooding (due to sump overflow or backflow through drain system) of the AFW pump rooms due to drainage from the CST area.

410.46 (SRP 9.3.3) Describe the means of preventing backflow through the drain systems of the control and auxiliary buildings for areas where train A and train B rooms/areas drain to a common header and no check valves or closed isolation valves are installed.

410.47 (SRP 9.3.3) In Amendment 3 to the FSAR you revised Section 9.3.3.3 whereas originally there were watertight doors for all ESF equipment rooms and with the revision watertight doors would only be used for ESF rooms if a flooding analysis showed they were necessary. Indicate which ESF rooms will not have watertight doors and provide the results of your flooding analysis that shows the doors are not necessary. The analysis should show that the doors are not necessary for flooding into or out of the room. Also revise FSAR Tables 9.3.3-3 and 9.3.3-4 to reflect the fact that all ESF equipment rooms are not watertight and revise the FSAR layout drawings as necessary.

410.48 (SRP 9.4.1) FSAR Table 9.4.1-2 indicates that the control building ventilation system is designed to maintain a 1/2-inch water gage (WG) pressure inside the control room. FSAR Sections 9.4.1 and 6.4 indicate that the control room normal HVAC system maintains a positive 1/8-inch and 1/4-inch WG pressure respectively in the control room. Clarify these apparent discrepancies. Also, verify that positive pressure is maintained by the emergency control room HVAC system.

410.49 (SRP 9.4.1) In FSAR Amendment 3, you revised FSAR Section 6.4.3 to eliminate the automatic control room isolation signal as a result of a safety injection signal. However, FSAR Section 6.4.2 and FSAR Figure 7.3.6-1 (control room isolation logic) indicate that the safety injection automatic isolation capability still exists. Revise the FSAR to show the actual design and if the safety injection isolation signal has been deleted, provide your basis for the design change.

410.50 (SRP 9.4.1) FSAR Figure 9.4.1-2 (sheets 1 through 3) show that the control room air intake smoke detectors have some automatic isolation capability. However, the FSAR text indicates that the smoke detectors perform no automatic function (except alarm). Clarify this apparent discrepancy and describe the details of any automatic functions the smoke detectors may perform.

410.51 (SRPs 9.4.1 and 9.4.5) Neither FSAR Section 9.4.1 or 9.4.5 provides a description of which essential HVAC system provides cooling to the cable spreading rooms during emergency or accident conditions. Provide a description of how the cable spreading rooms and surrounding areas are ventilated during emergencies or accidents.

410.52 (RSP) (SRP 9.4.5) Your design of the diesel generator building ventilation system does not meet requirements regarding the prevention of dust accumulation. Although you have provided justification for not filtering the air during diesel operation you have not provided adequate justification for not filtering the air during diesel inoperative periods. Since the normal ventilation air intakes are essentially at ground level and your electrical cabinets are not dustproof, it is our position that you provide some positive means of preventing dust accumulation on contactors or relays as recommended by NUREG/CR-0660, "Enhancement of On-Site Emergency Diesel Generator Reliability."

410.53 (SRP 9.4.5) In FSAR Section 9.4.8.2.3, you state that there is a normally closed - fail open air operated damper for the emergency air inlet to the turbine driven pump room. FSAR Figure 9.4.8-2 shows a motor operated damper and Table 9.3.1-2 does not list this damper as a safety-related air operated device. Revise your FSAR to correct this discrepancy and review the air operated devices throughout the plant to verify all safety-related air operated devices are included in Table 9.3.1-2.

410.54 (SRP 9.4.5 and 10.4.9) Verify that you will perform the turbine driven AFW pump endurance test with the AFW pump house HVAC system lined up for emergency operation and that the natural circulation ESF outside air intake rate is 4100 CFM as indicated on Figure 9.4.8-2. Also, following the test you should extrapolate your data to assure that 120°F will not be exceeded if the outside temperature reaches 98°F as you have calculated in your ventilation system analysis.

410.55 (SRP 9.4.5) In FSAR Section 9.4.9, you state that the piping penetration ventilation system will maintain the concrete surrounding the piping restraints for the main steam and feedwater systems below 200°F. Verify that the ambient air temperatures in these areas, including the valve rooms, will be maintained at a low enough temperature to allow personnel to inspect equipment during normal plant operation. If there is another HVAC system that performs this function, identify the system.

410.56 (SRP 9.5.1) You have not provided sufficient details with respect to adequate separation of cables, instruments and other components inside containment for safe shutdown following a fire. Describe with the aid of drawings the cable routing for post-fire safe shutdown equipment and instrumentation inside containment. You should also provide a discussion with respect to the routing of associated non-safety circuits of redundant trains.

410.57 (SRP 9.5.1) Your response to items C.5.b and C.5.c of BTP CMEB 9.5-1 is not in sufficient detail for us to complete our review. Provide the following additional information:

a. Describe the methodology used to verify that proper separation (fire protection) is provided for the safe shutdown capability in accordance with item C.1.b of CMEB 9.5.1. Provide arrangement drawings showing the safe shutdown system (including cable routing) in order that we may review the results.

b. Address the means provided for assuring the function of the safe shutdown capability when considering fire induced failures in associated circuits. Attachment 1 provides our concern with associated circuits. Attachment 1 also provides guidance that you need to review associated circuits of concern and the information to be provided for our evaluation. You should specifically respond to Part II.C of the enclosure.

c. You should describe in detail the design capability of your alternate shutdown system for achieving hot and cold shutdown in accordance with CMEB 9.5-1, items C.5.b and C.5.c. This discussion should include the equipment which comprises the alternate shutdown systems necessary for performing various safe shutdown functions, all required support equipment and the instrumentation available for monitoring shutdown including a source range instrument.

d. Commit to develop and implement alternate shutdown procedures. The procedures should address manpower requirements and manual actions (including repairs for cold shutdown) to accomplish shutdown. A summary of the procedures should be submitted for our review.

With respect to repairs required to achieve safe shutdown, it is our position that systems and components used to achieve and maintain hot shutdown conditions must be free of fire damage with no credit taken for repairs. Systems and components used to achieve and maintain cold shutdown should be either free of fire damage or the fire damage should be limited such that repairs can be made and cold shutdown achieved within 72 hours. Repair procedures for cold shutdown systems must be developed and materials for repair maintained onsite. Electrical or pneumatic jumpers are not a suitable method of repair for cold shutdown.

410.58 (SRP 9.5.1) Throughout your fire hazards analysis you identify some equipment as safe shutdown equipment that appears to be safety-related or necessary for normal shutdown but are not necessary for post-fire safe shutdown. An example of these are the volume control tank and reactor coolant pumps. Revise your area by area fire hazards analysis to list only those items necessary for post-fire safe shutdown. For items such as the volume control tank you should identify that there is diverse equipment or systems for performing the shutdown.

410.59 (SRP 9.5.1) Zone 3 on FSAR Figure 9A-3 contains Train B safe shutdown cables and Zone 6 contains Train A safe shutdown cables. Describe how the Train A cables are routed to Zone 6 without passing through Zone 3. This is one of many examples of the type of detailed information (cable routings on drawings requested in 410.57) that we need to perform an independent evaluation of your post-fire safe shutdown capability.

410.60 (SRP 9.5.1) In some of your area by area fire hazards analyses you specify under your list of safe shutdown equipment that there is no major equipment located in certain areas. For an example, see the analysis for Level C, Zone 24 of the auxiliary building. Either verify that there is no safe shutdown equipment located in the area or identify what safe shutdown equipment is located in the area and describe the shutdown method in the event of its loss.

410.61 (SRP 9.5.1) Analyses 9A.1.17.5 and 18.2 identify safe shutdown cable trays located in each of the areas. However, in the conclusion for each area loss of the cable trays is not analyzed, while the loss of the ACCW heat exchangers are analyzed. Clarify whether the safe shutdown cable trays do exist in these areas, and if they do, analyze the loss of the cable trays due to fire.

410.62 (SRP 9.5.1) In the conclusions for some of your fire hazards analyses you state that Train A and Train B are separated by barriers. Revise the conclusions to indicate the rating of the fire barriers and indicate that they are in accordance with CMEB 9.5-1.

410.63 (SRP 9.5.1) In your fire analysis for the diesel generator fuel oil storage tanks and pumphouse you have analyzed zones 165 and 166 (Refer to Figure 9A-32). However, you have not provided an analysis of the common valve roomarea located between Zones 165 and 166. Provide such an analysis. Provide the same type of analysis for the AFW pumphouse common areas that do not have a zone designation.

410.64 (SRP 9.5.1) For the nuclear service cooling water pumphouse and electrical tunnels (Figure 9A-34), verify that the Train A(B) transfer pump cables are always separated by 3-hour barriers from the Train B(A) cables and equipment.

410.65 (SRP 10.3 and 5.4.7) In FSAR Table 9.3.3-1 (Sheet 2 and 3) you indicate that only one steam generator power operated relief valve is necessary for safe shutdown. This implies that only one steam generator is necessary for safe shutdown. Clarify the intent of your statement and describe how a safe cold shutdown can be achieved with only one steam generator power operated relief valve, under natural circulation, loss of offsite power conditions. Provide the length of time for such a cooldown and verify that sufficient AFW water supply is available.

410.66 (SRP 10.4.9) Figure 10.4.9-1 shows a lot of heat tracing of the AFW system piping. Provide a description of the heat tracing (safety-grade, power supply) and indicate the method of detection of loss of function (alarms, indication) and describe any technical specifications associated with the heat tracing system. Also if any of the heat traced piping is located outdoors, verify that tornado missile protection is provided for that portion of the AFW system.

410.67(RSP) (SRP 10.4.7 BTP ASB 10-2) Verify that your preoperational test program will include tests to verify that unacceptable feedwater hammer will not occur using the plant operating procedures for normal and emergency restoration of steam generator water level following loss of normal feedwater and possible draining of the feedring. Provide the procedures for these tests for approval before conducting the tests.

410.68(RSP) (SRP 10.4.7) In accordance with SRP Section 10.4.7 (April 1984) verify that the feedwater control valve and controller are designed to be stable and compatible with the systems imposed operating conditions (e.g., control functions required, range of control and pressure drop characteristics, valve stroke, trim, etc.). Test data or operating experience data shall be used where available. In addition commit to review plant operating and maintenance procedures to assure that precautions for avoidance of steam/water hammer and water hammer occurrences have been provided.

410.69 (SRP 10.4.9 and 10.3) Provide a systems analysis of a pipe break in the common portion of the steam supply to the turbine driven AFW pump. In your analysis describe the means of isolation and the effects on the reactor coolant system of the blowdown from two steam generators.

ATTACHMENT 1

ASSOCIATED CIRCUIT GUIDANCE

I. INTRODUCTION

The following discusses the requirements for protecting redundant and/or alternative equipment needed for safe shutdown in the event of a fire. The requirements of Appendix R address hot shutdown equipment which must be free of fire damage. The following requirements also apply to cold shutdown equipment if the applicant/licensee elects to demonstrate that the equipment is to be free of fire damage. Appendix R does allow repairable damage to cold shutdown equipment.

Using the requirements of Sections III.G and III.L of Appendix R, the capability to achieve hot shutdown must exist given a fire in any area of the plant in conjunction with a loss of offsite power for 72 hours. Section III.G of Appendix R provides four methods for ensuring that the hot shutdown capability is protected from fires. The first three options as defined in Section III.G.2 provides methods for protection from fires of equipment needed for hot shutdown:

1. Redundant systems including cables, equipment, and associated circuits may be separated by a three-hour fire rated barrier; or,

2. Redundant systems including cables, equipment and associated circuits may be separated by a horizontal distance of more than 20 feet with no intervening combustibles. In addition, fire detection and an automatic fire suppression system are required; or,

3. Redundant systems including cables, equipment and associated circuits may be enclosed by a one-hour fire rated barrier. In addition, fire detectors and an automatic fire suppression system are required.

The last option as defined by Section III.G.3 provides an alternative shutdown capability to the redundant trains damaged by a fire.

4. Alternative shutdown equipment must be independent of the cables, equipment and associated circuits of the redundant systems damaged by the fire.

II. <u>Associated Circuits of Concern</u>

The following discussion provides A) a definition of associated circuits for Appendix R consideration, B) the guidelines for protecting the safe shutdown capability from the fire-induced failures of associated circuits and C) the information required by the staff to review associated circuits. It is important to note that our interest is only with those circuits (cables) whose fire-induced failure could affect shutdown. Guidelines for protecting the safe shutdown capability from the fire-induced failures of associated circuits are provided. These guidelines do not limit the alternatives available to the licensee for protecting the shutdown capability. All proposed methods for protection of the shutdown capability from fire-induced failures will be evaluated by the staff for acceptability.

A. Our concern is that circuits within the fire area will receive fire damage which can affect shutdown capability and thereby prevent post-fire safe shutdown. Associated Circuits* of Concern are defined as those

*The definition for associated circuits is not exactly the same as the definition presented in IEEE-384-1977.

cables (safety related, non-safety related Class 1E, and non-Class 1E) that:

1. Have a physical separation less than that required by Section III.G.2 of Appendix R, and;

2. Have one of the following:

   a. a common power source with the shutdown equipment (redundant or alternative) and the power source is not electrically protected from the circuit of concern by coordinated breakers, fuses, or similar devices (see diagram 2a), or

   b. a connection to circuits of equipment whose spurious operation would adversely affect the shutdown capability (e.g., RHR/RCS isolation valves, ADS valves, PORVs, steam generator atmospheric dump valves, instrumentation, steam bypass, etc.) (see diagram 2b), or

   c. a common enclosure (e.g., raceway, panel, junction) with the shutdown cables (redundant and alternative) and,

      (1) are not electrically protected by circuit breakers, fuses or similar devices, or

      (2) will allow propagation of the fire into the common enclosure (see diagram 2c).

EXAMPLES OF ASSOCIATED CIRCUITS OF CONCERN

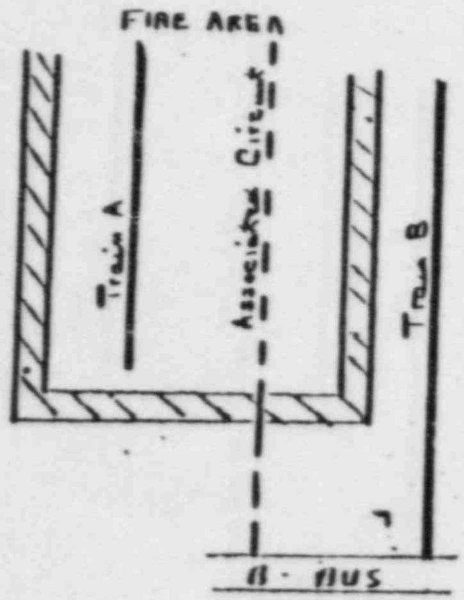


Diagram 2A

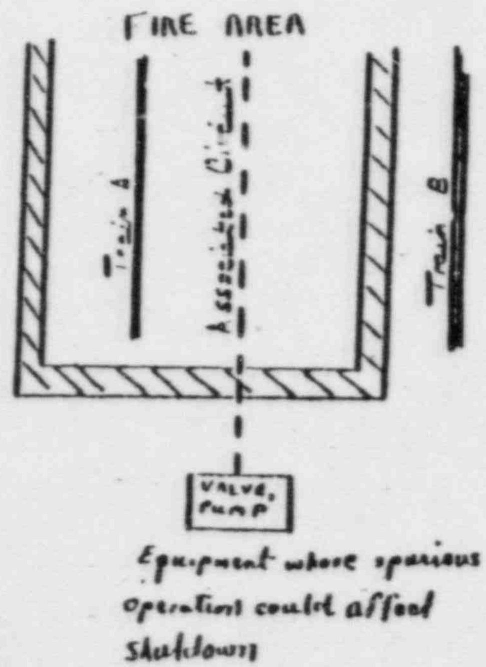
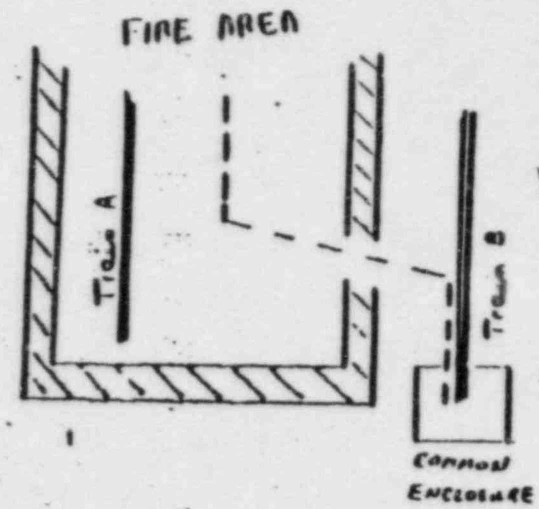


Diagram 2B



The area barriers shown above meet the appropriate sub-paragraphs (a-f) of section III.G-2 of Appendix R.

Diagram 2C

B. The following guidelines are for protecting the shutdown capability from fire induced failrues of circuits (cables) in the fire area. The shutdown capability may be protected from the adverse effect of damage to associated circuits of concern by the following methods:

1. Provide protection between the associated circuits of concern and the shutdown circuits as per Section III.G.2 of Appendix R, or

2. a. For a common power source case of associated circuits: Provide load fuse/breaker (interrupting devices) to feeder with fuse/breaker coordination to prevent loss of the redundant or alternative shutdown power source. To ensure that the coordination criteria are met the following should apply:

(1) The associated circuits of concern interrupting devices (breakers of fuses) time-overcurrent trip characteristic for all circuit faults should cause the interrupting device to interrupt the fault current prior to initiation of a trip of any upstream interrupting device which will cause a loss of the common power source.

(2) The power source shall supply the necessary fault current for sufficient time to ensure the proper interruption without loss of function of the shutdown loads.

The acceptability of a particular interrupting device is considered demonstrated if the following cirteria are met:

(i) The interrupting device design shall be factory tested to verify overcurrent protection as designed in accordance with the applicable UL, ANSI, or NEMA standards.

(ii) For low and medium voltage switchgear (480 V and above) circuit breaker/protective relay periodic testing shall demonstrate that the overall coordination scheme remains within the limits specified in the design criteria. This testing may be performed as a series of overlapping tests.

(iii) Molded case circuit breakers shall periodically be manually exercised and inspected to insure ease of operation. On a rotating refueling outage basis a sample of these breakers shall be tested to determine that breaker drift is within that allowed by the design criteria. Breakers should be tested in accordance with an accepted QC testing methodology such as MIL STD 10 5 D.

(iv) Fuses when used as interrupting devices do not require periodic testing. Administrative controls must insure that replacement fuses with ratings other than those selected for proper coordination are not accidently used.

b. For circuits of equipment and/or components whose spurious operation would affect the capability to safely shutdown:

(1) provide a means to isolate the equirment and/or components from the fire area prior to the fire (i.e., remove power cables open circuit breakers); or

(2) provide electrical isolation that prevents spurious operation. Potential isolation devices include breakers, fuses, amplifiers, control switches, current XFRS, fiber optic couplers, relays and transducers; or

(3) provide a means to detect spurious operations and then procedures to defeat the maloperation of equipment (i.e., closure of the block valve if PORV spuriously operates, opening of the berakers to stop spurious operation of safety injection);

c. For common enclosure cases of associated circuits:

(1) provide appropriate measures to prevent propagation of the fire and

(2) provide electrical protection (i.e., breakers, fuses or similar devices)

C. <u>INFORMATION REQUIRED</u>

The following information is required to demonstrate that associated circuits will not prevent operation or cause maloperation of the shutdown method:

a. Describe the methodology used to assess the potential of associated circuits adversely affecting the shutdown capability. The description of the methodology should include the methods used to identify the circuits which share a common power supply or a common enclosure with the shutdown system and the circuits whose spurious operation would affect shutdown. Additionally, the description should include the methods used to identify if these circuits are associated circuits of concern due to their location in the fire area.

b. Show that fire-induced failures (hot shorts, open circuits or shorts to ground) of each of the associated circuits of concern will not prevent operation or cause maloperation of the shutdown method.

2. The residual heat removal system is generally a low pressure system that interfaces with the high pressure primary coolant system. To preclude a LOCA through this interface, we require compliance with the recommendations of Branch Technical Position RSB 5-1. Thus, the interface most likely consists of two redundant and independent motor operated valves. These two motor operated valves and their associated cables may be subject to a single fire hazard. It is our concern that this single fire could cause the two valves to open resulting in a fire initiated LOCA through the high-low pressure system interface. To assure that this interface and other high-low pressure interfaces are adequately protected from the effects of a single fire, we require the following information:

   a. Identify each high-low pressure interface that uses redundant electrically controlled devices (such as two series motor operated valves) to isolate or preclude rupture of any primary coolant.

   b. For each set of redundant valves identified in a., verify the redundant cabling (power and control) have adequate physical separation as required by Section III.G.2 of Appendix R.

c. For each case where adequate separation is not provided show that fire induced failures (hot short, open circuits or short to ground) of the cables will not cause maloperation and result in a LOCA.