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DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards responses to Chemical Engineering Branch FSAR safety & acceptance review questions re fire protection. Draft safe shutdown analysis in case of fire transmitted on 830527.Final analysis to be transmitted by 830717.

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Carolina Power & Light Company

SERIAL: LAP-83-251

JUL 11 1983

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555

SHEARON HARRIS NUCLEAR POWER PLANT
UNIT NOS. 1 AND 2
DOCKET NOS. 50-400 AND 50-401
ACCEPTANCE REVIEW AND SAFETY REVIEW QUESTIONS RESPONSES
FIRE PROTECTION

Dear Mr. Denton:

Carolina Power & Light Company (CP&L) hereby transmits one (1) original and forty (40) copies of the Shearon Harris Nuclear Power Plant (SHNPP) responses to the Final Safety Analysis Report (FSAR) Safety Review (SR) and Acceptance Review (AR) Questions. These fire protection questions are in the 280 Series and originate from the Chemical Engineering Branch. The question numbers are 280.1 (AR), 280.2 (AR), 280.13 (SR), 280.14 (SR), 280.15 (SR), 280.17 (SR), 280.18 (SR), 280.22 (SR), 280.23 (SR), 280.25 (AR), 280.26 (AR), 280.27 (AR), 280.28 (AR), and 280.29 (AR). Responses to the following seven (7) questions will be transmitted shortly: 280.1 (SR), 280.11 (SR), 280.18 (AR), 280.24 (SR), 280.24 (AR), 280.30 (SR), and 280.30 (AR).

We delivered one copy of our draft Safe Shutdown Analysis in Case of Fire on May 27, 1983. The final analysis is presently being printed and will be transmitted formally by July 17, 1983.

Please contact my staff if you have any questions.

Yours very truly,

M. A. McDuffie
Senior Vice President
Engineering & Construction

JDK/cfr (7123JDK)
Attachment

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Question

280.1 (AR) You state in your Fire Hazards Analysis how various safety-related cable trays, conduit and equipment are separated by distance from its redundant counterpart, and the criteria that were used to establish barriers between these redundant trains. However, your fire hazards analysis does not provide adequate protection for the effects of postulated exposure fires involving permanent and/or transient combustibles (exposure fires) on systems, circuit cable trays or equipment required for safe plant cold shutdown which are separated only by distance (e.g., no fire barriers between redundant trains 20 ft. or less from each other, as listed in page 9A-21 of the FHA). It is our position that as a minimum, redundant trains within 20 feet of each other should be protected by a one hour fire rated barrier as well as area automatic sprinklers. In some instances, such as the reactor coolant makeup and injection systems, redundant trains separated by more than 20 feet may require additional protection. In the fire hazards analysis, you need to demonstrate that, assuming failure of the primary suppression system, a fire on installed or transient combustibles will not result in the loss of capability to achieve safe shutdown. Where this cannot be demonstrated, an alternate means of assuming safe plant shutdown (cold shutdown) should be provided. Alternate shutdown will most likely be required for areas such as the cable spreading rooms, and the control room.

Demonstrate:

(a) Safe shutdown from the main control room where a fire disables any remote shutdown panel, or any safe shutdown equipment including conduit/cable trays controlled from remote locations.

(b) Safe shutdown from remote locations when the main control room is uninhabitable due to a fire or when fire disables safe shutdown equipment or cables in the cable spreading areas.

Alternate shutdown capability without fire damage need only be provided for the essential instrumentation, controls and equipment necessary to bring the plant to a hot standby condition. Fire damage to systems necessary to achieve and maintain cold shutdown should be limited so that repairs can be made and cold shutdown condition achieved within 72 hours. Attached (Enclosure 2) are our guidelines for alternate shutdown systems.

Response As noted in the "Safe Shutdown Analysis in Case of Fire," fires involving in situ or transient combustibles will not result in plant loss of capability to achieve safe shutdown. For details refer to the "Safe Shutdown Analysis."

Question

280.2 (AR) Substantiate the fire resistance capability of the barriers used to separate safety-related areas or high hazard areas by verifying that their construction is in accordance with a particular design that has been fire tested. Describe the design, the test method used and the acceptance criteria. Provide information for the following components:

(a) Rated fire barriers, including floor and ceiling construction and the support for barriers that are not floors or ceilings;

(b) Fire dampers and fire doors, including a description of how they are installed in the ventilation ducts that penetrate rated fire barriers of safety-related areas; and

(c) Fire barrier penetration seals around cuts, pipes, cables, cable trays and in other openings (e.g. concrete joints sealers and fillers) including verification that all seals are of the thickness specified in the tests, and that cables and cable trays are supported in a manner similar to supporting arrangements used in any tests.

Response

2a) Barriers used to separate safety-related areas and high hazard areas are reinforced concrete construction with thickness of 12 to 36 inches. In rare instances, a thickness of eight inches is used. The structural support members for rated fire barriers are constructed of reinforced concrete. Adequate concrete coverage is provided for the steel reinforcement thus ensuring that the fire resistance rating of the structural support is commensurate to that of the barrier. The above listed constructions have been established as having a minimum fire resistance rating of three hours in accordance with fire test methods and passage criteria outlined in NFPA-251, Standard Methods of Fire Tests of Building Construction and Materials (this test is similar to ASTM E119 and UL 263). In few particular instances, 8-inch and 12-inch concrete block walls are used as noted in the FHA. In these cases, UL equivalent block, rated for three hour fire resistance has been used.

Special fire resistant barriers using TSI Thermo-Lag 330-1 are used in the cable spreading room due to space limitations. The TSI designs have been satisfactorily tested in accordance with ASTM E-119 by recognized independent testing laboratories. The TSI barriers are being installed and inspected by trained personnel to ensure compliance with specified design documents.

b) Fire dampers installed in ducts meet the intent of NFPA-90A, Standard for Air Conditioning and Ventilating

Systems. Fire doors are installed in fire barriers meeting the intent of NFPA 80, Standard for Fire Doors and Windows.

c) Fire Barrier penetration seals around pipes, cables, cable trays and in other openings (e.g. concrete joints) are tested using ASTM E-119, Time Temperature Exposure, by recognized independent testing laboratories. The fire resistant ratings of the seals are consistent with the fire resistant ratings of the barriers. Cables and cable trays are supported in a manner similar to those used in tests. Inspection programs established by the fire seal vendor and approved by CP&L will be used to ensure that the installation is in accordance with standards described in the fire test.

Question

280.13 (SR) Verify that fire protection has been provided for safe shutdown so that one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage and that systems necessary to achieve and maintain cold shutdown from either the control room or the emergency control station(s) can be repaired within 72 hours.

Provide an analysis which shows that one redundant train of equipment structures, systems, and cables necessary for safe shutdown can be maintained free of fire damage by either:

(1) Separation of cables and equipment and associated circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers should be protected to provide fire resistance equivalent to that required of the barrier;

(2) Separation of cables and equipment and associated circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system should be installed in the fire area; or

(3) Enclosure of cable and equipment and associated circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system should be installed in the fire area.

Response The Safe Shutdown Analysis (SSA) verifies that one train of systems necessary to achieve and maintain safe shutdown conditions from either the main control room or the auxiliary control panel can be maintained free of damage in case of fire through utilization of any one of the three separation criteria listed above or the exemption requests listed in the SSA. For details refer to Table 9.5B-3, "Safe Shutdown Analysis by Fire Area," of the Safe Shutdown Analysis and to FSAR Section 9.5.1.2.2.

Question

280.14 (SR) Identify those areas of the plant that will not meet the guidelines of Section C.5.b of BTP CMEB 9.5-1 and, thus alternative shutdown will be provided. Additionally provide a statement that all other areas of the plant will be in compliance with Section C.5.b of BTP CMEB 9.5-1.

For each of those fire areas of the plant requiring an alternative shutdown system(s) provide a complete set of responses to the following requests for each fire area:

(1) List the system(s) or portions thereof used to provide the shutdown capability with the loss of offsite power.

(2) For those systems identified in (1) for which alternative or dedicated shutdown capability must be provided, list the equipment and components of the normal shutdown system in the fire area and identify the functions of the circuits of the normal shutdown system in the fire area (power to what equipment, control of what components and instrumentation). Describe the system(s) or portions thereof used to provide the alternative shutdown capability for the fire area and provide a table that lists the equipment and components of the alternative shutdown system for the fire area. For each alternative system, identify the function of the new circuits being provided. Identify the location (fire zone) of the alternative shutdown equipment and/or circuits that bypass the fire area and verify that the alternative shutdown equipment and/or circuits are separated from the fire area in accordance with Section III.G.2.

(3) Provide drawings of the alternative shutdown system(s) that highlight any connections to the normal shutdown systems (P&IDs for piping and components, elementary wiring diagrams of electrical cabling). Show the electrical location of all breakers for power cables, and isolation devices for control and instrumentation circuits for the alternative shutdown systems for that fire area.

(4) Verify that procedures have been or will be developed that describe tasks to be performed to effect the shutdown method. Provide a summary of these procedures outlining operator actions.

(5) Verify that the manpower required to perform the shutdown functions using the procedures of (4) as well as provide fire brigade members to fight the fire is available as required by the fire brigade technical specifications.

(6) Provide a commitment to perform adequate acceptance tests of the alternative shutdown capability. These tests should verify that: equipment operates from the local control

station when the transfer or isolation switch is placed in the "local" position and that the equipment cannot be operated from the control room; and that equipment operates from the control but cannot be operated at the local control station when the transfer isolation switch is in the "remote" position.

(7) Verify that repair procedures for cold shutdown systems are developed and material for repairs is maintained on site. Provide a summary of these procedures and a list of the material needed for repairs.

Response

As outlined in response 280.13, Shearon Harris Unit 1 is in compliance with Section C.5.b of BTP CMEB 9.5-1; therefore, it is not necessary to provide alternative shutdown. For details refer to the Safe Shutdown Analysis and FSAR Section 9.5.1.2.2.

Question

280.15 (SR) Verify that in the event of a fire involving alternate shutdown equipment that causes a hot short in the transfer switches, hot and cold shutdown can still be achieved. Also show that in the event of fire involving alternate shutdown equipment without hot shorts in transfer switches, safe shutdown can be effected.

Response

The Transfer Panel for Train A is in the A Switchgear Room (Fire Area 1-A-SWGR-A) and the Transfer Panel for Train B is in the B Switchgear Room (Fire Area 1-A-SWGR-B). The location of these panels and areas is shown on FSAR Figure 9.5A-9. For further details refer to the response to Question 280.22.

Since a single fire cannot damage both trains, as demonstrated by the Safe Shutdown Analysis, safe shutdown will not be affected.

Question

280.17 (SR) Verify that the design of alternate shutdown equipment will not permit a single failure or cause loss of redundant safety system; e.g. you may not permit control circuits for both RHR systems to pass through one transfer switch, thus allowing a loss of redundant safety systems by a single failure.

Response See the responses to Questions 280.15 and 280.22.

Question

280.18 (SR) Verify that a fire involving any high-low pressure interfaces that use redundant electrically controlled devices to isolate the primary coolant boundary will not challenge the integrity of the primary pressure boundary (GDC 11 and GDC 31).

Response The following Reactor Coolant System high-low pressure interfaces rely on redundant electrically controlled devices to maintain primary system integrity.

1. RHR suction isolation valves (FSAR Figure 5.4.7-1)
2. Power Operated Relief System (FSAR Figure 5.1.2-2)
3. Letdown Isolation (FSAR Figure 9.3.4-1)
4. Primary Sampling (FSAR Figure 9.3.2-1)
5. Reactor Coolant Gas Vent System (Not yet available)

1. RHR suction isolation valves (FSAR Figure 5.4.7-1)

Each RHR train is provided with two (2) independently powered motor operated valves. These valves are closed during normal operation and are separately and independently interlocked with pressure signals to prevent their being opened whenever the RCS pressure is greater than approximately 425 psig. The two inlet isolation valves are also separately and independently interlocked with pressure signal to automatically shut if the RCS pressure increases to 750 psig during a plant start-up.

Associated power and control cables for the redundant valves are physically and electrically separated.

2. Power Operated Relief System (FSAR Figure 5.1.2-2)

The pressurizer is provided with redundant power operated relief valves. These solenoid operated valves are designed to fail closed on loss of power to prevent uncontrolled steam dump. For additional protection each relief valve has a motor operated isolation valve located upstream. For diversity the relief valves are DC powered while the isolation valves are AC powered. The control circuits for the solenoid valves and the power cables for the motor operated valves are routed in separate trays or conduits. The cables utilized are qualified in accordance with IEEE-383. Electrical protection is provided by use of either fuses or circuit breakers.

3. Letdown Isolation (FSAR Figure 9.3.4-1)

Inside containment the letdown line is provided with two pneumatic valves in parallel. Three parallel valves are utilized for containment isolation and are downstream of the letdown orifices. Either one of two valves in series or all three valves in parallel is capable of isolating the Reactor Coolant System. Two of the three containment isolation valves in parallel are normally closed. All valves fail closed on loss

of air or power. An analysis of the routing of all cables essential to the operation of these valves demonstrates that no single fire can prevent letdown line isolation.

4. Primary Sampling (FSAR Figure 9.3.2-1)

Each sampling line has redundant solenoid operated valves which will fail closed on loss of power. The valves located inside the containment are powered from the safety bus B while those located outside containment are powered from the safety bus A, therefore, a fire cannot challenge the integrity of the primary pressure boundary.

5. Reactor Coolant Gas Vent System (Figure not yet available)

The Reactor Coolant Gas Vent System is currently being designed in compliance with NUREG-0737. Each vent path will be provided with redundant solenoid operated valves which will fail closed on loss of power. In addition, a restriction orifice will be provided on the vent line to limit flow to less than the make-up capability of one charging pump.

Question

280.22 (SR) Verify that a control room fire will not cause spurious signals resulting in undesirable operation of any safe shutdown equipment controlled from the alternate shutdown panel.

Response In the event that temporary control room evacuation is required, the establishment and maintenance of a safe shutdown condition can be performed from the auxiliary control panel (ACP). Two transfer panels (A and B) are provided in order to transfer control of required trains of equipment (A and B respectively) from the main control board (MCB) in the Control Room to the ACP. In the transfer panel, the contacts to the MCB are normally closed and the contacts to the ACP are normally open. When transfer takes place, contacts to the MCB open and contacts to the ACP close. This switching methodology provides electrical isolation between the MCB circuits and the ACP circuits. The ACP, the MCB, and the transfer panels are in totally separate fire areas in the Reactor Auxiliary Building (see FSAR Figures 9.5A-9 and 9.5A-10). By the use of the transfer panels, in addition to the separate routing of circuits to the ACP, it is assured that spurious signals will not be sent to equipment which is being controlled from the ACP.

For additional information regarding the transfer panels refer to the response to Question 280.15 and FSAR Section 7.4.1.11.

Question

280.23 (SR) Verify that all associated circuits of concern whose fire-induced failure could affect safe shutdown have been adequately protected.

Response See the response to Question 280.13 (SR).

Question

280.25 (AR) In accordance with Section 9.5.1, Branch Technical Position ASB 9.5-1, position C.4.a.(1) of NRC Standard Review Plan and Section II.G of new Appendix R to 10 CFR Part 50, it is the staff's position that cabling for redundant safe shutdown systems should be separated by walls having a three-hour fire rating of equivalent protection (see Section III.G.2 of Appendix R). That is, cabling required for or associated with the primary method of shutdown, should be physically separated by the equivalent of a three-hour rated fire barrier from cabling required for or associated with the redundant or alternate method of shutdown. We need assurance that redundant shutdown cable systems and all other cable systems are separated from each other so that both are not subject to damage from a single fire hazard. Complete responses to the following list of requests for information should provide the information for each system needed to bring the plant to a safe shutdown.

Response As noted in the "Safe Shutdown Analysis," redundant Shutdown Cable Systems (and the associated Cable Systems) are separated or protected from each other so that both trains are not subject to damage from a single fire. For additional information and exemption requests, refer to the "Safe Shutdown Analysis" (SSA).

Question

280.26 (AR) Provide a table that lists all equipment including instrumentation and vital support system equipment required to achieve and maintain hot and/or cold shutdown. For each equipment listed:

a. Differentiate between equipment required to achieve and maintain hot shutdown and equipment required to achieve and maintain cold shutdown,

b. Define each equipment's location by fire area,

c. Define each equipment's redundant counterpart.

d. Identify each equipment's essential cabling (instrumentation, control, and power). For each cable identified: (1) Describe the cable routing (by fire area) from source to termination, and (2) Identify each fire area location where the cables are separated by less than a wall having a three-hour fire rating from cables for a redundant shutdown system, and

e. List any problem areas identified by item 280.26(d)(2) above that will be corrected in accordance with Section III.G.3 of Appendix R (i.e., alternate or dedicated shutdown capability).

Response For a discussion of equipment, instrumentation and essential cabling required to achieve and maintain hot and/or cold shutdown, and for information regarding equipment location by fire areas, refer to the "Safe Shutdown Analysis" (SSA).

Question

280.27 (AR) Provide a table that lists Class IE and Non-Class IE cables that are associated with the essential safe shutdown systems identified in item 1 above. For each cable listed: (See Note*)

a. Define the cables' association to the safe shutdown system (common power source, common raceway, separation less than IEEE Standard-384 guidelines, cables for equipment whose spurious operation will adversely affect shutdown systems, etc).

b. Describe each associated cable routing (by fire area) from source to termination, and

c. Identify each location where the associated cables are separated by less than a wall having a three-hour fire rating from cables required for or associated with any redundant shutdown system.

*Note

Option 280.28(a) is considered to be one method of meeting the requirements of Section III.G.3 Appendix R. If option 280.28(a) is selected, the information requested in items 280.27(a) and 280.27(c) above should be provided in general terms and the information requested by 280.27(b) need not be provided.

Response For information regarding cables necessary for safe shutdown, cable routing/raceways and fire areas, refer to the "Safe Shutdown Analysis," (SSA). For information regarding justification for equivalent protection also refer to the SSA. For information regarding IEEE-384, please refer to FSAR subsection 8.3.1.2.30.

Question

280.28 (AR) Provide one of the following for each of the circuits identified in item 280.27(c) above:

a. The results of an analysis that demonstrate that failure caused by open, ground, or hot short of cables will not affect its associated shutdown system.

b. Identify each circuit requiring a solution in accordance with Section III.G.3 of Appendix R, or

c. Identify each circuit meeting or that will be modified to meet the requirements of Section III.G.2 of Appendix R (i.e., three-hour wall, 20 feet of clear space with automatic fire suppression, or one-hour barrier with automatic fire suppression).

Response For information regarding the requirements of BTP-9.5.1 Position C.5.b, refer to the "Safe Shutdown Analysis," (SSA) and to the responses for SHNPP Questions 280.13 (SR) and 280.14 (SR). For information regarding separation criteria of cables, refer to FSAR subsection 8.3.1.2.30.

Question

280.29 (AR) To assure compliance with GDC 19, we require the following information to be provided for the control room. If credit is to be taken for an alternate or dedicated shutdown method for other fire areas (as identified by item 280.26(e) or 280.26(b), above) in accordance with Section III.G.3 of new Appendix R to 10 CFR Part 50, the following information will also be required for each of these plant areas.

a. A table that lists all equipment including instrumentation and vital support system equipment that are required by the primary method of achieving and maintaining hot and/or cold shutdown.

b. A table that lists all equipment including instrumentation and vital support system equipment that are required by the alternate, dedicated, or remote method of achieving and maintaining hot and/or cold shutdown.

c. Identify each alternate shutdown equipment listed in item 280.29(b), above, with essential cables (instrumentation, control and power) that are located in the fire area containing the primary shutdown equipment. For each equipment listed provide one of the following:

(1) Detailed electrical schematic drawings that show the essential cables that are duplicated elsewhere and are electrically isolated from the subject fire areas, or

(2) The results of an analysis that demonstrates that failure (open, ground, or hot short) of each cable identified will not affect the capability to achieve and maintain hot or cold shutdown.

d. Provide a table that lists Class IE and Non-Class IE cables that are associated with the alternate, dedicated, or remote method of shutdown. For each item listed, identify each associated cable located in the fire area containing the primary shutdown equipment. For each cable so identified provide the results of an analysis that demonstrates that failure (open, ground, or hot short) of the associated cable will not adversely affect the alternate, dedicated, or remote method of shutdown.

Response

For the SHNPP Unit 1 position with respect to BTP CMEB 9.5-1 Section C.5.b, refer to the "Safe Shutdown Analysis," (SSA). A table listing equipment including instrumentation and vital support system equipment that are required for achieving and maintaining hot and/or cold shutdown from either the Main Control Room or the Auxiliary Control Panel is provided in Tables 9.5B-1b and 9.5B-2b of the SSA. Additional information regarding remote shutdown capability is provided in FSAR Section 7.4.1 and can be used in conjunction with the SSA.

Redundant essential cables are physically and electrically isolated from each other. For additional information refer to SHNPP Question responses 280.15 (SR) and 280.22 (SR) Information regarding cables associated with remote shutdown is provided in tables 9.5B-4a and 9.5B-4b of the SSA.