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Department of Nuclear Energy

50-285

March 14, 1980

Mr. Robert L. Ferguson
Plant Systems Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: Fort Calhoun, Fire Protection Review, Items 3.1.4, 3.1.12, 3.1.15,
3.1.16, 3.1.20, 3.1.28, 3.2.2, 3.2.3, and 3.2.4.

Dear Bob:

The above listed items comprise the nine Brookhaven National Laboratory
input in accordance with the current licensee information that we have on
hand.

Respectfully yours,

Robert E. Hall, Group Leader
Reactor Engineering Analysis

REH:EAM:sd
attachment

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FORT CALHOUN

Fire Protection Review

Item 3.1.4 - Fuel Tank for Diesel Driven Fire Pump

SER Section 3.1.4 indicates that a modification will be made to prevent structural steel framing in the vicinity of the fuel storage tank, supplying the diesel engine-driven fire water pump, from being damaged by a fire at the tank.

By letter dated August 23, 1978, the licensee proposed to provide a reinforced concrete block enclosure around the diesel fuel tank, and fill the space between the tank and the enclosure walls with sand and/or limestone.

The proposed modification effectively buries the tank and eliminated it as a possible fire hazard. However, the proposed arrangement of liquid level indicator and drain line did not sufficiently eliminate the possibility of a diesel fuel leak which could present a fire hazard to the intake structure. Therefore, the staff recommended the following modifications or equivalent alternatives be incorporated:

1. The drain line should be terminated above the enclosure without penetrating the enclosure wall.
2. The existing "sight glass" level indicator on top of the tank should be used instead of the proposed level indicator.

Subsequently, by letter dated May 23, 1979, the licensee provided a revised plan which includes concrete wing walls to protect the drain line and the sight glass.

This item is satisfactory and we recommend that the staff accept it.

Item 3.1.12 - Fire Detectors

SER Section 3.1.12 indicates that the licensee will install fire detectors in the two safety injection and containment spray pump rooms on elevation 971' of the auxiliary building.

By letter dated January 8, 1979, the licensee provided a Fire Detector Analysis which showed the approximate locations of the three ionization type smoke detectors proposed to be installed in each of these rooms.

The proposed modifications appeared to be satisfactory, with one exception. The detectors to be installed in safety injection and containment spray pump room number 2 (Fire Area 2) are shown on drawing no. 13007-SK-3 to be upstream of a cable tray in the room. Because of the postulated air flow patterns in this room, a fire in these cables may not be readily detected by these detectors. We had previously recommended to the staff that unless there were additional considerations not included in the licensee's analysis, a better location for the two detectors between column lines 6E and 8A would be west of the cable tray shown on the drawing.

Subsequently, by letter dated July 9, 1979, the licensee indicated that the cable tray of concern contains two nonsafety-related control cables while the cable tray on the east side of the room contains 28 control cables (of which 24 are safety-related) and six power cables (of which 4 are safety-related). The selected locations of the detectors are above the safety injection pumps where the exposure fire hazard to the cables is greatest. Therefore, the licensee concluded that the selected detector locations are optimum for the fire hazards in the room.

We accept the licensee's position and find this item satisfactory and recommend that the staff accept it.

Items 3.1.15 and 3.2.4 - Cable Separation

SER Sections 3.1.15 and 3.2.4 indicate that the licensee will:

- Apply flame retardant coatings to cables or install fire barriers in areas where redundant trains of safety-related cables do not meet the separation requirements, or where nonsafety-related cables are interposed between redundant divisions of safety-related cables,
- Describe the minimum separation between redundant cables, including the presence of interposing combustibles, and propose modifications to preserve the safe shutdown capability of the plant in all areas in which redundant safe shutdown related cables are located.

By letter dated September 29, 1978, the licensee provided the results of a cable separation analysis and proposed various modifications for areas where the licensee judged cable separation to be inadequate. The licensee assumed that cable separation in an individual fire area is inadequate only if:

- More than one division of safety-related cables is present, and
- Alternate methods (including manual operation of valves) of performing the safe shutdown functions for which the affected cables exist are not available.

We believe that these assumptions are acceptable to the NRC staff subject to verification by the licensee that the valves which have to be manually operated are in areas unaffected by the postulated fires.

By letter dated July 9, 1979, the licensee submitted additional information requested by the NRC staff during a conference call on May 23, 1979. The licensee revised several parts of the previously submitted cable separation analysis, and provided engineering drawings and descriptions of proposed modifications.

There are eight fire areas in which the cable separation is not adequate. The licensee will provide alternate shutdown capability independent of the cable spreading room (Fire Area 41) and the control room complex (Fire Area 42), and will install a 3 hour rated fire barrier between redundant cables and equipment in the switchgear area (Fire Area 36). In the remaining five areas (Fire Areas 6, 31, 32, 34A and 34B), the licensee has proposed to separate one division of safe shutdown cables from the redundant division with 3 hour rated enclosures or noncombustible barriers.

The information submitted by the licensee for Fire Areas 6 and 31 describes the cables which will be protected, and the method of protection. The concept of a rated barrier enclosing the cables is satisfactory, but we recommend that the NRC require the licensee to:

- Indicate the identity of the UL listed designs which will be used. If UL listed designs are not used, the basis for acceptability of the proposed designs should be provided.
- Verify that the proposed enclosures will not adversely affect the ampacity of the enclosed cables under nonfire conditions and under load.
- Verify that the temperature rise inside an enclosure during a fire in the room will not adversely affect the performance of the cables, while under load.
- Verify that in Fire Area 6, 2 inches of Pyrocrete on metal lath is to be applied all around the cables to be protected. The information that we received from the licensee was not clear on this point.
- Verify that in Fire Area 31 the serviceability of the proposed removable Pyrocrete panels is adequate for the intended use, and that Pyrocrete will be applied to all members shown on Section 1-1 of Stone and Webster Drawing No. 13007.37-SD-30C-2.

Only one drawing (no. 13007.37-ES-37D-1) showing some of the details of the fire barriers proposed for Fire Areas 32, 34A, and 34B was provided. The drawing did not identify the fire area to which each of the details applied, but Barrier number 1 seems to correspond to Fire Area 32, Barrier number 2 to Fire Area 33, Barrier number 3 to Fire Area 34A, and Barrier number 4 to Fire Area 32. However, the detailed drawings of Barriers 3 and 4 do not actually show any barriers. The licensee response also indicates that barrier dimensions are in accordance with the provisions of IEEE 384-1977. The criteria in IEEE 384 for separation of redundant cables in general plant areas (Section 5.1.4) do not apply if there is potential for an exposure fire.

In addition to previous requirements, we recommend that the staff request the licensee to:

- Provide the barrier details missing from Stone and Webster Drawing No. 13007.37-ES-37D-1.
- Justify, by test or analysis, that the proposed fire barriers will be effective in preventing damage to redundant cables.

We will complete our evaluation of proposed modifications following receipt of requested information.

Item 3.1.16 - Fire Water Supply

SER Section 3.1.16 indicates that the motor-driven fire water pump recirculation line will be increased from 3 inches to 10 inches in diameter, and the pump intake line will be relocated so that previously experienced failure of the pump due to sand and silt clogging the pump intake will not occur. The licensee will also perform a special operational test of the fire water system, on a sprinkler system mock-up. The purpose of the test is to:

- Verify that any sand or silt in the fire water system will not clog the sprinkler orifices or branch lines, and
- Quantify the amount of silt or sand that may get into the fire water system.

These modifications are due to be completed by March, 1980. The design details and results of the special operational test have not been received yet. We will complete our evaluation of this section following the receipt of the necessary information. We recommend that the staff request the licensee to verify that the increased size of the recirculation line produces the optimum flow and velocity for keeping the intake free of sand and silt.

Item 3.1.20 - Cable Penetration Seals

SER Section 3.1.20 indicates that the licensee will upgrade the electrical cable penetration seals to a design demonstrated by test to have a 3 hour fire resistance rating.

By letter dated October 18, 1978, the licensee described the proposed modifications to achieve the 3 hour fire resistance rating. The licensee also indicated that penetration seals being installed have passed tests conducted generally in agreement with the methods and criteria described in the NRC August 30, 1977 letter to the Omaha Public Power District, except that no pressure differential was applied across the seals during the test.

The licensee stated that Chemtron Corporation, to whose installation procedures Fort Calhoun cable penetration seals have been installed, acknowledged that a 3 hour fire test was successfully conducted with a positive pressure of 9.0 inches of water maintained on a 5,885 square inch penetration.

Because the largest penetration in the plant is 1,924 square inches, and because the maximum expected nonfire differential pressure is approximately 0.5 inches of water, we find the proposed modifications for cable penetration seals satisfactory and recommend that the staff accept this item.

Item 3.1.28 - Protection for Stairways and Open Hatch

SER Section 3.1.28 indicates that the stairway in the electrical penetration area (Fire Area 34) will be enclosed by fire barriers to provide 3 hour rated separation between basement and ground levels. A water curtain actuated by smoke detectors will be provided at the open stairway and open hatch which join personnel corridors in the basement level (Fire Area 6) and the ground floor level (Fire Area 20).

By letter dated December 12, 1979, the licensee provided drawings and a description of the proposed water curtains. By letter dated January 18, 1980, the licensee indicated that the water curtains became operational on January 11, 1980. The licensee's response did not provide the design basis for the water curtains. In addition, the sprinkler contractor's drawings of the area did not indicate the size and location of draft stops around each floor opening.

We recommend that the staff request that the licensee:

- Provide a design basis for the water curtains and verify by hydraulic calculations that the required water flow is achieved with all water curtains operating.
- Indicate the size and location of draft stops around each floor opening protected by a water curtain.
- Verify that cross-zoning is between detectors on individual floors as well as between detectors on both floors.
- Provide a capability for remote actuation of the water curtains from outside the personnel corridors, or justify the absence of such a feature.

We will complete our evaluation of projection for stairways and open hatch openings following receipt of the required information.

Item 3.2.2 - Testing Fire Detectors

SER Section 3.2.2 indicates that the licensee will provide the basis and criteria for the installation and testing of fire detectors in the plant.

By letter dated January 8, 1979, the licensee submitted a Fire Detector Analysis which outlined the basis for location, spacing, and number of fire detectors in Plant Fire Areas 1 through 43. In addition, the Fire Detector Analysis provided descriptions and drawings of all safety-related plant areas. By letter dated July 9, 1979, the licensee responded to staff questions and concerns raised during a May 23, 1979 conference call.

Staff evaluation indicates that the licensee's Fire Detector Analysis is generally less conservative than NFPA 72E in determining the spacing of fire detectors below non-smooth ceilings. The practical result is that detection times may be longer than that which could be achieved by compliance with NFPA 72E.

For areas in which only one division of safety-related equipment or cables is located, a small delay in fire detection, although not desirable, is tolerable. However, it is imperative that detection in areas containing redundant divisions of safety-related equipment or cable be prompt relative to the rate of fire spread. Upon completion of the modifications described in the SER, there will be eight areas containing redundant divisions of safety-related cables or equipment, including:

- Fire Areas 6 and 20, personnel corridor areas
- Fire Area 10, charging pump area
- Fire Area 30, containment
- Fire Area 31, intake structure
- Fire Area 32, compressor area

- Fire Area 41, cable spreading room
- Fire Area 42, control room complex

The licensee will provide alternate safe shutdown capability independent of Fire Areas 41 and 42. Fire Areas 10 and 13 have essentially smooth ceilings, and detector location and spacing there are satisfactory, considering the location of combustibles.

The arrangement of combustibles and fire detectors in Fire Area 30, containment, is such that fires in cable trays beneath open metal floor grates may not be readily detected. However, redundant divisions of cables are sufficiently remote from each other so that the safe shutdown capability of the plant would not be endangered.

Fire Area 32, the compressor area, contains redundant auxiliary feedwater pumps. The licensee will install a barrier between these pumps and additional detectors in the areas of the pumps. This combination should be effective in preserving at least one pump in event of fire.

Fire Areas 6 and 20, personnel corridor areas, joined by an open stairway and open hatch, contain redundant divisions of cable. The licensee has proposed to install a water curtain at each floor opening, actuated by detectors. The locations of the detectors appear to be satisfactory for the intended purpose. A complete discussion is contained in our evaluation of the licensee response to SER Section 3.1.28.

The licensee has not provided any information on the testing of fire detectors in the plant. Also, the manufacturer's literature supplied by the licensee indicates that the ionization type detector presently installed (Pyrotronics DIS-3/5A) is not recommended in areas where the air velocity is less than 25 feet per minute, and there are many areas in the plant in which the air velocity is less than 25 feet per minute.

We will therefore recommend that the staff require the licensee to:

- Provide information on the testing of detectors in the plant, and
- Install Pyrotronics Model DIS-5B detectors or equal of other manufacturers in lieu of DIS-3/5A detectors in areas where air velocities are less than 25 feet per minute.

We recommend that the staff keep this item open at the present time.

Item 3.2.3 - Reactor Coolant Pump Oil Collection System

SER Section 3.2.3 indicates that the licensee will provide one of the following:

- A lube oil collection system to contain lube oil leakage and to drain leaked oil to a safe place.
- A fire suppression system to control a lube oil fire and to protect the reactor components from that fire.

- The results of a study demonstrating that safe shutdown will not be impaired in the event of an unmitigated reactor coolant pump lube oil fire.

By letter dated June 6, 1979, the licensee proposed to install lube oil collection systems and provided the design description and drawings for the proposed systems.

We have reviewed the submitted information and find it satisfactory. We recommend that the staff accept this item.