



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

June 13, 1977

Docket No. 50-261

LICENSEE: Carolina Power and Light (CP&L)

FACILITY: H. B. Robinson Steam Electric Plant Unit No. 2  
(Robinson-2)

SUMMARY OF MEETING HELD ON JUNE 2 AND 3, 1977 TO DISCUSS FIRE PROTECTION MEASURES

A list of attendees is attached.

On June 2 and 3, 1977, representatives of CP&L and their consultants met with the staff to discuss the fire protection analysis and fire protection program for Robinson-2.

The agenda for the meeting, in the form of questions and tentative staff positions previously sent to CP&L, is also attached.

Commitments made by the licensee in the course of the meeting included the following (identified by Agenda number):

1. The licensee will supply the requested information by September 1, 1977.
2. The licensee identified 7 deficient areas and agreed to take corrective action.
3. The licensee committed to re-routing to the exterior the hydrogen line to the Volume Control Tank. Re-routing of the diesel fuel line is still under review by the licensee.
4. The licensee stated that any suppression system installed would be isolable from the hose station that would serve that area.
6. The licensee will:
  - a. Provide sketches of all representative cable penetrations discussed in the meeting.
  - b. Provide test results for these representative penetrations.

*memo 4*

- c. Provide a justification of the adequacy of these representative penetration based on a worse case fire.
  - d. Within 3 weeks of June 3, 1977, provide a schedule for completion of the above effort.
  - e. Provide a justification for excluding any type of penetrations, such as containment penetrations from the test schedule.
  - f. Provide a justification for not providing a fire stop in the diesel generator bus bar Panduits.
- 7B. The licensee will confirm when the permanent fire house is completed (December, 1978).
- 7C. The licensee is already in conformance. Additional lanterns, dedicated for fire service, will be provided when the permanent fire house is completed.
- 1-3. The licensee will modify his system as necessary to conform.
- 8-1. The licensee will provide a detector in this area.
- 10-2. The licensee will provide sprinklers over the air compressors, will provide fire detectors and will apply Flamemastic to the cables in this area.
- 15-1. The licensee will provide a 3 hour barrier between the Battery Room complex and adjoining areas, but does not agree to providing additional barriers between the two Battery Rooms.
- 16-1. The licensee will provide a stable mounting for this cabinet, and determine if there is a better location inside the room.
- 18-1. The licensee reaffirmed his commitment to provide a dedicated system which would permit safe shutdown and cooldown of the plant despite the effects of a fire at any one location. The licensee presented a preliminary sketch of such a system based on a fire in the Cable Spreading Room.
- 21-4. The licensee agreed to upgrade the kitchen to provide permanent appliances and better storage conditions. He will also provide a portable extinguisher in the kitchen.

- 27-4. The licensee will upgrade the shield to the present Westinghouse system.
- 28-1. The licensee will provide one detector for each RHR pump pit.
- 30-2. The licensee has already provided a dike around the diesel oil storage tank to prevent the spread of oil.

In addition to the above, the licensee agreed to provide written responses to the following Agenda Items by June 24, 1977:

1\*, 2, 3, 6, 9, 10, 11, 12, 13, 16, 18, 1-3, 1-4 (combine with Item 6), 1-5, 3-2, 8-1, 9-1, 9-2, 10-1 (combine with Item 3), 10-2, 14-3, 15-1, 15-2, 15-3, 15-4, 16-1, 18-1\*, 18-2, 18-6, 18-7, 18-8, 18-9, 20-1, 20-2, 21-1, 21-2, 21-4, 21-6 (combine with Item 2), 27-1 through 27-8, 29-1, 29-2.

The staff also requested that the licensee provide by the same date:

1. A schedule for completion of the proposed modifications (assuming they were already approved in their present form by the staff), and
2. A schedule for submission of a description of proposed interim measures for safe shutdown and cooldown pending completion of the dedicated system.

The staff noted the licensee's commitments listed above but reserved judgement as to their adequacy pending review of the written submittals.

With respect to Agenda Items 8 and 1-7, these questions were withdrawn by the staff pending further definition.

The staff announced that a meeting to discuss the licensee's documented responses would be held either on June 30 or July 11, 1977. Subsequent to the meeting, the July 11, 1977 date was selected.

G. B. Zwetzig, Project Manager  
Operating Reactors Branch #4  
Division of Operating Reactors

\*To be supplied by September 1, 1977.

OFFICE ➤	ORB#4-SDR	PS:DR	C-ORB#4-TDR			
SURNAME ➤	GZwetzig	R Ferguson	PWRD			
DATE ➤	6/13/77	6/15/77	6/17/77			

MEETING WITH CP&L JUNE 2 AND 3, 1977

LIST OF ATTENDEES

NRC

G. B. Zwetzig  
T. M. Lee  
M. J. Virgilio  
R. L. Ferguson

NUS Corporation

P. W. Eshleman  
W. H. Doyle  
K. D. Kirby  
A. A. Katterhenry

Rolf Jensen & Assoc., Inc. \*

CP&L

J. B. Klevan

D. B. Waters  
W. Hills  
R. H. Chambers  
M. F. Page  
W. J. Caraway

BNL\*\*

B. E. Hall \*  
E. A. MacDougall \*

\* NRC Consultant

\*\* June 2, 1977 only

QUESTIONS AND TENTATIVE STAFF POSITIONS

H. B. ROBINSON UNIT NO. 2

FIRE PROTECTION EVALUATION

GENERIC QUESTIONS

1. Provide the design criteria for all automatic suppression and detection systems (both existing and proposed) including such items as design densities, soak times, power supplies, and associated alarms. Identify areas of non-compliance with applicable NFPA Standards.
2. Do the manual hose stations conform to all the requirements of NFPA 14? Demonstrate that all points of safety related areas can be reached with the length of hose stored at manual hose stations. Additional stations may be required to adequately service fire areas 20 and 18.
3. Identify any piping containing flammable gas or liquid which is routed through areas containing safety-related equipment, safety-related cables or through which personnel must pass to reach safety-related equipment. Also identify any areas of these types in which the flammable gas or liquid could enter in the event of a pipe break.
4. Verify that a single failure in a fire protection system would not impair both primary and backup fire suppression capabilities.
5. Certain cables electrically connected to equipment necessary for safe shutdown may be used for functions designated as non safety related and therefore classified as non safety related. Examples of these might be remote indicating lights for valves breakers etc. Describe whether such cables are kept with the safety division to which they were originally connected and if not describe the effects on the safe shutdown equipment due to shorts to these cables as a result of fire.
- P. 6. A representative of each design of the cable penetration fire barrier should be tested to demonstrate a three-hour rating, as is required for fire barriers. The tests should be performed or witnessed by a representative of a qualified independent testing laboratory, and should include the following:
  - (1) The tests should be performed in accordance with ASTM E-119 and the following conditions.
  - (2) The cables used in the test should include the cable insulation materials used in the facility.

- (3) The test sample should be representative of the worst case configuration of cable loading, cable tray arrangement, anchoring and penetration fire barrier size and design. The test sample should also be representative of the cable sizes in the facility. Testing of the penetration fire barrier in the floor configuration will qualify the fire stop for use in the wall configuration also.
- (4) Cables penetrating the fire barrier should extend at least three feet on the unexposed side and at least one foot on the exposed side.
- (5) The fire barrier should be tested in both directions unless the fire barrier is symmetrical.
- (6) The fire barrier should be tested with a pressure differential across it that is equivalent to the maximum pressure differential a fire barrier in the plant is expected to experience.
- (7) The temperature levels of the cable insulation, cable conductor, cable tray, conduit, and fire stop material should be recorded for the unexposed side of the fire barrier.
- (8) Acceptance Criteria - The test is successful if:
  - a. The cable penetration fire barrier has withstood the fire endurance test without passage of flame or ignition of cables on the unexposed side for a period of three hours, and
  - b. The temperature levels recorded for the unexposed side are analyzed and demonstrate that the maximum temperature are sufficiently below the cable insulation ignition temperature, and
  - c. The fire barrier remains intact and does not allow projection of water beyond the unexposed surface during the hose stream test.

If previous test can be shown to meet the above position, the licensee should provide the results of the tests to show that the above position is met.

7. A) Justify the adequacy of the quantity of portable lanterns and self contained breathing apparatus.
- P. B) Provide two spare bottles for each self contained breathing unit and 6 hour onsite reserve of air.
- P. C) Portable lanterns should be dedicated exclusively for emergency use and stored in places easily accessible for fire fighting at all times.
- P. 8. With regard to your fire hazard analyses, calculation of the combustible loading by spreading all combustibles out evenly, over the whole fire area is not acceptable. Rather, local effects and the arrangement of combustibles should be taken into account. Also, using the Fire Protection Handbook to determine the fire severity may not be proper, as most of the tables in the handbook were compiled for office occupancy involving papers and wood. Typical combustibles such as oils, PVC and flammable gases in the nuclear plants have very much different burning characteristics. Accordingly, revise and resubmit those portions of your fire hazard analyses as necessary to take these factors into account. For each case, explain how the flammable liquid spread was determined, and how the burning rate(s) was determined for the combustibles in each fire area.
9. Discuss whether a fire could affect the instrument air system such as to cause a power transient equal to or greater than those considered in the FSAR. Could the fire prevent recovery from the transient in the manner described in the FSAR?
10. In all the areas where manual fire fighting is proposed as either primary or backup means of suppression describe the methods which would be used for heat and smoke removal using either fixed or portable air handling equipment.
11. Provide information concerning the method of supervision of fire doors and fire suppression system cutout valves for those doors and valves for which this information was not specified in your Fire Hazards Analysis.
12. Verify that all stairways in the auxiliary building are protected by fire barriers as specified by BTP 9.5.1.
13. Justify the adequacy of the present fire brigade size, taking into consideration, in the event of a major fire, the number of people required to shutdown the plant from the remote panels and/or dedicated system. This analysis should be performed for the shift when the least number of personnel

\* Items marked with P. are tentative staff positions.

- are present in the plant.
14. Justify lack of fire detectors in the turbine control oil system and generator hydrogen system areas.
  15. Provide a detailed drawing of the fire main showing the cross-connection with the Unit 1 fire main. The drawing should show the relative position of these with respect to intake structure. Verify that the fire water supply system meets all of our requirements as stated in BTP 9.5-1.
  16. Identify the location of all safety-related remote shutdown panels required for safe shutdown and demonstrate that no fire which could impair control from the control room could also prevent access to these remote shutdown areas.
  17. In the fire hazards analysis the licensees committed to relocating stored dry ion exchange resin, away from safety related areas. Where was this resin relocated and what is the distance to the closest safety-related area.
  18. We require, as stated in BTP 9.5-1, that floors, walls and ceilings enclosing separate fire areas have a minimum fire rating of three hours. List those areas of the plant where this three-hour criteria is not met and provide the basis or the fire hazards analysis used to conclude that they "exceed the requirements set by the fire hazard." (Statement taken from page 4-178 of the Fire Hazards Analysis.)

Fire Area 1 & 2, Diesel Generator

- P. 1-1. Diesel oil make-up to "A" room should be re-routed so as not to pass through "B" room and should be supplied with separate isolation valves.
- 1-2. Provide an evaluation of the consequences of a fire in a diesel generator room which causes a failure of a pipe or electrical cable which passes through but does not terminate in the diesel generator room. Describe the effect of such an event on safe shutdown and the emergency power supply.
- 1-3. Are the ventilation supply and exhaust fans serving the diesel generator room wired such that activation of the suppression system (CO<sub>2</sub>) will de-energize both fan motors? If not, justify the acceptability of your design.
- 1-4. Is the diesel bus bar (enclosed in plastic conduit) provided with a fire stop at the wall penetration? This penetration design should be included in tests of penetrations.

- 1-5. Provide details on the operation of the automatic fuel shutoff for the diesel generators, including the indication system.
- 1-6. Are drains provided to remove diesel oil from the diesel generator room in the event of a day tank rupture and are these drains so designed to prevent the spread of fire to other areas of the plant?
- P. 1-7. The system employed to close the fire doors of the diesel generator rooms does not appear to represent a well-established and proven design or a UL-approved design, and therefore may be of questionable reliability. Provide documentation demonstrating that the reliability of this design is comparable to that of approved designs or modify the system to provide a design of proven reliability.

Fire Area #3 (Combine 3, 4, 5, 7) Containment Spray Pumps, Safety Injection Pumps etc;

- P. 3-1. We require, as stated in BTP 9.5.1, that automatic detection and suppression be provided in this area. Provide justification for why such systems are not proposed.
- 3-2. In the pump rooms (Fire Areas 3, 4, and 5) where manual fire suppression is to be used, what protection is provided to safety related redundant pumps and motors from becoming incapacitated by inadvertent water spray.
- 3-3. Describe the methods which would be used in each area for heat and smoke removal using either fixed or portable air handling equipment. Describe how exhaust and makeup air would be provided to achieve adequate air movement.

Fire Area #8 ECCS Equipment Area

- 8-1. Provide an analysis showing whether a charcoal fire in this area could damage any safety related piping traversing this area.

Fire Area #9 and #34 North South Cable Vault

- P. 9-1. During the site visit it was noted that tray markings indicated that cabling of both divisions were routed thru the north cable vault. Clarify the statement in the Fire Hazards Analysis which says "redundant safety related cabling is separated by division of this room" (page 4-75).
- 9-2. BTP 9.5.1 section III.B discussed the advantages of using water to suppress electrical fires. It is known that CO<sub>2</sub> systems are not effective against deep seated cable fires. Provide justification for use of CO<sub>2</sub> system in this area.

Fire Area 10A through 10C Auxiliary Building Hallway

- P. 10-1. BTP 9.5.1 Section D.2 emphasizes that safety related systems should be isolated or separated from combustible materials. Currently the piping for hydrogen supply to the volume control tank is routed through this area where both divisions of safety-related cables are present. This piping should be relocated out of the area.
- P. 10-2. We require, as stated in BTP 9.5.1 Section D.3, that automatic water sprinklers be provided for this area.

Fire Area 14C Volume Control Tank

- 14-1. Hydrogen supply piping terminates in this area, thereby presenting hazards from leakage and subsequent hydrogen concentration buildup. Justify the lack of ventilation flow/hydrogen concentration monitoring equipment.
- 14-2. Are all electric switches in the room of the explosion proof type? If not, justify the use of non-explosion-proof switches.

Fire Area 14F/14G Auxiliary Building Exhaust Fan Rooms

- 14-3. Verify that the prefilters and absolute filters used in all exhaust systems are of non-combustible construction.

Fire Area 15 Battery Room

- P. 15-1. BTP 9.5.1 Section D.7 states that "battery rooms should be separated from each other and other areas of the plant by barriers having a minimum fire rating of 3 hours inclusive of all penetrations and openings." How does the licensee propose to comply with this position?
- P. 15-2. Hydrogen concentration monitoring is not currently provided in the battery room. Licensee shall provide either hydrogen concentration or ventilation flow monitoring.
- 15-3. The major fire hazards in this area are the battery chargers. Provide an analysis to show the adequacy of the type and location of the detectors in this fire area.
- 15-4. Verify that all electric switches in the room are of an approved explosion proof type.

Fire Area #16 Heat and Vent Equipment For Control Room

- 16-1. The metal cabinet in this area which is used to store paper computer tapes, appears to be unstable and a possible fire hazard. It is also poorly located relative to the charcoal filters in this area. You are requested to either relocate this cabinet and provide a more stable mounting, or provide the results of an analysis which shows that a fire involving the paper computer tapes in the metal cabinet in this area will not jeopardize personnel habitability, and damage the instrumentation in the control room. The evaluation should consider the cabinet doors being open or shut, the cabinet being upright or toppled, the tapes contained in the cabinet or scattered on the floor, and the impact of radiant and or convection heat transfer on both the mechanical equipment and ventilating duct in this area. The evaluation shall also consider the possibility of charcoal filters generating CO due to externally applied heat.

Fire Area #17 Unit One Cable Spreading Room

- 17-1. The Unit 1 Cable Spreading Room shall be separated from other areas of the plant by fire barriers of a 3 hour minimum rating. All openings, penetrations, and doors should be upgraded to the equivalent rating.

Fire Area 18 and 19 Cable Spreading Room/Electrical Equipment Area

- P. 18-1. Describe in detail the separate dedicated system which will provide the independent capability for remote safe shutdown. Provide a list of the systems and components which will be controlled by this system. Provide the details of the physical layout of the power and control cable and the routing through the plant showing that the system could not be effected by the same fire which could damage redundant divisions of cable needed for normal safe shutdown.
- P. 18-2. Due to the difficulty in providing separation of the safety-related cables in this plant, engineering of this dedicated system should commence immediately. A schedule for implementation should be provided as soon as possible.
- P. 18-3. Total flooding gas systems are not known to be effective against deep seated fires. We require an automatic water suppression system be provided for this area as stated in BTP 9.5.1, section D.3 and Appendix A.
- 18-4. Verify the fire resistance rating of the penetrations in the area.

- 18-5. Provide the details for operating the proposed ventilation damper system to vent smoke from the area, in the event manual fire fighting becomes necessary, considering the possibility of the fire interrupting power to the damper.
- 18-6. If manual hose suppression in this area becomes necessary what protection has or will be provided to shield vital cabinets containing safety related electrical equipment from water damage. What drainage is available for the area.
- P. 18-7. Cable trays above the relay cabinets are overloaded such that no spatial separation has been provided between trays. Measures shall be taken to provide adequate separation between trays.
- P. 18-8. The proposed application of flamemastic coating is such that an entire stack of trays may be encased. By what means can the licensee ensure that no cables from both divisions will be encased in the same application. Encasing more than one tray in a single application is not acceptable.
- 18-9. During the site visit it was observed that 4 cable trays above safety related emergency bus were marked indicating that both divisions of safety related cables were in the same tray. Does this conform to your cable separation criteria?

Fire Area 20 Rod Control Room

- 20-1. Verify that a fire in the rod control cabinets or cables in this area would not prevent rod insertion or cause a power transient to be imposed on the reactor, by rod drive malfunction.
- 20-2. Could a fire in any area result in the application of power to the control rod drive units in such a manner as to prevent the release of the control rods upon receipt of a trip signal?

Fire Area 21 A, B, C Control Room

- 21-1. BTP 9.5.1 D.2 states "The control room is essential for safe operation. It must be protected against disabling fire damage and should be separated from other areas of the plant by floors, walls and roof having a minimum fire resistance rating of three hours." Certain portions of the control room do not meet this criterion. Provide your plans for meeting this criterion or an analysis justifying a lower fire rating.

- P. 21-2. Immediate detection and suppression of a fire in a control room cabinet and console may be vital for safe shutdown. Suitable fire detectors should be provided for each safety-related cabinet, or their omission should be fully justified.
- 21-3 During the site visit it was noted that a table in the Hagan room is being used for instrument repair. Routine modifications and repairs should be performed in a repair shop outside of the control area. Electrical appliances and tools other than those necessary for normal operation should be restricted from the area.
- 21-4. In the kitchen area, to minimize the fire hazard the following are recommended. A) cooking appliances should be of fixed, permanent type. B) the area should be separated from the control room by a rated fire door. C) strict administrative controls on housekeeping should be provided including the control of combustibles such as paper plates, napkins, etc. in metal cabinets. D) Automatic detection and suppression should be provided for this area. E) Additional Type A extinguisher should be provided for this area.
- 21-5. Considering the size of the area and quantity of equipments in the control room and Hagan room, justify that two portable fire extinguishers will be sufficient for any anticipated fires.
- 21-6. Justify that the proposed additional hose station on the observation deck is adequate to service both the control room and the Hagan room. Consideration should be given to the hazards involved in dragging a water hose through the control room. An additional hose station is advisable at the back entrance to the Hagan room.

Fire Area 25A Turbine Building

- 25-1. Since the auxiliary boiler which handles large quantities of combustibles is located adjacent to the auxiliary feed water pump (which is safety related), discuss whether a detector(s) should be provided in this area for quick detection of fire.
- P. 25-2. The auxiliary boiler should be provided with automatic fuel oil shut off system. Means shall be provided to shut off fuel supply when fire occurs outside of the boiler.

Fire Area 25 B, C, D Turbine Oil Systems Area

25-3. What provisions are available to trip the oil pumps once a fire is detected in the turbine oil reservoir area?

25-4. Are both lube oil reservoir and storage tank protected by deluge system?

Fire Area 26 Transformers

26-1. What provisions are available to de-energize the fans and oil pumps of the transformers once a fire is detected and automatic suppression initiated.

Fire Area 27A Containment Cable Penetration Area

27-1. Fire in the area would impair the safe plant shutdown capability. Fixed fire suppression capability should be provided per BTP 9.5.1.

27-2. What is type and who is the manufacturer of this large pressurized water extinguisher proposed for this area. Is it UL listed or FM approved?

Fire Area 27B Containment

27-3. A portable pressurized water and/or foam extinguisher is proposed for these areas where accessibility and radioactivity area known to be a problem. Fixed suppression capability should be provided, justify lack of such.

27-4. Has shielding of some sort been provided to prevent contact of leaked lube oil with hot pump surfaces? If not, justify lack of such.

27-5. Describe the automatic fire detection to be provided for each of the primary coolant pumps.

Fire Area 27C Containment General Area

27-6. How large a fire would be required in order to activate a detector in the air recirculating units? Consider the effects of dilution of the smoke by the large volume of air in the containment.

P. 27-7. A repeater(s) shall be installed inside the containment area to facilitate the use of portable radio in manual fire fighting.

27-8. Manual hose stations or equivalent protection from portable systems capable of providing protection for all areas susceptible to fires should be provided inside containment.

- 27-9. Present the results of the analysis to justify the Statement in your submittal, page 4-212 "Fire system water in the containment would represent a potential boron diluent in the event of a LOCA, and would therefore cause a nuclear safety problem". This analysis should take into account the amount of borated water from the refueling water storage tank, and additional boron injection rates via systems and methods provided.

Fire Area 29 RUC Pump Pit

- 28-1 Since manual suppression is proposed as the only method of fire fighting, provide detailed information with regard to radioactivity level in and accessibility to this area.

Fire Area 29 Intake Structure

- P. 29-1. Due to the high fire and/or explosion hazard of the propane gas storage tank, it should be either enclosed within an explosion proof fire barrier and protected by automatic detection and suppression system, or relocated away from service water, and electric fire water pumps.
- 29-2. What means are available for continuous fire detection at the intake structure? If none are provided, justify the absence of such means.
- 29-3. Provide the results of an analysis which demonstrate the satisfactory long term operation of the propane gas driven fire pump in sub-freezing weather.
- 29-4. Provide details of the method used for determining the fire loading for the propane tank.

Fire Area 30, 31, 32, Storage Tanks

- 30-1. Provide an analysis showing the effect of a fire in the diesel oil storage tank on the safety related Water Storage tank.
- 30-2. What design features are provided to limit the spread of diesel oil in the event of storage tank rupture.

MEETING SUMMARY DISTRIBUTION

ORB#4

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Docket File

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