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WISCONSIN PUBLIC SERVICE CORPORATION

Public Service

P.O. Box 1200, Green Bay, Wisconsin 54305

May 26, 1978

Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention Mr. A. Schwencer, Chief
Operating Reactor Branch #1

Gentlemen:

Docket 50-305
Operating License DPR-43
Response to Request for Additional Information and
Staff Positions Concerning Fire Hazards Analysis

Enclosed please find twenty (20) copies of Enclosure 1, our response to your request for additional information and Enclosure 2, our response to the staff positions concerning Fire Protection at the Kewaunee Nuclear Power Plant.

Very truly yours,

E. W. James
Senior Vice President
Power Supply & Engineering

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Enc.

A006
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1/20*

ENCLOSURE 1
REQUEST FOR ADDITIONAL INFORMATION

1. The fire hazards analysis for Kewaunee has taken credit for cable separation meeting Regulatory Guide 1.75 to assure redundant divisions are not affected by the same fire. However, where cables for redundant safe shutdown systems are located in the same fire area separation is not of itself, sufficient assurance that redundant cables will not be involved in the postulated design basis fire. Possible involvement of redundant safe shutdown cables because of increased room temperature and radiant heat transfer or due to interposing combustible materials such as non-safety related cables in separate trays which provide a path between redundant trays must be considered. Additionally, credit for flame tests of Kewaunee cables cannot be taken to demonstrate that such a fire will not significantly propagate past its source. Whereas such tests may screen out highly combustible material, they in no way simulate the fire behavior of the cables in the configurations found in the Kewaunee facility.

   We require additional information to update your fire hazards analysis. Throughout the plant, where redundant safe shutdown cables and or equipment are located in the same fire area, describe the separation and protection provided to prevent loss of redundant equipment. This analysis should consider: (1) cable as combustible material (2) possible damage of safe shutdown cables in trays or conduit crossing over open cable trays of the redundant division (3) possible damage due to combustible paths between redundant safe shutdown cables (4) possible damage to redundant safe shutdown systems due to room temperature buildup and radiant heat transfer.

   Areas which may be excluded from the analysis are those fire areas (1) in which only one division of safe shutdown cables and or equipment exists or (2) for which an alternate safe shutdown capability exists and where repairs would not be necessary to accomplish safe shutdown.

RESPONSE: *In response to the additional information requested for certain areas to complete your analysis, we have determined that all areas except for the six (6) listed below can be eliminated because redundant safe shutdown cabling or equipment is not in the same fire area. These six areas have been reviewed considering the criteria requested in your letter. Cable was considered as combustible material only if there was enough fire load in the proximity of the cables to initiate a fire in the cable trays taking into consideration room temperature buildup and radiant heat transfer. Possible damage to safe shutdown cables in conduit crossing redundant division cables was considered and additional*

1. RESPONSE (Cont.): information can be found in the response to question 16 and position P18. Additional information for these six areas is given below.

SC 70 SCREENHOUSE

Redundant Service Water Pumps and their associated cabling are located in the screenhouse area. The only consequential fire load in the area is the oil reservoir for the circulating water pumps. Horizontal cable separation is approximately 15 ft. between redundant trains and even greater over the circulating water pump area. No combustible pathways exist between redundant cable trays and room temperature buildup from the maximum credible fire is negligible as the screenroom is provided with two 50,000 SCFM exhaust fans. The area is provided with five ionization detectors monitored in the Control Room and one hose station, two CO_2 extinguishers and two pressurized water extinguishers for prompt fire fighting action. The result of our evaluation considering the above information is that the maximum credible fire in this area will not affect the operation of redundant safe shutdown equipment or cabling.

TU 95 AUXILIARY FEEDWATER PUMP ROOM

Redundant Auxiliary Feedwater pumps, 480 volt switchgear, the remote safe shutdown panel and redundant safeguard cable trays are in this area. There are no significant fire loads in the area. Redundant safeguard cable trays are separated by approximately 15 ft. horizontally. The steam driven auxiliary feedwater pump is separated from the motor driven pumps by a missile barrier and firewall. There are no combustible pathways between redundant safe shutdown equipment or cabling. The ability to perform a safe shutdown is maintained even if the remote safe shutdown panel becomes inaccessible. (See response to question 8) Room temperature buildup and radiant heat transfer damage will be negligible as there are two emergency

1. RESPONSE (Cont.): fan coil units serving this area to prevent high temperature buildup. There are also two 6400 SCFM units capable of removing 200,000 BTU/hr. The area is provided with four ionization detectors monitored in the Control Room for prompt alert to a possible fire. There is one CO_2 hose station and one water hose station in the area and two water hose stations and five portable extinguishers of various types provided adjacent to the area for prompt fire extinguishing. Our evaluation concludes that the maximum credible fire in this area will not cause damage to the redundant safe shutdown cabling or equipment in this area and the detection and fire fighting equipment available make it unlikely that any fire would not be promptly detected and extinguished.

AX 23 SPECIAL VENTILATION AREA

The Boric Acid pumps, Charging pumps, Safety Injection pumps, RHR pumps and associated redundant safe shutdown cabling is located in this area. This area is very large and most redundant safe shutdown equipment is separated by large distances and in some cases with walls and floors. For safeguard cabling located in close proximity additional information is provided in the response to question 16 and position P18. The area has a very low incidence of combustibles. This area is subject to transient fire loads since the area must be crossed in order to bring materials into containment and other controlled areas, however, administrative controls have been established to ensure that transient fire loads will not affect the operation of redundant safe shutdown equipment. Damage to safe shutdown equipment and cabling from room temperature buildup and radiant heat transfer is precluded because of the size of the area and number of ventilation systems and fan coil units supplying the area. Ionization detectors and water hose stations have been provided in locations where redundant safe shutdown equipment and cabling exists. (See response to question 13) Considering this information, the maximum credible fire in this area will not

1. RESPONSE (Cont.): disable redundant safe shutdown equipment or cabling.

AX 30 RELAY ROOM

Control and instrument safeguard circuitry and relays are located in this area. An investigation into the equipment needed to perform safe shutdown was made and the result was that the Kewaunee Plant could be safely shut down through manual valve operations and pump circuit breakers even if total loss of the relay room occurred. Regardless, in an effort to minimize damage and loss of equipment the area is equipped with 17 ionization detectors which alarm in the control room, a CO_2 deluge system, a nearby water hose station and several manual extinguishers. The incidence of combustibles and ignition sources are very low and the relays are in class C rated cabinets to contain any possible ignition sources due to short circuiting or overheating relays. The result of our analysis indicates that temperature buildup is not significant enough to induce cable ignition. Therefore, there is little or no probability of losing redundant control or instrumentation of safeguard equipment, much less the entire loss of all the equipment in the area.

AX 32 CABLE ROUTING AREA

Some control and instrument cables from both safeguard trains pass through this area. All of the cables coming into this area are from the Relay Room. Since the total loss of all cabling in the Relay Room has been analyzed with the result that safe shutdown will not be prevented, the same analysis can be applied to this area. However, it is very improbable that redundant cabling in this area would be lost due to fire or explosion (see question 33) because of the large separation between safeguards cable trays and between cable trays and the combustible materials. The green safeguards train passes only through a small corner of the area. The rather large combustible load in this area is located some 200 ft. from the green train. An automatic deluge system is being provided for this high

1. RESPONSE (Cont.): combustible loaded area. A wet pipe sprinkler system is being installed over the safeguard trays to prevent the loss of safeguard equipment in case of fire. The automatic deluge system will be equipped with pneumatic rate of rise activation detectors. In addition nine ionization detectors are located in the area to provide prompt alert to a fire. A water hose station is located in the area and another on the stairwell directly adjacent to the area. Four pressurized water and four CO_2 manual extinguishers are located in close proximity to the area for fire fighting. The analysis shows that safe shutdown can be achieved even with a total loss of the safeguard cabling in the area. However, the detectors and equipment provided make the probability of total loss of all safeguard cabling in this area very small if not zero.

RC 60 CONTAINMENT

There is an extensive amount of redundant safe shutdown equipment in containment, however, the majority of it is passive and would not be affected by a fire. All the active equipment in containment is designed to fail in a safe manner to permit safe shutdown whether power is lost from fire or other sources. Regardless, in order to examine possible damage to safety related equipment and cabling the following considerations have been evaluated. Redundant safeguard cable trains have large separation. There is a very low incidence of combustible materials in containment. Temperature buildup and heat transfer is negligible which precludes temperatures which could reach ignition of the cables. The only major source of combustibles is the Reactor Coolant Pump lube oil system which is being provided with an automatic foam deluge system activated by pneumatic rate of rise detectors. Our conclusion is that the loss of redundant safeguard equipment from the maximum credible fire in containment is very remote if not impossible, even though positive actuation is not required to permit safe shutdowns.

2. Provide marked up colored drawings showing the routing and separation of redundant safe shutdown cables inside containment. The fact that redundant system cables are not in the same cable tray does not mean they will not be affected by the same fire. The analysis of question (1) also applies to the reactor containment.

RESPONSE: *Drawings were provided to the site review team during their visit of March 28-31.*

3. In radwaste areas where combustibles are present, provide the following: the location, type and quantity of radioactive materials potential releases to the environment, exposure to fire fighters for fires in these combustibles; a description of the assumptions used; and the available fire protection and detection.

RESPONSE: *Fire Area AX-24 is the only area where radwaste materials are kept. As compactable low level wastes are collected, they are drummed in fire proof containers. Filters and resins are encased in concrete in barrels as they are removed from service. Therefore, the maximum fire load considered is two barrels of low level compactable waste that hasn't been drummed.*

For calculated release to the environment, each barrel was assumed to contain a maximum of 5×10^4 *μCi of Cobalt-58 as the limiting case from previous plant experience. A complete burn-up was assumed to take 15 minutes. Using the equations for release to the environment from the FSAR with no credit for containment or filtration of the airborne particulate results in a radionuclide concentration released to the unrestricted area that is only 20% of MPC of 10CFR20 Appendix B. Taking credit for filtration would remove 99% of the airborne particulate and would result in only .2% of MPC being released to the environment.*

The material is stored in Fire Area AX-24 which is in the plant controlled area. Fire fighting procedures call for full breathing apparatus to be employed by the Fire Brigade in fighting fires in the controlled area. The resulting inhalation dose to fire

3. RESPONSE (Cont.): fighters equipped with full breathing apparatus is negligible. A description of the available fire protection equipment can be found in the Fire Protection Program Analysis description for Fire Area AX-24. Also, a fire water hose station has been recently added in this area close to the compacting area (see question 13).

4. Identify all piping containing flammable gas or combustible liquid which is routed through areas containing safe shutdown equipment, safe shutdown cables, or areas through which personnel must pass to reach safe shutdown equipment for local operation. Describe the effects of a fire involving the liquid or gas on the safe shutdown equipment.

RESPONSE: A propane line passes through AX-32, the Cable Routing Area, and goes to burners used in the hot and cold chem labs. The exposed propane line is constructed of heavy walled carbon steel piping with all joints welded, thus minimizing the potential damage to the piping and minimizing the possibility of leakage.

The hydrogen line passes through AX-32 to the Volume Control Tank. The only exposed portion of piping is in area AX-32 and the Volume Control Tank Room. The hydrogen line is composed of heavy walled stainless steel piping with welded joints thus minimizing the potential damage and leakage probabilities.

Area AX-32 has been analyzed and the results of the analysis indicate that safe shutdown could be maintained even with the complete loss of room AX-32. (See response to questions No. 1 and No. 33). However, additional fire protection systems are being added to reduce the potential damage from fire in this area, see question 13.

The VCT room, although not considered a fire area by itself, is separated from area AX-23 by heavy concrete walls and steel door due to high radiation requirements of the area. The area is also separated from redundant power cabling in area AX-23 by a thick concrete floor easily a three hour fire barrier.

5. Describe the methods which would be used for heat and smoke removal using either fixed or portable air handling equipment. If the plant HVAC system is proposed for such service, provide design data to show that these systems are rated for the conditions (temperature and capacity) required when used for this service.

RESPONSE: *As a result of the review team's in-plant inspection, this question was redirected to specific plant areas. Where these questions have remained unanswered, the responses will appear as answers directed at specific areas, such as in question No. 1.*

6. Identify any provisions for the diesel generator rooms or other areas containing large quantities of liquid combustibles which prevent a fire from being transmitted to safety related areas via the drain system.

RESPONSE: *The main turbine lube oil storage tank is in a curbed enclosure which drains to a 14,000 gallon emergency sump. No other safety related areas drain to or are connected to this sump. The diesel generator day tank rooms are curbed and sized to contain the entire contents of the day tanks. There are no drains provided in the day tank or diesel generator rooms and, therefore, a fire could not spread from these rooms to other safety related areas.*

7. Identify the location of ventilation air intake and exhaust openings and describe the potential for smoke being drawn into air intakes after being exhausted from another area.

RESPONSE: *Turbine Building intake is on south end of Aux. Building. Aux. Building Exhaust is 100 ft. northwest on roof. Past experience indicated a problem, as evidenced by area radiation monitors, with aux. building exhaust entering TB intake. Aux. Building stack was raised and problem corrected for all meterological conditions as evidenced by radiation sampling.*

8. For area AX-30 you state that shutdown can be accomplished from the auxiliary feedwater panel because the cabling does not pass through the relay room. State whether the capability to manually actuate breakers to start the Residual Heat Removal System and to borate the reactor coolant as needed is also available.

RESPONSE: *Breakers are such that equipment can be manually closed or opened at the breaker. Control power can be disconnected at the breaker to give local operation positive local control isolated from relay faults which may be induced by fire. Therefore, the control and instrument cables are not required in order to operate equipment necessary for safe shutdown. The power cables needed to operate this equipment does not pass through the relay room.*

9. Provide the results of an evaluation of the effects of a fire affecting the auxiliary feedwater panel which demonstrates that the capability to operate the minimum required auxiliary feedwater equipment from both the panel and the control room would not be lost.

RESPONSE: *Provisions are installed for manual operation of the steam driven auxiliary feedwater pump to attain the minimum auxiliary feedwater flow required. Therefore, auxiliary feedwater control from the auxiliary feed panel and control room stations are not required.*

10. Describe the rating of fire doors and frames in fire barriers and whether ventilation duct fire dampers are installed in fire barriers.

RESPONSE: *Fire doors and frames have been or will be rated to a rating equivalent to that required of the barriers. More specific response to this question and the discussion of ventilation duct fire dampers can be found in the response to question No. 32.*

11. 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.

11. (Cont.)

RESPONSE: A composite description of plant electrical distribution can be found in the Kewaunee FSAR Section 8.2.2. Power and control cables of a safeguard train are kept strictly in cable trays designated for that safeguard train. Cabling used to provide functions that are designated non-safety related, that originate from a safeguard source or are provided on safeguard equipment, are kept within that safety division. Generally, cabling provided for status light indication on a safety component is run within the safeguard train servicing that component. Furthermore, non-safeguard cabling is run such that it will not cross both safeguard trains. Therefore, there are no effects on the ability to shutdown the plant in case shorts on this cabling occurs.

12. Provide the results of an analysis which shows that rupture or inadvertent operation of a fire fighting system will not subsequently cause damage or failure of safety-related equipment required for safe shutdown by sprays or flooding.

RESPONSE: The fire water system and its associated deluge and wet pipe systems have been reviewed for the Kewaunee Plant. These systems have been analyzed for postulated pipe ruptures and inadvertent operation. No single pipe rupture or inadvertent operation will cause damage or failure to safety rleated equipment which would prevent safe shutdown of the plant. Several motor control centers for safety related equipment were found in close proximity to sprays or possible pipe ruptures, but steps will be taken to seal and provide protection from sprays and flooding for this equipment.

13. Describe the modifications to be made as a result of the fire review and fire hazards analysis.

RESPONSE: *The following physical modifications were made or will be made as a result of the fire hazards analysis and the fire review on the Kewaunee Nuclear Power Plant:*

(1) *Eight hose stations were added in the auxiliary building (see question No. 17).*

(2) *A remote CO_2 deluge system was added for the Relay Room AX-30.*

(3) *An automatic deluge system is being installed for the working material storage area in AX-32.*

(4) *A wet pipe spray system is being added along both trains of safeguard cables passing through the Cable Routing Area AX-32.*

(5) *An automatic deluge foam system is being added for both reactor coolant pumps in containment.*

(6) *A number of doors are being changed out to three-hour fire rated doors. A list was provided to the review team during the site visit. The response to question No. 22 delineates which barriers will be three-hour and one-hour equivalent barriers. The doors in these barriers will be upgraded to meet at least the rating on the barriers.*

(7) *Also in response to question No. 22, a detailed review of the three-hour and one-hour equivalent barriers is being made and penetrations and fire dampers will be installed or upgraded to meet at least the equivalent rating of the barrier.*

(8) *In response to question No. 21, the alarm circuitry from the main fire detector panel to the control room will be supervised. This is an upgrade from the existing wiring scheme.*

RESPONSE (Cont.):

(9) Ventilation air flow monitors will be installed for the battery rooms.

(10) As a result of an extensive investigation and evaluation being performed in response to question No. 16 and position No. P18, cable rerouting or fire barriers may be constructed to protect redundant cabling. However, at this time, it is felt that the Kewaunee cable routing criteria used during construction was well in advance of the standards of the day and no modifications will be necessary to meet acceptable separation criteria.

14. Describe the effects on safe shutdown capability of a fire affecting cables from the opposite division in each diesel generator room.

RESPONSE: Our preliminary investigation has revealed that the purpose of these cables are to provide permissives for voltage restoring. These contacts prevent a live bus transfer when tieing safeguard buses 1-5 and 1-6 through the bus ties. Therefore, there are no effects on safe shutdown capability from a fire causing the loss of these cables in a diesel generator room.

Further investigation is being performed in conjunction with question No. 16 and staff position P18.

15. Verify that I.R. type flame detectors are located in the diesel generator rooms; and smoke detectors are located at the mezzanine level of the auxiliary building.

RESPONSE: Two (2) I.R. type flame detectors and six (6) fixed temperature fenwal thermostats are located in each diesel generator room. Fourteen (14) ionization detectors are located in fire area AX-23, seven of which are located on the mezzanine (616') level.

16. During the plant tour, it was noted that cables in conduit from the orange division were located in the area of cables from the green division. The areas of concern are the hallway in fire area AX-23, elevation 586 ft. of the auxiliary building along column #9, and the room that provides access to the residual heat removal pumps. Verify that these cables in conduit are not required for safe shutdown.

RESPONSE: *During the construction of the Kewaunee Plant, one of the criteria for cable routing was that cable of one safeguard train must be routed in conduit if it was to pass over or be in close proximity to open cable trays of the opposite train, reference FSAR Section 8.2. A detailed evaluation of redundant safeguard cabling was not pursued. In the Kewaunee Fire Protection Analysis cabling run in conduit was considered as having an adequate fire barrier unless the calculated fire loading in a particular area dictated other considerations must be made. Existing administrative controls were considered adequate to cover transient fire loads. Hence, the fire review team found safeguard cabling in conduit in close proximity to cable trays of the opposite safeguard train.*

In an effort to satisfy the staff concerns and to verify that the Kewaunee Plant will maintain the ability to safely shutdown the plant under all postulated fires, we are upgrading our analysis by initiating a complete search and evaluation of all areas where safeguard cabling in conduit may pass in close proximity to the opposite safeguard train. The evaluation will assure that redundant safe shutdown cabling will not be affected by a postulated fire. Rerouting of cabling or construction of fire barriers will be initiated if the results of the evaluation warrant such action.

We expect this evaluation to be completed and available for staff review in approximately 90 days. We believe this action is in agreement with staff position P18 and the evaluation will include the areas cited in this question.

17. During the tour it was noted that certain of the new hose stations in the auxiliary building were supplied by long runs of small piping. Describe what capacity is available at the hose stations taking into account line losses through the runs of piping feeding these hose stations.

RESPONSE: Flowing pressures were calculated for all auxiliary building hose stations using the Hazen & Williams formula per NFPA 13. The 100' hose length was considered in all calculations.

Station	Valve No.	Location	Flow		Pressure
1	SW-30-18	586' aux. bldg. basement wall N of freight elevator	65 gpm	@	50.8 psi
2	SW-30-19	586' aux. bldg. wall N of Laundry pumps	67 gpm	@	53.6 psi
3	SW-30-20	610' aux. bldg. SW of BA transfer pumps	65 gpm	@	50.0 psi
4	SW-30-22	610' aux. bldg. S of Steam Gen. Blowdown Tank	64 gpm	@	49 psi
5	SW-30-21	aux. bldg. 626' E entrance to BA tank room	59 gpm	@	38.6 psi
6	SW-30-23	626' aux. bldg. E side of Re-fueling Water Storage Tank	60 gpm	@	40.6 psi
7	FD-34-1	aux. bldg. 616' stairway near "G" line	100 gpm	@	101.1 psi
8		aux. bldg. 586' solid radwaste handling area	69 gpm	@	58.4 psi

18. During the tour, it was noted that the frames on fire door openings are not fire rated. Provide the results of an evaluation by a qualified fire protection engineer of the adequacy of the design of these frames to support the fire doors in a fire situation and withstand the effects of a fire.

18. (Cont.)

RESPONSE: The original purchase order and specifications for the doors that now constitute fire doors was investigated. The doors, metal frames and all associated hardware were purchased to the same qualifications with UL certification required for each. It is our contention that the fire rating listed on each door applies also to the frames. Furthermore, when the frames were installed in the walls, they were grouted in, which provides added assurance that these frames would support the fire doors in a fire situation and withstand the effects of a fire.

Fire doors and frames will be evaluated and installed as necessary to be consistent with the response to question No. 22.

19. Identify the location of the fixed battery powered lighting units available in the plant.

RESPONSE: Fixed battery powered lighting units are located as follows:

Building	Elevation	Coordinates
Auxiliary	586	K.5/8.6
Auxiliary	606	H.8/5.7
Auxiliary	606	G.3/5.2
Auxiliary	626	G.3/5.2
Auxiliary	633	H.5/8.0
Auxiliary	633	H.2/8.0
Control Room	626	6 units
TU	586	B.6/9.0

20. In the consequences of the design basis fire discussion in the fire hazards analysis for fire area AX-30, relay room, it is noted that shutdown would be carried out from the auxiliary feedwater area panel with cabling independent of the relay room should the function of the relay room be lost in a fire. In such a fire instrumentation may be lost and may not be available at the auxiliary feedwater panel, in addition to the controls for equipment such as pressurizer heaters and sprays, charging pumps, and safety injection pumps. Describe how safe shutdown would be achieved in such a situation, including a description of how various critical functions such as primary system make up, boration of the primary system, feedwater to the steam generators, and steam dump would be accomplished.

RESPONSE: *The analysis of the maximum credible fire considered for the relay room does not contend that all instrumentation and control circuits would be lost. The statement in the fire hazards analysis does not imply that total loss of all instrumentation and control must be a design basis fire consideration.*

The following items were taken into account for the analysis of the maximum credible fire in the relay room. Maximum separation is utilized in the separation of safeguard cabinets (15'-40'). Maximum separation of redundant cabling is maintained in routing the cable trays with vertical stacks of cable trays consisting of one safeguard or protection train only. Construction consists of fire retardant cabling and fire rated cabinets and trays. The incidence of burnable materials is low and transient fire loads are administratively controlled. Furthermore, a full flooding CO_2 deluge system has been added (see response to question No. 13) to minimize the potential loss and damage of equipment in the relay room. Based on these considerations the total loss of all instrument and control circuitry is not considered credible.

A remote safe shutdown from the auxiliary feedwater panel was performed as one of the start-up tests of the Kewaunee Plant. This scenario is common to all PWRs, Kewaunee's generation and newer. Primary system makeup and boration is maintained through the Safety Injection or Charging Pumps and the Refueling Water Storage Tank. Feedwater to the steam generators is maintained

20. (Cont.)

RESPONSE (Cont.):

through the auxiliary feedwater pumps and the condensate storage tank or Service Water System. Steam dump is maintained through the air controlled power reliefs or mechanical safety valves. A scenario which includes the loss of certain instrumentation or control circuits would incur an increased amount of potential damage to equipment. However, the ability to achieve safe shutdown is not compromised and the resulting effect on the health and safety of the public is bounded by documented analyses (Ref. FSAR Section 14).

21. Verify that the alarm circuitry which runs from the main detector panel in the turbine building to the control room will be supervised.

RESPONSE: This modification is currently being performed. See response to question 13.

22. Provide drawings showing the location and required rating of fire barriers. Verify that the penetrations through the barriers will be sealed to a rating equivalent to that required of the barriers. Describe modifications to fire doors, fire dampers, openings, and cable penetrations to be performed so that penetrations meet these ratings. Where dampers will not be provided in duct penetrations, justify their omission.

RESPONSE: Enclosed are two sets of color coded drawings indicating the rating of fire barriers. Equivalent three hour fire ratings are required for barriers separating areas containing safe shutdown equipment or cabling from areas with high fire loads. Equivalent one hour fire ratings are required for barriers separating areas containing safe shutdown equipment or cabling from areas with low or non-existent fire loads. Equivalent ratings are required for floors and ceilings although not shown on the drawings.

An investigation is currently being performed on all fire rated barriers. Where the results of the investigation indicate upgrading is necessary, modifications will be made. All

22. (Cont.)

RESPONSE (Cont.):

penetrations will be examined and analyzed. Equivalent one hour and three hour penetration barriers will be installed or upgraded. Fire doors will meet the required rating. Dampers will be installed where required.

We expect this investigation and analysis to be completed in 90 days with the results available for onsite NRC review. Any physical modifications required will be initiated in a timely manner following completion of the analysis.

23. State the time period available to initiate operation of an auxiliary feedwater pump after reactor trip. State the criteria that determines this time period.

RESPONSE: *Seventy-six (76) minutes are available from the time feedwater is lost until the time heat transfer is lost following a trip from full power. This is based on decay heat in the core and Steam Generator levels at the low level trip settings.*

24. The following discrepancies between the licensee's submittal and drawings obtained during the site visit should be resolved:

a. Reactor Containment RC-60: submittal shows 8 ionization detectors; drawings show 12 (3 each RCP, 3 each electrical penetration).

b. Shield Building SB-65: submittal shows 2 ionization detectors; drawings show 6 (3 each electrical penetration).

c. Condensate and Make-up Water Tank Room AX-33: submittal shows no detection; drawings show 5 thermal detectors.

d. Main Shop, Tank and Pump Rooms AX-22: submittal shows no detection; drawings show 2 ionization detectors.

e. Health Physics Office AX-40: submittal shows no detection; drawings show 2 ionization detectors.

24. (Cont.)

f. Special Ventilation Rooms AX-23: submittal shows 9 ionization detectors in filters; drawings show 7 ionization detectors providing area coverage (3 at El. 642'-3"; 4 at El. 657'-6"). The procedures write-up obtained during the survey shows pneumatic detectors in the filters instead of of ionization type.

g. Stairwell "B" AX-34: submittal shows 2 ionization detectors; drawings show no detectors in this area.

h. QA/QC Vaults MS-52 and MS-55: submittal shows 3 ionization detectors in each vault; procedures show 4 ionization detectors in both vaults.

g. Screenhouse SC-70: submittal shows 5 ionization detectors; drawings and procedures show 3.

RESPONSE: *The following list is the corrected listing of fire detectors and should be used to update the listing in the fire hazards analysis.*

a. Containment, RC-60, 12 ionization detectors

b. Shield Building, SB-65, 6 ionization detectors

c. Condensate and Make-up Water Tank Room, AX-33, 5 thermal detectors

d. Main Shop, Tank and Pump Rooms, AX-22, 8 ionization detectors and one pneumatic rate of rise detector on deluge system

e. Health Physics Office, AX-40, 2 ionization detectors

f. Special Ventilation Rooms, AX-23, 14 ionization detectors and 7 heat detectors for filters

g. Stairwell "B", AX-34, no detectors

h. QA/QC Vaults, MS-52 and MS-55, 4 ionization detectors

i. Screenhouse, SC-70, 3 ionization detectors

j. Relay Room, AX-30, 19 ionization detectors

k. Cable Routing Area, AX-32, 17 ionization detectors

l. Control Room, AX-35, 13 ionization detectors, 1 smoke detector, 2 heat detectors

m. Turbine Room, TU-22, 4 ionization detectors

n. Diesel Generator Room 1-A, TU-90, 2 flame detectors, 6 fixed temperature fenwal thermostats

o. Diesel Generator Room 1-B, TU-92, 2 flame detectors, 6 fixed temperature fenwal thermostats

p. Air compressor and pump room, TU-95, 4 ionization detectors

25. During the site visit it was noted that the gate valves on some deluge systems appear to be equipped with electrical tamper switches. This is not mentioned in the submittal. Which gate valves are so supervised?

RESPONSE: *All automatic valves on deluge systems are supervised.*

26. Appendix C of the fire procedures write-up does not appear to cover the Halon system in the QA/QC vaults. Is this system connected to the signalling system?

RESPONSE: *The Halon system in the QA/QC vaults is an independent system with independent actuation system. It should be noted that the QA/QC vaults are located in the material storage building, which is a separate building from the plant. It contains no safe shutdown related equipment.*

27. Additional information should be provided on the type and fire hazards associated with those portions of the filter units that are not charcoal (i.e., HEPA filter media, etc.).

RESPONSE: *The HEPA filter material is combustible. It is not considered a hazard as the charcoal filters are because of its much higher ignition temperature. There is no source for ignition of these filters and no consequences if they should catch on fire since they are enclosed in heavy walled metal ducting which would enclose such a fire. The filter units are on the exhaust side of the systems and, therefore, smoke effects are not a problem. Ignition sources would not reach the HEPA material via ducting because non-combustible roughing filters precede each HEPA unit, and maximum temperature buildup in exhaust systems are below ignition temperature of the HEPA material.*

28. Provide data on the flame spread rating of the plastic material used in the Control Room luminescent ceiling.

RESPONSE: *The material used in the Control Room ceiling is glass.*

29. Provide analysis of the consequences of an explosion in the building heating boiler on the Condensate and Make-up Water Storage Tanks. Indicate whether boiler safety combustion controls comply with applicable NFPA standards.

RESPONSE: *The condensate and make-up water storage tanks are not required for safe shutdown of the Kewaunee Plant as described in the Fire Hazards Analysis section 3. Feedwater can be provided by the Service Water System and primary make-up water from the Refueling Water Storage Tank. The heating boiler and associated controls, the condensate and make-up Water Storage Tanks and associated piping are all QA Type III and have no effect on the safe shutdown of the plant.*

30. Provide data on the maximum fire flow demand from sprinkler of water spray systems to show that one fire pump is sufficient to meet this demand plus reserve for hose streams.

RESPONSE: *The largest single fire system demand is 480 gpm for the automatic deluge system for the material storage area. Each fire water pump is rated at 2000 gpm. There is ample water for reserve hose streams.*

31. Provide data on the number and location of foam nozzles and foam concentrate for hose lines.

RESPONSE: *One foam nozzle and concentrate is currently available for use at the Kewaunee Plant. It is located in the stairway at the 616' level adjacent to AX-32. When the deluge system and "wet pipe" system for AX-32 is completed, it will be moved to the Turbine Building basement for use on potential fires involving the turbine lube oil sump, diesel generators and area TH-95.*

32. Provide data to support conclusion that metal panels above fire doors (e.g., between Turbine Building and Relay Room) can withstand a 3-hour exposure.

RESPONSE: *In response to question No. 22 an investigation an analysis will be performed and will address the concerns of this question. The response to question No. 22 identified those barriers required to withstand a 3-hour exposure. Where the barriers are found not to qualify, they will be upgraded.*

33. Provide an analysis of the affect of an explosion involving a hydrogen or propane leak in AX-32 on safe shutdown capability. Justify the lack of flammable gas detectors in this area.

RESPONSE: *The results or outcome of an explosion in this area would be similar to a fire which was answered in question No. 1. Safe shutdown capability would not be lost in the event of an explosion in this area.*

An explosion of either hydrogen or propane is very unlikely, if not impossible. In order to have an explosion a large concentration of gas in a confined area is required. The area under consideration is rather large with adequate to good ventilation flow. The design of the system makes a large leak very unlikely and a slow leak would not be able to build up the required concentration for an explosion. During normal operation, both hydrogen and propane are used frequently and abnormal leakage would be promptly detected.

34. Clarify roof deck construction as contained on page 6.4-10 of the submittal (statement is not compatible with terminology used by Underwriters Laboratory and Factory Mutual).

RESPONSE: *The metal roof deck consists of ASTM A446, Grade "A", galvanized cold rolled steel with ribs spaced on 6" centers at a depth of 1½". The metal gauge varies. Several sections of the roof are*

34. (Cont.)

RESPONSE (Cont.):

constructed of concrete roof slabs. On top of the roof deck the following is applied:

An asphalt primer, steep asphalt, 2" thick rigid insulation meeting requirements for Class "A" roofs, two layers of coated roofing sheets, a layer of roofing cement, a top coating and 1/4" to 5/8" layer of gravel.

35. The following areas contain safety-related electrical cable trays and do not appear to be covered by the fire detection system:

AX-28 (Stairwell "A")
AX-34 (Stairwell "B")
AX-24 (El. 586' -0 along north wall)

Fire detection should be extended into these areas or justification should be provided as to why these safety related cables are not required for shutdown.

RESPONSE: A detailed investigation of safeguard cabling is being performed in response to question No. 16 and staff position P18. During this investigation, the function of the cabling in these areas will be determined. Fire detection will be provided if the results of the investigation reveal that it is required to assure safe shutdown.

36. The following openings between the Turbine Building and Auxiliary Building areas containing safety-related systems were not included in the list of doors to be up-graded to 3-hour fire doors.

TU22 - AX-28 (El. 586'-0)
TU22 - AX-21 (El. 586'-0)
TU22 - AX-20 (El. 586'-0)
TU22 - AX-32 (El. 606'-0) (3 doors)
TU22 - AX-34 (El. 626'-0)
TU22 - AX-32 (El. 626'-0)
TU22 - AX-37 (El. 626'-0)
TU22 - AX-23 (El. 586'-0)

If these doorways are not already equipped with listed 3-hour fire doors and frames, they should be up-graded, or justification should be provided why this is not necessary.

36. (Cont.)

RESPONSE: Three hour and one hour fire barriers are shown on the general arrangement drawings provided in response to question No. 22. All doors in the three hour rated barriers will be upgraded to this level.

In direct response to your question:

TU22-AX28	(El. 586')	No opening or door exists
TU22-AX21	(El. 586')	There is no direct fire path between areas. There is a wall between TU22 before the AX21/AX22 barriers. There is safeguard cabling in area AX21 but not safe shutdown required.
TU22-AX20	(El. 586')	AX20 contains no safe shutdown required cabling or equipment. Safeguard cabling is only one line of instrument cabling.
TU22-AX32	(El. 606')	Only two doors pass directly from TU22 to AX32, both will be three hour rated.
TU22-AX34	(El. 626')	This will be three hour rated.
TU22-AX32	(El. 626')	This will be three hour rated.
TU22-AX37	(El. 626')	There is no direct fire path between areas. There is a wall between TU22 and AX37 before the AX22/AX37 barrier. This is one hour rated because there is no safeguard cabling or equipment required for safe shutdown in this area. Reactor protection circuitry is fail safe.
TU22-AX23	(El. 586')	This will be three hour rated.

ENCLOSURE 2
RESPONSE TO STAFF POSITIONS

P1. Smoke detection should be provided in all safety related areas containing combustibles (including cables).

RESPONSE: *Ionization detectors are being verified for all areas containing safe shutdown required equipment and cabling. (See responses to questions No. 16 and No. 35.)*

P2. All Safety related areas should be reachable from a hose station with a hose of not greater than 100 feet in length.

RESPONSE: *Our approach used in the fire hazards analysis was to verify and add additional hose stations in the plant where possible fire hazards existed. As a result, eight additional hose stations were added. After reading your position, which we do not agree to in principle, we have, nevertheless, found that all safety related areas required for safe shutdown of the plant are reachable from a hose station with a hose of not greater than 100 feet in length.*

P3. Qualified portable smoke ejectors and ductwork should be provided for smoke removal in areas not having fixed smoke removal capability and to cover for failures of fixed equipment.

RESPONSE: *Kewaunee will purchase qualified portable smoke ejectors and associated portable duct work to provide a minimum of three units with a combined capacity of 15,000 CFM.*

P4. Portable water or Halon 1211 extinguishers should be provided in the control room for class A fires.

RESPONSE: *One 2½ gallon portable water fire extinguisher will be provided for the control room.*

P5. Two spare air bottles and a six-hour supply be provided for each air mask required for fire brigade personnel and operators.

RESPONSE: *A minimum of ten emergency air masks are available for the fire brigade. A 1½ hour air supply is available at each mask and an additional six hour supply is available on site for each mask.*

P6. Radio communication within the plant should be provided for fire brigade use to communicate between the fire location and the control room.

RESPONSE: *Seven two-way FM radio transmitter receivers are on site and available for use by the fire brigade.*

P7. Cable penetration fire stops should be tested to demonstrate a fire rating equivalent to that required for the fire barrier in which the penetration is used. The tests should be performed in accordance with ASTM E-119, with the following exceptions:

(a) The cables used in the test should include the cable insulation materials used in the facility.

(b) The test sample should be representative of the worst case configuration of cable loading, cable tray arrangement and anchoring, and penetration firestop size and design. The test sample should also be representative of the cable sizes in the facility. Testing of the penetration fire stop in the floor configuration will qualify the firestop for use in the wall configuration also.

(c) Cable penetrating the firestop should extend at least three feet on the unexposed side and at least one foot on the exposed side.

(d) The firestop should be tested in both directions unless the firestop is symmetrical.

(e) The firestop should be tested with a pressure differential across it that is equivalent to the maximum pressure differential a firestop in the plant is expected to experience.

(f) Temperature levels of the cable insulation, cable conductor, cable tray or conduit, and firestop material should be recorded for the unexposed side of the firestop.

P7. (Cont.)

(g) Acceptance criteria - the test is successful if:

(1) The cable penetration firestop has withstood the fire endurance test without passage of flame or ignition of cables on the unexposed side for a period equal to the required fire rating, and

(2) The temperature levels recorded for the unexposed side are analyzed and demonstrate that the maximum temperatures are sufficiently below the cable insulation ignition temperature, and

(3) The firestop remains intact and does not allow projection of water beyond the unexposed surface during the hose stream test.

RESPONSE: *In the response to question No. 22, the required equivalent fire rating for certain fire barriers was given. An investigation of all penetrations in these barriers is currently in progress. Upon completion of the investigation an analysis will be performed on each penetration. The analysis will be done in order to ensure that our penetrations meet or exceed the required one hour and three hour fire ratings. Where they do not, upgrading will be initiated.*

The analysis is not intended to include testing as outlined in the position above. There is ample information available on cable penetration tests performed by other utilities and vendors with which to compare our penetration construction. From our research into costs for construction of mock assemblies and testing them, it will be less costly to perform an engineering evaluation to verify our penetrations are constructed equal to or better than penetrations previously tested in accordance with the requirements above and to reconstruct those that don't meet the criteria.

P8. Hose stations should be provided in the reactor building. These hoses should be capable of reaching all significant cable concentrations and areas where oil fires may occur. Available sources of water inside containment such as service water may be utilized if analysis shows that the additional usage will not affect safety. Valves to operate the hoses should be located such that a fire inside containment will not preclude access to the valve.

RESPONSE: *Service water hoses are available in the reactor building at each level. Nozzles will be provided for these to permit their use for fire fighting.*

P9. All valves in the fire water systems protecting safe shutdown should be either electrically supervised, locked open or provided with a tamper proof seal, and administratively controlled.

RESPONSE: *In addition to the current administrative controls, all valves in the fire water system that protect safety related areas will be provided with a tamper indicating seal.*

P10. Fire doors protecting safe shutdown areas from large fire hazards or separating areas containing redundant safe shutdown cables and/or equipment should be normally closed and locked or electrically supervised with delayed alarm and annunciation in the control room.

RESPONSE: *The security plan modification will require these doors to be both locked and electrically supervised. An additional door was added to the list of doors during discussion of this position with the site review team.*

P11. Ventilation air flow monitors should be installed in each station battery room ventilation system to alarm and annunciate in the control room, the loss of the ventilation air flow.

RESPONSE: *A loss of ventilation flow monitor will be installed in each battery room to annunciate in the control room.*

P12. During the tour it was noted that an insufficient supply of fire hose was provided at the hose houses on the yard loop. A minimum amount of 150 ft. of 2 1/2" hose and 150 ft. of 1 1/2" hose should be located at each hose house, or a minimum of 100 ft. of 2 1/2" hose and 100 ft. of 1 1/2" hose located at each house along with a hose cart for the yard provided with 200 ft. of 1 1/2" hose and 200 ft. of 2 1/2" hose.

RESPONSE: *Each hose house is stocked with a minimum of 100' of 1 1/2" and 100' of 2 1/2". A hose cart will be provided for the yard which will be stocked with 200' of 2 1/2" hose and 200' of 1 1/2" hose.*

P13. Hose house #7 should be raised so that it doesn't interfere with the roadway on opening.

RESPONSE: *Hose house #7 will be raised above the level of the roadway to prevent the roadway from interfering with the doors.*

P14. Hose hydrant #5 should be barricaded so that vehicular traffic will not cause damage to the hydrant.

RESPONSE: *A barricade will be constructed around hose hydrant #5 to protect it from vehicular traffic.*

P15. Because of the electrical hazard, hose nozzles in areas with higher voltage equipment should be replaced with water spray type nozzles, or with nozzles that go from "off" to "spray" pattern, to "straight steam".

RESPONSE: *Electrical nozzles will be provided at the hose stations located near high voltage equipment.*

P16. Instrumentation independent of the relay room should be provided at the auxiliary feedwater panel to provide adequate instrumentation for shutdown of the reactor for a fire disabling the relay room or control room. As a minimum, this instrumentation should include pressurizer pressure and level and steam generator level.

RESPONSE: *The instrumentation suggested in this position is not necessary to ensure safe shutdown capability. Safe shutdown can be attained without the instrumentation processed through the*

P16. (Cont.)

RESPONSE (Cont.):

relay room although that scenario could possibly involve extensive equipment damage. With the design of the relay room, the fire rating of the equipment used and the modifications initiated to minimize potential damage to equipment, it is not considered credible that all instrumentation would be lost in a relay room fire. (See also the response to question No. 20).

P17. Sprinkler protection covering both safety divisions should be provided in the service rooms at elevation 616 ft. of the auxiliary building.

RESPONSE: This modification has been initiated. See response to question No. 13.

P18. Safety related fire areas should be evaluated to identify situations where conduit of one safety division crosses over or is routed in proximity to the redundant division. Describe the effects on safe shutdown for a fire affecting this cable and conduit.

RESPONSE: This investigation and analysis is currently being performed. A more detailed description of this analysis is provided in response to question No. 16. As a result of this analysis, effects on safe shutdown will be evaluated and corresponding modification may be initiated.

P19. The post indicator valve located near hose house #2 should be barricaded to protect it from damage from vehicular traffic.

RESPONSE: The post indicator valve near hose house #2 will be barricaded to protect it from vehicular traffic.

P20. Only pressure treated fire retardant lumber should be used in the plant.

RESPONSE: An inventory of pressure treated fire retardant lumber will be maintained for use in safety related areas while the plant is not shutdown. A more complete description of our policy in

P20. (Cont.)

RESPONSE (Cont.):

regards to pressure treated fire retardant lumber was submitted in our May 15, 1978, response to "Nuclear Plant Fire Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance".

P21. The door between the control room and the relay room should be gasketed to prevent against smoke infiltration.

RESPONSE: *This door will be gasketed.*

P22. An exhaust hood with filter should be provided over the cooking area of the control room.

RESPONSE: *The oven unit and burners located in the control room cooking area will be removed and replaced with a microwave oven.*

P23. Additional fixed lighting units with individual battery packs should be provided in the following areas:

Building	Elevation	Coordinates
Turbine	Basement	B.1/7.0
Turbine	Basement	AE.3/7.0
Auxiliary	Basement	G.7/6.8
Auxiliary	Basement	J.0/8.8
Turbine	Mezzanine	F.9/7.5

These lights along with the existing battery lights should provide adequate lighting for access to safety-related areas and shutdown of the plant for a fire causing loss of lighting systems.

RESPONSE: *Fixed lighting units operated by individual battery packs will be provided for the areas suggested in this position.*

P24. Fire dampers should be provided in ventilation duct penetrations in the turbine driven auxiliary feedwater pump room. These dampers should complete the enclosure of the turbine auxiliary feedwater pump room and preclude a fire from affecting this pump and the motor driven pumps.

P24. (Cont.)

RESPONSE: *The fire hazards analysis currently does not consider the turbine driven aux. feedwater pump room as a separate fire area, even though barriers exist to credit it as a separate fire area. These barriers will be investigated and evaluated for consideration of a one hour fire rating. The ventilation duct penetrations will be upgraded as necessary to meet this rating.*

P25. A minimum of 10 sealed beam or lantern type lights should be provided for the fire brigade.

RESPONSE: *Ten six-volt battery operated lamps will be provided for the fire brigade.*

P26. The doorways from the diesel generator rooms should be curbed to prevent flow of oil out of the rooms.

RESPONSE: *These doorways will be curbed.*