



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING EXEMPTION FROM 10 CFR PART 50, APPENDIX R

NORTHEAST NUCLEAR ENERGY COMPANY

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 1

DOCKET NO. 50-245

1.0 INTRODUCTION

By letters dated November 21, 1985, August 22, 1986 and January 14, 1987, the licensee requested approval of a number of exemptions from the technical requirements of Sections III.G. and III.J. of Appendix R to 10 CFR Part 50. Additional information on these exemptions and several related issues was submitted by the licensee in letters dated May 19 and 22, and July 18, 1986 and January 7, 1987. The staff's evaluation of this information is contained in this report as follows: Sections 2.0 through 10.0 consist of the evaluation of specific exemption requests; Section 11.0 consists of the staff's evaluation of the licensee's response to fire damper installation variances at Unit 1; and Section 12.0 consists of an evaluation of the licensee's comments on the staff's November 6, 1985 safety evaluation concerning previously requested exemptions.

Section III.G.2. of Appendix R requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

1. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier;
2. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet containing no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; and
3. Enclosure of cables and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

If these conditions are not met, Section III.G.3. requires an alternative shutdown capability independent of the fire area of concern. It also requires that a fixed fire suppression system be installed in the fire area of concern if it contains a large concentration of cables or other combustibles. These alternative requirements are not deemed to be equivalent; however, they provide equivalent protection for those configurations in which they are accepted.

Because it is not possible to predict the specific conditions under which fires may occur and propagate, the design basis protective features are specified in the rule rather than a design basis fire. Plant specific features may require protection different from the measures specified in Section III.G. In such a case, the licensee must demonstrate, by fire hazards analysis, that existing protection in conjunction with proposed modifications will provide a level of safety equivalent to the technical requirements of Section III.G. of Appendix R.

In summary, Section III.G. is related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain safe shutdown are free of fire damage. Fire protection configurations must either meet the specific requirements of Section III.G. or an alternative fire protection configuration must be justified by a fire hazard analysis.

The staff's general criteria for accepting an alternative fire protection configuration are the following:

- o The alternative assures that one train of equipment necessary to achieve hot shutdown from either the control room or emergency control stations is free of fire damage.
- o The alternative assures that fire damage to at least one train of equipment necessary to achieve cold shutdown will be limited such that it can be repaired within a reasonable time (minor repairs with components stored onsite).
- o Modifications required to meet Section III.G. would not enhance fire protection safety above that provided by either existing or proposed alternatives.
- o Modifications required to meet Section III.G. would be detrimental to overall facility safety.

2.0 SHUTDOWN COOLING PUMP ROOM

2.1 Exemption Requested

The licensee requested approval of an exemption from the requirements of Section III.G. of Appendix R to 10 CFR Part 50 to the extent that it requires features capable of limiting fire damage such that systems necessary to achieve and maintain cold shutdown can be repaired within 72 hours.

2.2 Discussion

The reactor building is divided into two zones. Each contains components and cables needed for one method of maintaining cold shutdown conditions. Fire Zone R-1B is the shutdown cooling pump room which also contains the cable penetration for the shutdown cooling and isolation condenser system valves in the drywell. The remainder of the reactor building forms Fire Zone R-1A and contains equipment and cables associated with the low pressure coolant injection (LPCI) and automatic depressurization systems (ADS).

Combustible material in R-1B consists of cable insulation and lube oil which has an equivalent fire loading of six minutes as compared to the ASTM E-119 time temperature curve. The fire loading in R-1A in proximity to the open doorways is, at most, equivalent to 23 minutes on the time temperature curve.

The minimum horizontal separation between systems associated with the two cold shutdown pathways on either side of the common boundary between the zones is 50 feet.

Existing fire protection includes smoke detection systems inside the shutdown cooling pump room and in the area immediately outside the entrance to this area, as described in the licensee's November 21, 1985 letter. In addition, fire hose stations and portable fire extinguishers are provided for use in these locations.

The licensee justifies the exemption on the basis of the physical separation provided between systems for the redundant shutdown pathways, the limited fire hazard and the existing fire protection.

2.3 Evaluation

The technical requirements of Section III.G. are not met in this area because the fire protection options delineated in Section III.G.2. have not been provided to assure that cold shutdown systems in the reactor building can be repaired within 72 hours of a fire in this area.

The staff's principal concern was that a fire in either of the reactor building zones would spread into the other zone, resulting in significant damage to systems from both cold shutdown pathways. However, the fire load within the shutdown cooling pump room is low. If a fire would occur, the existing smoke detection system within the room would actuate and transmit an alarm automatically to the control room. The fire brigade would be dispatched to the area and would put out the fire using the available manual fire fighting equipment. Pending arrival of the brigade, the masonry walls surrounding the room would tend to confine the smoke and hot gases within the area. Because of the open doorways, some quantity of smoke and hot gases would spread into adjoining areas, but would be so dissipated and cooled as to present no threat to the shutdown systems in the adjoining locations.

The fire hazards in the reactor building outside of the shutdown cooling pump room consist primarily of cable insulation. A fire in these locations would be characterized, initially, by slow burning and limited room temperature rise. Pending arrival of the fire brigade, the hot smoke and gas layer that would be produced would rise to the ceiling, away from the unprotected door openings, into the shutdown cooling pump room. By the time this hot gas layer would reach the doorway, the fire brigade would have arrived and begun active fire suppression efforts. Therefore, the absence of fire-rated doors at these openings would have no safety significance.

2.4 Conclusion

Based on the above evaluation, the staff concludes that the licensee's alternate fire protection provides an equivalent level of safety to that achieved by compliance with Appendix R. Therefore, the licensee's exemption request from the requirements of Section III.G. in the reactor building, as described above, should be granted.

3.0 UNIT 1 AND UNIT 2 POWER INTERCONNECT CABLE AREA

3.1 Exemption Requested

The licensee requested approval of an exemption from the technical requirements of Section III.G.2. of Appendix R to 10 CFR Part 50 to the extent that it requires the installation of automatic fire detection and fire suppression systems in an area where redundant shutdown systems are separated by a 1-hour fire barrier.

3.2 Discussion

Two cables which supply power to a control rod drive pump are routed through a duct bank, featuring a manhole, located on the ground floor of the turbine building. These same cables are routed in two conduits from the point they leave the duct bank to the yard area, a distance of approximately 80 feet.

Combustible material located in this area consists of cable insulation, lube oil, clothing and paper. The equivalent fire severity as determined by the licensee is approximately 1-hour.

Existing fire protection includes: an automatic deluge system for the hydrogen seal oil unit; automatic sprinkler systems in an area of cable concentration and in the vicinity of each reactor feed pump lubricating oil system; a smoke detection system as described in the licensee's November 21, 1985 letter; and manual fire fighting equipment. The licensee committed, in the above referenced letter, to enclose the two cables in the manhole and the conduits in a 1-hour fire-rated barrier.

The licensee justified the exemption on the basis of the existing and proposed fire protection.

3.3 Evaluation

The technical requirements of Section III.G. are not met in this area because automatic fire detection and suppression systems are not provided inside the duct bank at the manhole.

The staff's principal concern was that a fire of significant magnitude could damage the subject power cables. However, major fire hazards within the turbine building have been mitigated by the automatic fire protection systems described above. The remaining combustible material is limited in quantity and generally dispersed throughout the building. A fire involving such material would be characterized, initially, by slow burning and limited room temperature rise. It is expected that the fire would be detected by the existing fire detection systems or by plant operators. The fire brigade would be subsequently dispatched and would put out the fire using the installed portable fire fighting equipment. Pending arrival of the brigade, the proposed 1-hour fire-rated barrier would assure that the subject power cables would remain free of fire damage. The barrier will have sufficient fire resistance, with conservative margin, to withstand the effects of a fire. Therefore, additional fire detection and suppression systems are not necessary to assure safe plant shutdown following a fire.

3.4 Conclusion

Based on the above evaluation the staff concludes that the licensee's alternate fire protection configuration provides an equivalent level of safety to that achieved by compliance with Appendix R. Therefore, the licensee's request for exemption from the requirements of Section III.G. in the power interconnect cable area should be granted.

4.0 EMERGENCY LIGHTING

4.1 Exemption Requested

The licensee requested approval of an exemption from the requirements of Section III.J. of Appendix R to 10 CFR Part 50 to the extent that it requires 8-hour battery powered emergency lighting units in access routes to locations required for safe shutdown after a fire.

4.2 Discussion

For a fire in certain areas, plant operators must go to the condensate transfer pumphouse, the diesel generator, the gas turbine generator building, the reactor building and to bus 24F in the switchyard to compensate for fire damage and to safely shut down the plant. This necessitates travel across the yard area, which is not provided with 8-hour battery powered emergency lighting units.

Outdoor security lighting has been provided. However, the lighting cannot be assured to be available since cables associated with the system are routed through areas in which a fire is assumed to

occur. The licensee has stated that it is infeasible to install battery powered lighting units in these outdoor locations so as to provide an adequate level of illumination throughout the path of travel. Instead, the licensee proposes to use flashlights for the path of travel outdoors. The licensee also will use flashlights in the locations in which a fire occurs in conjunction with fire fighting and post-fire recovery activities.

4.3 Evaluation

The technical requirements of Section III.J. are not met in the yard area because 8-hour battery powered lighting units have not been provided in access routes to locations required for safe shutdown.

The staff had three concerns with the licensee's proposal. The first was that the flashlights would not be maintained in an operable condition for use in an emergency. However, the licensee committed to control access to and to maintain the flashlights so as to be assured of their availability and operability when needed.

The staff was also concerned that there might be obstructions or tripping hazards in the route of travel that might not be revealed with the beam of a flashlight. Based on past observations of the proposed route, no such conditions exist. This will be re-verified during the Appendix R inspection.

Finally, the staff was concerned that in proceeding across the yard area, the operator would be required to use both hands, which would effectively prevent him from using the flashlight. However, the licensee has indicated that no such actions are necessary. On this basis, the staff considers the licensee's use of flashlights to be acceptable.

4.4 Conclusion

Based on the above evaluation, the staff considers the licensee's proposed alternative fire protection configuration to be equivalent to that achieved by conformance with Appendix R to 10 CFR Part 50. Therefore, the licensee's request for exemption from the requirement of Section III.J. in the outside yard area should be granted.

5.0 DRYWELL LINER

5.1 Exemption Requested

The licensee requested approval of an exemption from the technical requirements of Section III.G. of Appendix R to 10 CFR Part 50 to the extent that it requires that redundant shutdown-related systems be separated by at least 20 feet, free of intervening combustibles, and be protected by automatic fire detection and suppression systems.

5.2 Discussion

The containment drywell consists of a steel liner, which contains the reactor pressure vessel, surrounded by a concrete shield wall. Due to the thermal expansion requirements of the steel liner a gap must be maintained between the liner and the concrete wall. To form the concrete shield wall, 2-inch thick sheets of plastic foam were placed over the steel liner and covered with a plastic sheet. The concrete was then poured over this and allowed to set. The foam plastic was then removed creating a void space. The licensee has identified redundant instrument tubing and electrical penetrations for shutdown-related systems within this void space which are not separated/protected per the fire protection options identified in Section III.G. of Appendix R.

The combustible material which would represent a hazard to these redundant systems in the void space consists of 2-inch by 6-inch sheets of the foam plastic which were left in place at the end of major concrete pours to prevent objects from entering the gap.

The licensee has stated that there are no ignition sources, except for welding operations, in the vicinity of the drywell. However, cutting and welding is prohibited in the drywell area while the unit is at power. Cutting and welding operations during outages are covered by procedures which assure that the risk of fire is low.

The licensee justifies the exemption on the basis of the impracticality of installing additional fire protection in this void space, the lack of ignition sources, the limited amount of combustibles and the hot work procedures.

5.3 Evaluation

The technical requirements of Appendix R are not met in the drywell liner because redundant shutdown systems are not separated/protected per the fire protection options delineated in Section III.G.

The staff's concern was that an exposure fire of significant magnitude would damage redundant shutdown systems within liner area. However, because of the construction and configuration of the liner, there is no credible ignition source other than those in conjunction with cutting and welding. Because no cutting and welding is permitted at the liner during plant operations and because outage-related hot work is covered by procedures designed to prevent fires, the staff has reasonable assurance that fires within the liner are not a significant hazard to safe plant operation. In the unlikely event a fire would start, the amount of plastic within the liner is not sufficient, in the staff's judgment, to represent a threat to the safe shutdown-related systems located there.

5.4 Conclusion

Based on the above evaluation, the staff concludes that the licensee's alternate fire protection configuration represents an equivalent level of safety to that achieved by compliance with Appendix R. Therefore, the licensee's request for exemption from the requirements of Section III.G. within the drywell liner area should be approved.

6.0 CABLE VAULT (Fire Area T-16)

6.1 Exemption Requested

The licensee requested an exemption from Section III.G.2. to the extent that it requires the installation of a complete one-hour fire-rated barrier between redundant shutdown-related power train control cables.

6.2 Discussion

The room is bounded by walls, floor and ceiling of reinforced concrete and solid concrete block.

Safe shutdown equipment which is located within the vault consists of S-1 and S-2 power train control cables associated with the following equipment: FWCI, LPCI, Isolation Condenser, and the ADS valves.

The redundant cables are located in separate, totally enclosed, metal cable trays that are vertically separated by a distance of approximately 2 feet. One-inch thick maronite boards are located on top of the S-2 cable tray to act as a radiant energy shield.

Existing fire protection includes;

1. A smoke detection system,
2. An independent smoke and heat removal system,
3. Manual hose sections, and
4. Portable fire extinguishers.

The licensee proposed to install a complete, area-wide, automatic fire suppression system.

The licensee justifies the exemption on the basis that the maronite board in conjunction with the enclosed cable trays will limit potential fire spread. In addition, the fire detection and suppression systems will prevent damage to the redundant power trains.

6.3 Evaluation

The technical requirements of Section III.G. are not met because one train of the shutdown-related cables is not completely enclosed in a one-hour fire-rated barrier.

The staff's concern was that one train of the shutdown-related cables is not provided with sufficient passive fire protection, such as a barrier or spatial separation, to keep it free of damage until the postulated fire self extinguishes or is suppressed by the fire brigade, or by the automatic fire suppression system.

The fire detection and suppression systems provide active protection per Section III.G. There is, however, a time delay associated with their operation. It is during that time that safe shutdown components are vulnerable to damage. The principal threat to cable is from convective and radiant heat. Once the fire suppression system activates, this threat will be effectively eliminated.

Cable insulation in the trays represent the only identified combustible material. The cables are coated with a fire retardant, which will prolong the time to cable ignition and will decrease flame propagation rate. The enclosed metal cable trays and the maronite board radiant heat shield will tend to limit damage to one shutdown division. In addition, the smoke and heat removal system will limit the temperature rise in the room.

It is staff judgment, therefore, that the reduced combustibility of the cable, combined with the spatial separation and physical fire barrier, between redundant safety systems will provide a sufficient time buffer to assure that one shutdown division is free of fire damage for the brief time span necessary for the automatic fire suppression system to effectively extinguish the fire.

6.4 Conclusion

Based on the above evaluation, the staff concludes that the licensee's alternate fire protection configuration will provide reasonable assurance that one safety shutdown division will be free of fire damage and will achieve an acceptable level of fire protection equivalent to that provided by Section III.G.2. Therefore, the licensee's request for exemption for the cable vault should be granted.

7.0 SWITCHGEAR ROOM

7.1 Exemption Requested

The licensee requested approval of an exemption from the technical requirements of Section III.G. of Appendix R to 10 CFR Part 50 to the extent it requires that redundant shutdown-related systems be separated by a 3-hour-related fire barrier.

7.2 Discussion

The switchgear fire area is bounded by walls constructed of reinforced concrete and concrete block. The floor and ceiling are reinforced concrete. Within these boundaries the licensee has identified three HVAC ducts and two hatch openings which are not protected by fire-rated dampers and hatch covers, respectively.

The combustible material which represents a fire exposure hazard in the switchgear area and adjoining locations consists primarily of cable insulation, lube oil, clothing, paper, and wood, as described in the licensee's November 21, 1985 submittal.

Existing fire protection includes: pre-action-type sprinkler systems for the machine shop, condenser bay and for the bearing lift pumps and seal oil detrainning tank; automatic sprinklers in certain areas of cable concentration and for the lube oil systems for the condensate booster and reactor feed pumps; deluge-type sprinkler systems for the hydrogen seal oil unit, the turbine lube oil system and in the turbine lube oil room; smoke detection systems as described in the above-referenced letter; and manual fire fighting equipment.

The licensee justified the exemption on the basis of low fire loading, existing fire protection, the construction of the hatch covers and the ability to safely shut down the plant even if fire propagates through the non-fire-rated hatchways and HVAC ducts.

7.3 Evaluation

The HVAC duct penetrations and hatchways exist in a fire area boundary and, therefore, come within the guidance issued in Generic Letter (GL) 86-10. No exemption is required for these conditions according to the GL. However, the staff considers the licensee's submittal as constituting the required fire hazards analysis.

The staff's principal concern was that a fire of significant magnitude could occur in either the switchgear area or the locations on the opposite side of the unrated hatchways and HVAC duct openings and damage redundant systems necessary for safe shutdown.

However, significant fire hazards within these areas are mitigated by the automatic fire suppression systems described above. The combustible material outside of these protected locations is limited and dispersed. A fire involving this material would be characterized, initially, by slow burning and low heat generation. It is expected that the existing automatic fire detection systems and/or plant operators would discover the fire. The plant fire brigade would be dispatched and would put out the fire using the available manual fire fighting equipment. Because of the absence of fire dampers within the subject HVAC ducts, a certain quantity of smoke and hot gases would be expected to spread through them. However, the licensee has affirmed, by letter dated May 19, 1986, that safe shutdown could still be achieved.

Therefore, the absence of fire dampers within these ducts, or fire-rated covers at the hatch openings has no safety significance.

7.4 Conclusion

The licensee's analysis of the lack of fire dampers and the unrated steel hatch covers within the boundary construction of the switchgear fire area conforms with the guidance issued in GL 86-10 and is, therefore, acceptable. The staff has concluded that an exemption from Appendix R requirements is unnecessary.

8.0 AIR LOCK AND CABLE VAULT DOORS

8.1 Exemption Requested

The licensee requested approval of two exemptions from the technical requirements of Section III.G. of Appendix R to 10 CFR Part 50 to the extent it requires that redundant shutdown-related systems be separated by a 3-hour-rated fire barrier.

8.2 Discussion

Within the fire wall which separates the reactor building (fire area R-1) from the office area (fire area T-9) the licensee identified a non-fire-rated door and frame. Another unrated door and frame exists in the wall which separates the office area from the cable vault (fire area T-2).

The fire loading in the office area consists of plastic, paper, wood, and clothing with an equivalent fire severity of 11 minutes as compared with the ASTM E-119 time-temperature curve. Combustible material in the reactor building consists of cable insulation with an equivalent fire severity of 55 minutes. The fire loading within the cable vault is greater than three hours and consists primarily of cable insulation.

Existing fire protection includes: automatic halon fire suppression systems in the computer room and cable vault area; automatic sprinkler systems which protect certain areas of cable concentration in the reactor building and in the motor generator (MG) set curbed area; a deluge system in the MG set lube oil pump area, smoke detection systems as described in the licensee's November 21, 1985 submittal; and manual fire fighting equipment.

The licensee justified the exemptions on the basis of the existing fire protection and the construction of the doors.

8.3 Evaluation

The non-fire-rated doors and frames exist in fire area boundaries and, as such, come within the guidance issued on GL 86-10. Accordingly, no exemptions for these conditions are required. However, the staff considers the licensee's submittal as constituting the required fire hazards analysis.

The staff's principal concern was that a fire of significant magnitude could occur and damage the subject doors such that fire propagation could cause the loss of redundant systems required for safe plant shutdown.

However, the significant hazards which represent a threat to these doors are mitigated by the automatic fire suppression systems described above. The remaining combustible materials are limited in quantity and dispersed throughout the unprotected areas. If a fire should occur, it would be detected in its formative stages by the automatic fire detection systems or would subsequently be discovered by plant operators. The plant fire brigade would be dispatched and would put out the fire using the available manual fire fighting equipment. Pending arrival of the brigade, the doors are substantially constructed and would be able to confine the smoke, hot gases and flame to the area of fire origin until the fire is put out. Therefore, fire-rated doors in these two locations are not necessary to assure that one division of safe shutdown equipment is kept free of fire damage.

8.4 Conclusion

The licensee's analysis of the lack of fire-rated doors between the office area and the reactor building and cable vault conforms with the guidance issued in GL 86-10 and is, therefore, acceptable. Exemptions to Appendix R requirements are unnecessary.

9.0 CONTROL ROOM

9.1 Exemption Requested

The licensee requested approval of an exemption from the technical requirements of Section III.G. of Appendix R to 10 CFR Part 50 to the extent that it requires that redundant shutdown-related systems be separated by a 3-hour-rated fire barrier.

9.2 Discussion

The control room is bounded on three sides by reinforced concrete walls. The fourth side consists of a metal panel and glass wall which separates the Unit 1 and Unit 2 control room. The floor and ceiling are of reinforced concrete. The licensee has identified eight ventilation duct penetrations without fire dampers, three non-fire-rated doors and frames and an unrated steel plate barrier within the boundary of the control room fire area.

Combustible materials within the control room consist primarily of cable insulation and paper, with an equivalent fire severity of 18 minutes on the ASTM E-119 time temperature curve. The fire severity in the adjoining auxiliary ventilation equipment room is 22 minutes, the office areas is 8 minutes and the stairway to the office area is negligible.

Existing fire protection includes: halon fire suppression systems in the control room and computer room; automatic fire suppression systems over significant hazards in the turbine building; smoke detection systems as described in the licensee's November 21, 1985 letter; and manual fire fighting equipment.

The licensee justified the exemption on the basis of the low fire loading, the continuous occupancy in the control room, the existing fire protection, the absence of safe shutdown equipment in the office fire area T-9 and the distance separating the control room from required safe shutdown systems in the auxiliary ventilation equipment room.

9.3 Evaluation

The HVAC duct penetrations, the unrated fire doors, and steel plate barrier exist in the boundary construction of the control room fire area and, as such, come within the guidance issued in GL 86-10. No exemptions for these conditions are, therefore, necessary. However, the staff considers the licensee's submittal as constituting the required fire hazards analysis.

The staff's principal concern was that a fire either inside the control room or in adjoining locations would spread through these non-fire-rated features and damage redundant systems needed for safe plant shutdown. However, the control room is protected by automatic fire detectors and a total flooding halon fire suppression system. Any potential fire originating within the control room would be suppressed before significant fire propagation or smoke generation occurred.

The fire load in the adjoining HVAC room and office area is negligible. A fire in these locations would be characterized, initially, by slow burning and limited room temperature rise. The smoke from such a fire would either be detected by the existing turbine building smoke detector or by plant operators. The fire brigade would then be dispatched and would put out the fire using manual fire fighting equipment. Because there are no safe shutdown-related systems in the office fire area T-9 and because safe shutdown systems in the auxiliary ventilation equipment room are more than 100 feet from the unprotected openings into the control room, there is reasonable assurance that a fire in either of these locations would not prevent the plant from safely shutting down after a fire. Therefore, the lack of fire dampers in the HVAC ducts and the non-rated doors and barrier between the control room and the adjoining locations has no safety significance.

9.4 Conclusion

The licensee's analysis of the non-fire rated features in the perimeter walls of the control room conforms with the guidance issued in GL 86-10 and is, therefore, acceptable. No exemption from Appendix R requirements is necessary.

10.0 SWITCHGEAR AREA WATER CURTAIN/SPRINKLER SYSTEM

10.1 Exemption Requested

The licensee requested approval of an exemption from the technical requirements of Section III.G. of Appendix R to 10 CFR Part 50 to the extent that it requires that redundant shutdown-related systems be separated by a 3-hour-rated fire barrier.

10.2 Discussion

The switchgear area was described in Section 7.2 of this SE. A large opening exists in the perimeter wall between columns 13 and 14 which separates this area from the turbine hall. To compensate for this non-fire-rated feature and to prevent fire propagation through the opening, the licensee proposed to install an automatic sprinkler system along column line F.

The above fire areas are also separated at elevation 34 feet 6 inches by a steel enclosure formed around a stairwell. The enclosure is constructed of 1/4 inch steel plates. The door in the enclosure is an unrated steel security door. The licensee proposed to compensate for the unprotected steel by installing an automatic sprinkler system inside the enclosure. The basic design detail of both sprinkler systems are contained in the licensee's letters of November 21, 1985 and May 19, 1986.

10.3 Evaluation

The conditions described above exist in the perimeter of the switchgear fire area and, as such, come within the guidance issued in GL 86-10. No exemption for these conditions is necessary. However, the staff considers the licensee's submittals as constituting the required fire hazards analysis.

The staff's principal concern was that a fire could propagate through the open wall and steel stairway enclosure. However, if a fire should occur in these locations the existing smoke detection systems are expected to actuate. An alarm would be transmitted automatically to the control room. The fire brigade would subsequently be dispatched to the area and would put out the fire using the available manual fire fighting equipment. If rapid fire propagation and corresponding room temperature rise occurred before the arrival of the brigade, the automatic sprinkler system at the wall opening or stairway enclosure would actuate and discharge water in a "curtain" fashion to prevent fire propagation from one side to the other. This concept in fire protection has been used successfully to protect escalator opening in floors and conveyor openings in walls. The steel enclosure around the stairway and the non-combustible draft stops at the wall opening will facilitate sprinkler actuation as well as retard smoke and hot gas movement.

10.4 Conclusion

The licensee's analyses of the non-fire-rated features in the perimeter of the switchgear fire area conforms with the guidance issued in GL 86-10 and is, therefore, acceptable. No exemption from Appendix R requirements is necessary.

11.0 FIRE DAMPER DEVIATIONS

11.1 Discussion

By letter dated July 18, 1986, the licensee reported that on the basis of a fire barrier evaluation effort, two fire dampers at Unit No. 1 were found to be improperly installed. The licensee proposed to replace the dampers in accordance with details included in the letter. Pending completion of the modifications, a fire watch patrol was posted at the affected dampers.

11.2 Evaluation

The proposed fire damper modifications will provide reasonable assurance that in the event of a fire, the damper will remain in place within the plane of the fire barrier and will properly close upon melting of the fusible element. The dampers will, therefore, meet their design basis and are considered acceptable. The licensee's compensatory actions which were implemented pending completion of the modifications conform with the plant technical specifications.

11.3 Conclusion

Based on the above evaluation, the staff considers the licensee's response to the observed fire damper installation deficiencies to be acceptable. An exemption from Appendix R requirements is unnecessary.

12.0 SER REVISIONS

12.1 Discussion/Evaluation

By letter dated November 6, 1985, the staff granted a number of exemptions to the technical requirements of Section III.G. of Appendix R to 10 CFR Part 50 and evaluated aspects of the licensee's safe shutdown and alternate shutdown capabilities. By letter dated May 22, 1986, the licensee stated that the need for exemption for the lack of a automatic fire suppression system in the turbine building reactor feed pump area and for automatic suppression and a 1-hour fire barrier in the turbine building switchgear room no longer existed. The licensee also recommended the following revisions to the staff SE.

- o In the SE the staff stated that all openings in the control room perimeter walls and floor/ceilings were protected by fire-rated doors, dampers and penetration seals. However, by letter dated November 21, 1985 the licensee identified certain unprotected HVAC duct penetrations and non-fire-rated doors and a steel panel in the control room fire area boundary. These features have been evaluated in Section 9.0 of this SE and are considered acceptable.
- o In the SE, the staff stated that in the control room, fire detectors were provided in all areas outside of the normal line of sight of the operators. The licensee states, however, that certain "remote areas which do not contain fire hazards" have not been provided with fire detectors. On this basis, the staff considers the absence of detectors in remote areas of the control room to be acceptable and will confirm the absence of fire hazards during the upcoming Appendix R inspection.
- o In the SE, the staff referred to a manual smoke removal capability in the control room and the possible use of portable exhaust fans to remove smoke after a fire. In fact, no manual smoke removal capability exists other than the portable fans. However, this does not affect the staff's conclusions regarding the adequacy of fire protection within the control room.
- o In the SE, the staff listed a number of proposed modifications for the control room. One such modification was "Reports to power cabling to ensure local operation of a CRD pump...." This should read "Modify power circuits to ensure local operation of a CRD pump...."
- o A number of additional comments were made by the licensee concerning the staff's review of the safe shutdown and alternate shutdown capabilities. These comments will be addressed in the staff's SE of the licensee's December 10, 1986 revised Appendix R compliance review, which is pending.

13.0 SUMMARY

Based on the above evaluation the staff recommends that the following exemption requests should be approved:

- o Lack of a complete fire-rated enclosure around the shutdown cooling pump room;
- o Lack of fire detection and suppression systems in the area of the Unit 1 and Unit 2 power interconnect cable;
- o Lack of 8-hour battery powered emergency lighting units in the yard area;

- o Lack of separation, free of intervening combustibles, between redundant shutdown systems, and fire detection and suppression systems in the drywell liner area; and
- o Lack of one-hour fire-rated barrier between redundant shutdown-related power train control cables in the cable vault (Fire area T-16).

The following conditions conform with the guidance issued in GL 86-10. No exemptions are, therefore, necessary:

- o Lack of fire-rated dampers and hatch covers between turbine building areas T-3 and T-7;
- o Lack of a fire-rated door and frame between turbine building area T-9 and reactor building R-1;
- o Lack of fire-rated construction between turbine building areas T-1 and T-7/T-9;
- o Use of an automatic sprinkler system in lieu of fire-rated construction in the switchgear room fire area T-3 (two instances); and
- o Lack of a fire-rated door in the common boundary between turbine building areas T-2 and T-9.

The staff also concluded that the licensee's technical resolution of the fire damper installation variances at Unit 1 is acceptable.

Principal Contributor: D. Kubicki

Dated: JUL 17 1987