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

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Dockets Nos. 50-321
and 50-366

Mr. J. T. Beckham, Jr.
Vice President-Nuclear Generation
Georgia Power Company
P. O. Box 4545
Atlanta, Georgia 30302

Dear Mr. Beckham:

SUBJECT: DRAFT SAFETY EVALUATION REPORT (SER) ON APPENDIX R EXEMPTION REQUEST

We have completed our review of your July 1, 1982 submittal concerning Appendix R exemption requests and 10 CFR 50.48 schedular exemption requests for Edwin I. Hatch Nuclear Plant, Units 1 and 2. Our draft SER is enclosed.

We request that you review this draft SER to determine whether it accurately reflects the information contained in your submittal, and inform us within three weeks of any corrections you consider necessary. With respect to followup action regarding exemption denials, there are three options: (1) appeal denials to NRR management; (2) propose another alternative that requires an exemption; or (3) make modifications to meet the specific requirements of Appendix R. Please inform us within three weeks regarding which action you plan to take.

If an appeal meeting is requested, it should be limited to the technical review of the information on the record and should be held within six weeks.

If, for denied exemptions, you choose to propose an alternative which also requires an exemption, it should be filed under the provisions of Section 50.12 of 10 CFR Part 50. If you choose to propose such an alternative, we request that you do so within 60 days.

If, for denied exemptions, you propose to make modifications which meet the specific requirements of Section III.G of Appendix R, no additional submittal is necessary unless the modifications are to provide alternative shutdown capability. In these cases, you will be given six months to provide the description of the modifications for alternative shutdown capability.

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DATE							

You should note that our review of your Section III.G evaluation revealed instances, such as in the Reactor Building, where the requirements of Section III.G may have been misinterpreted. Specifically, you do not appear to have evaluated the plant for compliance with Appendix R on the basis of valid fire areas. Also, you appear to have relied upon partial fire detection and fire suppression systems (providing "spot" protection) to achieve compliance with Section III.G.2. In addition, you have assumed that the insulation on IEEE, qualified cable is noncombustible. Based on tests, our position is that such insulation will support combustion and, therefore, should be considered when evaluating the physical separation of redundant shutdown divisions. Our position with regard to the above issues is restated in Section 6 of the enclosure.

With respect to the requested 10 CFR 50.48 schedular exemptions, we have determined that your submittal does not provide sufficient bases to justify our granting the schedular exemptions. If you wish to supplement the previous submittal to provide additional information in support of this request, we will consider it before making a final decision on this subject.

If you have any questions regarding this letter or the draft SER, please contact G. W. Rivenbark, the NRC Project Manager for the Hatch Plant.

Sincerely,

"ORIGINAL SIGNED BY
JOHN F. STOLZ"
John F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing

Enclosure:
Draft SER

cc w/enclosure:
See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

EXEMPTION REQUEST

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GEORGIA POWER COMPANY, ET AL

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EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 & 2

DOCKETS NOS. 50-321 AND 50-366

1.0 Introduction

By letter dated July 1, 1982, the licensee submitted an Appendix R evaluation. Twelve exemptions to the technical requirements of Section III.G were requested. We received additional information in a meeting with the licensee on October 28, 1982.

Our requirements for the fire protection for safe shutdown are as follows:

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:

a. 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;

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

c. Enclosure of cable 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 alternative shutdown capability independent of the fire area of concern. It also requires a fixed suppression system to 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 the design basis fire. Plant specific features may require protection different than the measures specified in Section III.G. In such a case, the licensee must demonstrate, by means of a detailed fire hazards analysis, that existing protection or 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 hazards analysis.

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Our general criteria for accepting an alternative fire protection configuration are the following:

- 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.

- The alternative assures that fire damage to at least one train of equipment necessary to achieve cold shutdown is limited such that it can be repaired within a reasonable time (minor repairs with components stored on-site).

- Modifications required to meet Section III.G would not enhance fire protection safety above that provided by either existing or proposed alternatives.

- Modifications required to meet Section III.G would be detrimental to overall facility safety.

2.0.1 4160-V Transformer Room - Unit 1
2.0.2 West 600- Switchgear Room - Unit 1
2.0.3 Diesel Building Switchger Room - 2G - Unit 2
2.0.4 River Intake Structure

2.1 Exemption Requested

The licensee requested exemptions from Section III.G.2 to the extent that it requires the installation of an automatic fire suppression system.

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2.2.1 Discussion (4160-V Transformer Room)

The room is enclosed by walls, floor and ceiling of reinforced concrete. All components associated with safe shutdown pathway 1 were assumed lost in a fire in the room. Pathway 2 systems which require protection to assure their availability during a fire are those associated with: Residual heat removal (RHR) and the reactor recirculation system.

Combustible materials located in the room include cable insulation in conduit and fire retardant type transformer oil, which represent a negligible fire load.

Existing fire protection consists of a smoke detection system, portable fire extinguishers and manual hose stations.

The licensee proposes to completely protect the pathway 2 systems in the room by a one-hour fire rated barrier.

2.2.2 Discussion (West 600-V Switchgear Room)

The room is enclosed by walls, floor and ceiling of reinforced concrete. All components of safe shutdown pathway 1 were assumed lost in a fire in this room. Pathway 2 systems which require protection to assure their availability during a fire are those associated with:

1. Suppression chamber temperature elements,
2. Reactor pressure vessel level indication,
3. Suppression chamber level indication,
4. Plant service water, and
5. Automatic depressurization system.

Combustible materials located in the room include cable insulation which represents a fire load of 25,533 BTU/ft^2.

Existing fire protection consists of a smoke detection system, portable fire extinguishers and manual hose stations.

The licensee proposes to completely protect the pathway 2 systems in the room by a one-hour fire rated barrier.

2.2.3 Discussion (Diesel Building Switchgear Room - 2G)

The room is enclosed by walls, floor and ceiling of reinforced concrete. All components of safe shutdown pathway 2 were assumed lost in a fire in this room. The pathway 1 system which requires protection to assure its availability during a fire is Diesel 1B.

Combustible material located in this room includes cable insulation, which represents a fire load of 56,460 BTU/ft^2.

Existing fire protection consists of heat and smoke detection systems, portable fire extinguishers and manual hose stations.

The licensee proposes to protect the pathway 1 system in a one-hour fire rated barrier.

2.2.4 Discussion (River Intake Structure)

The building is enclosed with walls, floor and ceiling of reinforced concrete. Safe shutdown equipment located within this fire area includes both safety divisions of RHR service water pumps and associ-

ated cabling and motor control centers (MCC) for both units. In addition, the area contains both safety divisions of plant service water pumps and associated cabling, and MCCs for both units. Redundant safety circuits are located in conduit and cable trays are either separated by more than 20 feet without intervening combustibles or one train is protected by a one-hour fire rated barrier. One-half inch steel plate barriers have been installed to separate RHR service water pumps and MCCs for each unit, and to separate the service water pumps from the remainder of the equipment in the building.

Combustible materials located in the area include cable insulation and lube oil representing a fire load of 55,010 BTU/ft^2.

Existing fire protection consists of a smoke detection system, a wet-pipe automatic sprinkler system protecting the RHR and plant service water pump motors, manual hose stations and portable fire extinguishers.

2.2.5 Justification

For all fire areas the licensee justifies the exemptions on the basis that the low fire load in these areas, if ignited, would result in a fire of limited magnitude.

2.3 Evaluation

In all fire areas the technical requirements of Section III.G are not met because of the lack of an area-wide automatic fire suppression system.

The fire protection requirements of Section III.G of Appendix R represent an aggregate, comprised of active and passive components. They act synergistically to achieve an acceptable level of fire safety. In the subject areas, the licensee has provided active protection in the form of complete smoke detection systems. These systems provide reasonable assurance of early fire awareness and response by operating personnel and the plant fire brigade.

Additional protection is provided in the River Intake Structure by the automatic sprinkler system over the pump motors. Passive protection is achieved in these areas by phyiscal separation of redundant divisions by open spaces without intervening combustibles, by partial height barriers to protect the safety components, as in the River Intake Structure, or by complete one-hour fire rated barriers.

The fire loading in these rooms, which includes anticipated transient combustibles, is low. If the combustibles were totally consumed, they would produce a fire which corresponds to a fire severity on the ASTM time temperature curve of less than 40 minutes. But this fire would be unlikely to occur because of the existing level of fire protection.

It is our judgment that a fire, if one should occur in these areas, would not be significant, and would not breach the protection provided by physical fire barriers until the fire is self extinguished or was suppressed by the plant fire brigade. We have, reasonable assurance that one safe shutdown pathway will be free of fire damage.

2.4 Conclusion

Based on our evaluation, we conclude that the licensee's alternate fire protection configuration, will provide reasonable assurance that one safe 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 licensees request for exemption for the following rooms should be granted:

1. 4160-V Transformer Room - Unit 1,
2. West 600-V Switchgear Room - Unit 1,
3. Diesel Building Switchgear Room - 2G - Unit 2, and
4. River Intake Structure

3.0.1 Reactor Building Working Floor - el. 158 ft. - Unit 1
3.0.2 CRD Accumulators and Working Floor - Reactor Building - el. 130 ft. - Unit 1
3.0.3 Torus Room - Unit 1
3.0.4 Reactor Building Working Floor - el. 158 ft. - Unit 2
3.0.5 Reactor Building Working Floor - el. 130 ft. - Unit 2
3.0.6 Reactor Building Torus Area - Unit 2

3.1 Exemption Requested

The licensee requested exemptions from the technical requirements of Section III.G.2 to the extent that it requires the installation of an area wide automatic fire suppression system and a complete one hour fire rated barrier.

3.2.1 Discussion (Reactor Building - el. 158 ft. - Unit 1)

The area is enclosed with walls, floor and ceiling of reinforced concrete construction. This fire zone is open to vertically adjoining areas that have been identified by the licensee as separate fire zones. The floor elevation was subdivided into three fire sectors for the

purpose of assessing Appendix R compliance. Each sector is open to the others since no physical barrier exists between them. Safe shutdown equipment that is located within this floor elevation include both safety divisions of reactor protection system instrument racks and both safety divisions of remote shutdown panels.

The combustible materials present in this area include cable insulation and a concentration of clean health physics supplies which represent a fire load of 13,635 BTU/ft^2.

Existing fire protection consists of portable fire extinguishers and manual hose stations.

3.2.2 Discussion (Reactor Building - Working Floor - el. 130 ft. - Unit 1)

The area is enclosed with walls, floor and ceiling of reinforced concrete construction. This fire zone is open to vertically adjoining areas that have been identified by the licensee as separate fire zones. The floor elevation was subdivided into five "fire sectors" for the purpose of assessing Appendix R compliance. Each sector is open to the others since no physical barrier exists between them. Safe shutdown equipment located within this floor elevation includes both safety divisions of the control rod drive (CRD) accumulators, monitors, and temperature recorders.

Safety-related motor control centers (MCCs) R24-S011 and R24-S012 are also located within this zone. One cabinet is located on the north side of the drywell while the redundant MCC is remotely located on the opposite side of the drywell. The MCCs control cooling units for all

four corner rooms and the drywell as well as motor-operated valves for LPCI, RHR, Core Spray, RCIC, and HPCI pumps are located in this zone. In addition, two safety divisions of the LPCI MCCs are located along the east wall of the zone. Shutdown instrument panel (H21-P173) and DC MCC panel 1B (R24-S022), division 2 only are located on the east and north walls of the zone, respectively.

Combustible materials located within this floor elevation include cable insulation and clean health physics materials which represent a fire load of more than 105,000 BTU/ft^2.

Existing fire protection consists of a partial smoke detection system, portable fire extinguishers and manual hose stations.

The licensee proposes to protect select cable raceways, for either pathway 1 or 2 shutdown circuits, in a one hour fire rated barrier. This barrier will cover only that portion of the raceways that is located within 20 feet of its redundant counterpart. The remaining portions of the raceway will be unprotected.

3.2.3 Discussion (Torus Room - Unit 1)

The area is enclosed by walls, floor, and ceiling of reinforced concrete construction. The room was subdivided into two fire sectors for the purpose of assessing Appendix R compliance. Each sector is open to the other since no physical barrier exists between them. Safe shutdown equipment located within the Torus Room includes pathway 1 systems associated with RCIC, RHR, Torus Temperature, Drywell air and Torus level. Pathway 2 systems in the zone are those associated with HPCI, RHR, Torus Temperature, and Drywell air.

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Combustible material in the room consists of cable insulation which represents a fire load of approximately 48,000 BTU/ft^2.

Existing fire protection consists of manual hose stations. The licensee proposes to protect certain cable raceways in a one-hour fire barrier to assure that one shutdown pathway is free of fire damage. However, the barrier will cover only that portion of the raceway that is within 20 feet of its redundant counterpart.

3.2.4 Discussion (Reactor Building - el. - 158 ft. - Unit 2)

The area is enclosed in walls, floor and ceiling of reinforced concrete construction. The floor elevation was subdivided into three sectors for the purpose of assessing Appendix R compliance. Each sector is open to the others since no physical barrier exists between them. Redundant divisions of safety related cabling are located in the zone for systems such as the drywell air and RPV system, among others (not specifically identified by the licensee).

Combustible material located within the floor elevation consists of cable insulation which represent a fire load of 34,367 BTU/ft^2.

Existing fire protection consists of manual hose stations. The licensee proposes to relocate components to prevent them from being damaged by a single fire and to install a redundant air system to the accumulators.

3.2.5 Discussion (Reactor Building - el. 130 ft. - Unit 2)

The area is enclosed by walls, floor and ceiling of reinforced concrete construction. This fire zone is open to vertically adjoining areas that have been identified by the licensee as separate fire zones. In addi-

tion, the floor elevation was subdivided into five "fire Sectors" for the purpose of assessing Appendix R compliance. Each sector is open to the others since no physical barrier exists between them. Safe shutdown equipment in the zone includes both safety divisions of CRD accumulators and monitors as well as cabling for systems related to RPV level, ADS, HPCI, drywell air and RHR.

Combustible material located within the floor elevation consists of cable insulation which represent a fire load of approximately 116,000 BTU/ft^2.

Existing fire protection consists of a partial smoke detection system, manual hose stations and portable fire extinguishers. The licensee proposes to relocate certain circuits and protect others in a one-hour fire barrier to assure that one safe shutdown pathway is free of fire damage. However, the barrier will cover only that portion of the raceway that is within 20 feet of its redundant counterpart.

3.2.6 Discussion (Torus Area - Unit 2)

The area is enclosed by walls, floor and ceiling of reinforced concrete. The room was subdivided into two fire sectors for the purpose of assessing Appendix R compliance. Each sector is open to the other since no physical barrier exists between them. Safe shutdown equipment located in the room include pathway 1 and 2 systems associated with drywell air, HPCI, RHR and RCIC.

Combustible material in the room consists of cable insulation which represents a fire load of approximately 50,600 BTU/ft^2.

Existing fire protection consists of manual hose stations. The licensee proposes to protect certain circuit raceways with a one-hour fire barrier to assure that one shutdown pathway is free of fire damage. However, the barrier will cover only that portion of the raceway that is within 20 feet of its redundant counterpart.

3.2.7 Justification

The licensee justifies the exemptions for these areas on the basis that the low fire loading in the zones, if ignited, will not result in a fire of significant magnitude. In addition, the physical configuration of the zones (open spaces, high ceiling) coupled with the proposed modifications and existing protection, provide assurance that one safe shutdown pathway will be free of fire damage. The licensee states that the installation of an area-wide fire suppression system or one hour fire barriers (el. 158 ft. - Units 1 & 2) will not significantly enhance fire safety.

3.3 Evaluation

The technical requirements of Section III.G are not met because the fire zones are not equipped with area-wide fire suppression and fire detection systems.

In addition, redundant shutdown divisions are not separated by at least 20 feet with no intervening combustible material or by a complete one hour fire rated barrier.

The fire protection requirements of Section III.G represent an aggregate, comprised of active and passive components. The two forms of protection work synergistically to provide reasonable assurance that one train of safe shutdown systems is free of fire damage.

With the exception of the partial smoke detection systems on elevation 130 feet, these zones have no active fire protection. The partial smoke detection systems will provide reasonable assurance of early fire awareness in the immediate areas where the detectors are installed, but not in the unprotected locations. Consequently, a fire could occur and propagate for a significant period of time until discovered and efforts to suppress it begin.

The fire load in these zones varies. There are a number of locations where a concentration of combustible material exists. If a fire occurred in these locations, it would have a significant damage producing potential. This potential is increased because of the absence of an automatic fire suppression system or adequate physical separation between redundant safety divisions.

The licensee proposes to install one-hour fire rated barriers around a portion of the safety related cable in these zones. This will provide a limited degree of fire protection. But the remainder of the cable is unprotected and would be subject to fire damage. There is no generally recognized, consistently accurate predictor of fire propagation and damage in an unprotected environment. Consequently, providing protection for only a portion of critically important shutdown related cable and components will not provide reasonable assurance that the safe shutdown capability can be maintained after a fire.

The licensee's proposed modifications are selective in nature. That is, in one fire sector, shutdown pathway 1 systems are protected. In adjoining sectors, pathway 2 systems will be protected. Since there are no fire barriers at sector boundaries, a single fire may damage systems from both pathways, preventing the achievement and maintenance of safe shutdown.

3.4 Conslusion

Based on the above evaluation, we conclude that the modifications proposed for the subject areas do not provide an acceptable level of fire protection equivalent to that provided by Section III.G.2. Therefore, the licensee's request for an exemption for the following areas should be denied:

1. Reactor Building Working Floor - el. 158 ft. - Unit 1,
2. CRD Accumulators and Working Floor - Reactor,
3. Building - el. 130 ft. - Unit 1,
4. Torus Room - Unit 1,
5. Reactor Building Working Floor - el. - 158 ft. - Unit 2,
6. Reactor Building Working Floor - el. - 130 ft. - Unit 2, and
7. Reactor Building Torus Area - Unit 2

4.0 Control Building Station Battery Room - Unit 2

4.1 Exemption Requested

The licensee requested an exemption from Section III.G.2 to the extent that it requires the installation of a 3-hour rated fire barrier between redundant trains of safe shutdown related cable and equipment.

4.2 Discussion

The battery room is enclosed by walls, floor and ceiling of reinforced concrete construction having a fire resistance rating of 3 hours. HVAC duct penetrations of the walls are protected by fire dampers. Access to this room is via a single watertight door that is not fire rated. Safe shutdown equipment located in the room consists of one

safety division of station batteries and redundant circuits for the service air system. The licensee proposes to reroute these circuits to conform to the separation criteria of Section III.G.

Combustible material located in this room includes cable insulation, battery casings and hydrogen gas which represent a fire load of approximately 30,000 BTU/ft^2.

Existing fire protection consists of a smoke detection system, manual hose stations and portable fire extinguishers.

The licensee justifies the exemption on the basis that the watertight door is substantially constructed and will provide adequate protection from fire, in consideration of the existing fire loading and plant safeguards. Also, replacing this door with one that is fire rated will degrade plant safety because the station batteries must be protected from a circulatory water flood. A non-watertight fire rated door would not provide sufficient protection.

4.3 Evaluation

The technical requirements of Section III.G are not met because a complete 3-hour fire rated barrier does not exist to separate the redundant station battery rooms.

Our concern is that the steel, submarine-type, watertight doors will protect the battery room contents from direct flame impingement, heat, and smoke until the fire self extinguishes or is suppressed by the plant fire brigade. The fuel load in this area of the plant is low. If totally consumed, the combustibles would produce a fire which corresponds to a fire severity on the ASTM E-119 time temperature

curve of less than 25 minutes. The duration of this fire ignores the protection afforded by the plant fire protection program and actions by operating personnel and the fire brigade. It is our judgment that a fire in this area, if one should occur, would not be of significant magnitude or duration. It would be discovered early by the smoke detection system and extinguished by the fire brigade using manual fire fighting equipment.

Because the door is watertight, it would prevent smoke from passing through it. Since it is constructed of 5/8 inch thick steel, the door would act as an effective radiant heat shield. The door in conjunction with the ventilation system would prevent convective heat from increasing to a significant level so as to damage safety systems. Therefore, a three-hour fire rated door is not necessary to provide us with reasonable assurance that one safety division would remain free of fire damage.

4.4 Conclusion

Based on our evaluation, we conclude that the licensee's alternate fire protection configuration, will achieve an acceptable level of fire protection equivalent to that provided by Section III.G.2. Therefore, the licensees request for exemption for the Control Building Station Battery Room 2B should be granted.

5.0 Control Building Switchgear Hallway - Unit 2

5.1 Exemption Requested

The licensee requested an exemption from Section III.G.2 to the extent that it requires the installation of an automatic fire suppression system and a one hour fire suppression system and a one-hour fire rated barrier.

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5.2 Discussion

This fire zone is enclosed on three sides by construction having a 3-hour fire resistance rating. The fourth side is open to the control building corridor, which has been designated by the licensee as a separate fire zone. The ceiling and floor are of reinforced concrete.

Safe shutdown equipment which is located within this zone consists of redundant electrical cabinets to 600V-dc switchgear and related cable.

The combustible material in this area includes cable insulation which represents a fire load of approximately 33,806 BTU/ft^2.

Existing fire protction consists of a complete area-wide smoke detection system and manual hose stations of both water and carbon dioxide. The licensee proposes to protect the shutdown pathway 2 cable raceways in a complete one-hour fire rated barrier. The redundant switchgear are separated by a distance of less than 13 feet and by a partial concrete barrier.

The licensee employed an analtyical method to demonstrate the inherent protection afforded to existing safe shutdown systems. The intent of this method was to demonstrate that compliance with Section III.G of Appendix R would not ehnance the fire protection for safe shutdown.

5.3 Evaluation

The technical requirements of Section III.G are not met because of the lack of an area wide automatic fire suppression system. In addition, the redundant switchgear panels are not separated by a complete one-hour fire rated barrier.

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The analytical method can be summarized as follows:

- The redundant cables and components of concern were identfied.
- Their geometry and configuration within the fire area were described.
- The type of cable insulation and failure criteria were specified.
- The minimum quantity of flammable liquid needed to produce sufficient heat flux and heat energy to damage the cables were calculated, considering several heat transfer modes, i.e. radiation, plume impingement, and stratification.

The analysis determined the heat flux into the room needed to cause electrical failure of the redundant panels. This heat flux was converted to a quantity of flammable liquid, in a circular pool configuration.

We and our contractor Brookhaven National Laboratory have reviewed the analytical method. We have determined that the results of the methodology, as applied, do not demonstrate the equivalence of the protection provided for safe shutdown to the specific alternatives set forth in Section III.G of Appendix R. For example:

. The method does not consider the heat release rate of a given fire when it occurs against a wall or in a corner; the method only considers the heat release of a fire as it occurs in an open area.

. The method does not consider the effects of excess pyrolyzate resulting from the degradation of plastics burning in the stratified layer.

. The method does not consider all of the alternatives set forth in Section III.G. i.e., 3-hour fire barrier, 1-hour fire barrier with suppression system, twenty-feet separation free of combustibles

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with automatic suppression and alternate or dedicated shutdown capability independent of the area. The method only considers separation without automatic suppression and uses a stratification model which does not include the effects of separation.

The licensee has not used the results of this analysis to compare the protection provided with that specified in Section III.G. The licensee has stated that the accumulation of the calculated quantity of flammable liquids in the required configuration is an unrealistic condition, and will be prevented by administrative controls. We do not deem this to be a valid argument because there is no positive means of preventing the accumulation of transient materials in individual plant areas. As documented in Inspection and Enforcement Branch Reports, recent inspections at plants such as Davis Besse (50-346/82-03, April 1, 1982), Duane Arnold (50-331/81-25, January 11, 1982), D.C. Cook (50-315/82-11, December 31, 1981), and Nine Mile Point (50-220/82-09), have demonstrated that substantial quantities of hazardous substances such as 55 gallon drums of waste oil are located in even highly restricted and controlled entry areas.

We have not relied upon the results of the licensee's analysis in our evaluation. We have evaluated the exemption request using our standard method of review:

a. Review the information submitted and that existing in the docket file to determine the configuration of the redundant components,

b. Evaluate the existing fire protection, proposed modifications, and other compensating features or mitigating factors to determine the overall level of fire protection in the area of concern, and

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c. Determine if the overall level of safety is equivalent to that provided by Section III.G of Appendix R.

The in-situ fire load in the zone is large. If all the combustibles were totally consumed, it would result in a fire which corresponds to a fire severity on the ASTM time temperature curve of over 4½ hours. This in-situ fire load, combined with transient combustibles which may be present, represent a severe fire exposure hazard. The partial barrier that is located between the redundant panels would not prevent direct flame impingement, radiant and convective heat and smoke from possibly damaging them.

The zone is not provided with an automatic fire suppression system, which would extinguish a fire before damage occurred to both panels. Although the smoke detection system provides an early fire warning capability, the lack of adequate physical separation of the panels may result in a situation where significant damage occurs to the redundant components prior to the arrival of the fire brigade and successful fire suppression efforts.

5.4 Conclusion

Based on the above evaluation, we conclude that the modifications proposed for this area do not provide an acceptable level of fire protection equivalent to that provided by Section III.G.2. Therefore, the licensee's request for an exemption for the Control Building Switchgear Hallway - Unit 2 should be denied.

6.0 Clarification of Appendix R Issues

6.1 Introduction

Our review of the licensee's Appendix R evaluation revealed instances, such as in the Reactor Building, where the requirements of Section

III.G may have been misinterpreted. Specifically, the licensee does not appear to have evaluated the plant for compliance with Section III.G on the basis of valid fire areas.

The licensee has also relied upon partial fire detection and fire suppression systems (intended to provide spot protection) to achieve compliance with Section III.G.2.

In addition, the licensee has assumed that the insulation on IEEE qualified cable is noncombustible. We deem it prudent to state our position on these matters to avoid any misunderstandings.

6.2 Fire Areas

Section III.G of Appendix R identifies acceptable methods to provide fire protection for shutdown systems, when redundant trains are located "within the same area." A fire area is generally bounded by construction having a fire resistance of at least 3 hours or by equivalent protection such as a justified fire barrier of less fire resistance or a water curtain. Fire hazard analyses conducted prior to Appendix R to satisfy NRC Supplementary Guidance for Fire Protection Program Evaluation (September 1976), evaluated plant conditions from the perspective of both fire areas and fire zones (locations within a fire area that are not bounded by fire barriers). However, Section III.G of Appendix R sets forth the requirements for fire protection for safe shutdown capability only on the basis of fire areas.

The term "fire area" was defined in page 2 of BTP APCSB 9.5-1 "Guidelines for Fire Protection for Nuclear Power Plants"dated May 1, 1976. This definition also applied to Appendix A to BTP APCSB 9.5-1. A fire area was defined as "that portion of a building or plant that is separated from other areas by boundary fire

barriers (walls, floors and roofs) with any openings or penetrations protected with seals or closures having a fire resistance rating equal to that of the barrier." Because this definition appeared to be well understood and accepted by licensees and because Appendix R uses the same definition as Appendix A to BTP APCSB 9.5-1, the definition was not repeated in Appendix R.

To the extent that the previous evaluations by the licensee and the staff were based on fire areas which comply with the above definition, they are in compliance with Appendix R. To the extent that the previous evaluations were not based on fire areas, and the separation between fire zones does not comply with the separation defined in Section III.G of Appendix R, the technical requirements of Appendix R have not been met. Previous acceptance by the staff of features not specifically identified in Section III.G does not relieve the licensee of his responsibility to comply with Section III.G, or to request an exemption from these requirements.

The fire protection requirements of Section III. G of Appendix R are intended to provide reasonable assurance that at least one safe shutdown division is free of fire damage after a postulated fire in any area. Licensees, in their effort to assess compliance with Section III.G, are required to identify all those redundant shutdown systems that may be affected by a single fire within the plant. Because it is not possible to predict occurrance, locality or severity of fires, the area of potential fire influence needs to be defined by boundaries that can reasonably be expected to contain the flame, heat, and hot gases that will result from a fire. This definition of "fire areas" is predicated on sound fire protection engineering principles as they relate to the risk of fire damage to redundant shutdown equipment and cables, with due consideration to the propagation of fire and smoke through struc-

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tures. Fire area boundaries defined by non-substantive, non-physical, logical divisions or equipment groupings cannot be expected to restrict fire and smoke spread. Therefore, any Appendix R compliance analysis that was not based on fire areas defined by a three-hour fire rated wall, or by equivalent protection such as a justified fire barrier of less fire resistance, or an adequate water curtain, would not provide reasonable assurance that all potentially fire damaged shutdown systems had been considered.

6.3 Area Fire Detectors and Fire Suppression System

Sections III.G.2.B; III.G.2.C; III.G.2.D; and III.G.3 of Appendix R necessitate that a fire detection and fire suppression system be installed "in the area." This protection should be provided in conformance with appropriate industry standards (such as National Fire Protection Association Standards Nos. 13 and 72E) on the basis of sound fire protection principles. General industry practice, as exemplified by the following references from the National Fire Protection Association, (NFPA), Fire Protection Handbook and NFPA Standards, is to install fire protection throughout an area:

> ". . . complete installation of sprinklers throughout a building is necessary for complete protection of life and property. No areas should be left unprotected. It is risk to omit sprinklers from any single area because it is judged that the hazard is not sufficient to warrant them."[1]

"The basic principles for providing proper protection are namely: (1) Sprinklers installed throughout the premises . . ."[2]

"When complete coverage is required, (Fire) detection devices should be installed throughout all parts of the building."[3]

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There may be instances where the installation of a fire suppression system in an individual fire area may be detrimental to overall plant safety. In some instances the provision of a fire detection and a fire suppression system throughout the fire area may not significantly increase the level of fire safety afforded by partial coverage. Therefore, where it can be clearly demonstrated, by a fire protection engineering analysis, that the installation of a fire detection and fire suppression in only select locations within a valid fire area will provide an equivalent level of protection, we will consider partial coverage for such an area under the exemption process.

6.4 Cable Insulation as Intervening Combustible Material

Section III.G.2.b, identifies one means of ensuring that one of the redundant trains of shutdown equipment and cabling is free of fire damage. This entails separation of redundant trains by more than 20 feet with no intervening combustible material, and the provision of area-wide fire detection and suppression systems.

Numerous comprehensive flammability tests conducted by the Electric Power Research Institute (EPRI NP-1200, EPRI EL-1263), Factory Mutual (Contract RP-1165-1), and Sandia National Laboratories (NUREG/CR-2431 among others) have shown that burning plastic cable insulation represents a significant fire hazard.

These tests were conducted on both IEEE-383 qualified and unqualified cable. While the qualified cable exhibited a tendency to ignite and propagate flame less radily, combustion continued at significant levels. It is our position, therefore, that plastic cable insulation should be considered as a combustible material for the purpose of defnining potential fire exposures.

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6.5 Conclusion

We conclude that compliance with Section III.G of Appendix R is determined on the basis of valid fire areas, determined in conformance with the principles identified above. We also conclude that, where a comprehensive fire protection engineering analysis indicates that the provision of a fire detection and fire suppression system in only select locations within a valid fire area will provide an adequate level of protection, we will consider such partial coverage under the exemption process. Also, plastic cable insulation constitutes a combustible material.

7.0 Conclusion

Based on our evaluation, we conclude that the licensee's proposals for the following areas do not represent an acceptable level of safety to that which would be achieved with compliance with the requirements of Section III.G of Appendix R to 10 CFR 50:

1. Reactor Building Working Floor - el. 158 ft. - Unit 1
2. CRD Accumulators and Working Floor - Reactor Building - el. 130 ft. - Unit 1
3. Torus Room - Unit 1
4. Reactor Building Working Floor - el. - 158 ft. - Unit 2
5. Reactor Building Working Floor - el. 130 ft. - Unit 2
6. Reactor Building Torus Area - Unit 2
7. Control Building Switchgear Hallway - Unit 2

Therefore, the licensee's request for exemptions for these areas should be denied.

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In ~~seven~~ fire areas of the plant, we agree with the licensee that modifications required to meet Section III.G would not enhance fire safety above that provided by existing and proposed alternatives. Therefore, the licensee's request for exemptions for the following area should be granted.

1. 4160-V Transformer Room - Unit 1
2. West 600-V Switchgear Room - Unit 1
3. Diesel Building Switchgear Room 2G - Unit 2
4. River Intake Structure
5. Control Building Station Battery Room - 2B - Unit 2

1. "Fire Protection Handbook," Fourteenth Edition, National Fire Protection Association, Quincy, Massachusetts, 1976, p. 14-10.

2. "Standard for the Installation of Sprinkler Systems," NFPA 13-1978, page 13-67, paragraph 4-1.1.1.

3. "Fire Protection Handbook," Fourteenth Edition, National Fire Protection Association, Quincy, Massachusetts, 1976, p. 12-20.