September 17, 1986

Docket No. 50-261

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Mr. E. E. Utley, Senior Executive Vice President
Power Supply and Engineering & Construction
Carolina Power and Light Company
Post Office Box 1551
Raleigh, North Carolina 27602

Dear Mr. Utley:

Subject: Exemption from Certain Requirements of 10 CFR Part 50, Appendix R, Sections III.G.2 and III.G.3 - H.B. Robinson Steam Electric Plant, Unit No. 2

By letters dated July 20 and November 20, 1984, February 13, May 10, and October 28, 1985, you requested exemptions from the technical requirements of 10 CFR Part 50, Appendix R, Section III.G.3. This request involves 20 fire zones outside the containment where fire detection and fixed fire suppression systems have not been installed throughout the area. Thirteen fire zones are located in fire area A, one in fire area B and six in fire area G.

In addition, an exemption from the technical requirements of Section III.G.2.f was requested by letter dated August 17, 1984, in an area inside the containment for providing radiant heat shielding for certain Rockbestos cables. The cables service the alternative shutdown system steam generator level transmitters and steam generator A hot leg and cold leg resistance temperature detectors (RTDs).

Based on the enclosed staff safety evaluation and technical evaluation report prepared by the staff's contractor, the Commission has granted your exemption requests pursuant to 10 CFR Part 50.12. The exemption is effective as of the date of this letter. The enclosed exemption is being forwarded to the Office of the Federal Register for publication.

Sincerely,

Lester S. Rubenstein, Director
PWR Project Directorate #2
Division of PWR Licensing-A
Office of Nuclear Reactor Regulation

Enclosures:
1. Exemption
2. Safety Evaluation

cc: See next page

LA:PAD#2	PM:PAD#2	PWR-A	PD:PAD#2	OGC	D:PWR-A
DMiller	GRequa:bc	ERossi	LRubenstein	WShields	TNovak
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cc:
Thomas A. Baxter, Esquire
Shaw, Pittman, Potts and Trowbridge
1800 M Street, N.W.
Washington, DC 20036

Mr. McCuen Morrell, Chairman
Darlington County Board of Supervisors
County Courthouse
Darlington, South Carolina 29535

Mr. H. A. Cole
Special Deputy Attorney General
State of North Carolina
P.O. Box 629
Raleigh, North Carolina 27602

Mr. D. E. Hollar
Associate General Counsel
Carolina Power and Light Company
P.O. Box 1551
Raleigh, North Carolina 27602

U.S. Nuclear Regulatory Commission
Resident Inspector's Office
H. B. Robinson Steam Electric Plant
Route 5, Box 413
Hartsville, South Carolina 29550

Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
Suite 2900
101 Marietta Street
Atlanta, Georgia 30303

Mr. R. Morgan
General Manager
H. B. Robinson Steam Electric Plant
Post Office Box 790
Hartsville, South Carolina 29550

Mr. Dayne H. Brown, Chief
Radiation Protection Branch
Division of Facility Services
Department of Human Resources
701 Barbour Drive
Raleigh, North Carolina 27603-2008

Mr. Robert P. Gruber
Executive Director
Public Staff - NCUC
P.O. Box 29520
Raleigh, North Carolina 27626-0520

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the matter of	)	Docket No. 50-261
CAROLINA POWER & LIGHT COMPANY	)	
H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2	)	

EXEMPTION

I.

The Carolina Power and Light Company (CP&L, the licensee) is the holder of Operating License No. DPR-23 which authorizes operation of H. B. Robinson Steam Electric Plant, Unit 2. The license provides, among other things, that the H. B. Robinson Steam Electric Plant, Unit 2 is subject to all rules, regulations, and Orders of the Commission now or hereafter in effect.

The station is a single-unit pressurized water reactor at the licensee's site located in Darlington County, South Carolina.

II.

On November 19, 1980, the Commission published a revised Section 50.48 and a new Appendix R to 10 CFR Part 50 regarding fire protection features of nuclear power plants. The revised Section 50.48 and Appendix R became effective on February 17, 1981. Section III of Appendix R contains 15 subsections, lettered A through O, each of which specified requirements for a particular aspect of the fire protection features at a

nuclear power plant. One of these subsections, III.G, is the subject of the licensee's exemption request.

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 nonsafety 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 nonsafety 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.

c. Enclosure of cable and equipment and associated nonsafety 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.

Subsection III.G.3 of Appendix R requires that for areas where alternative or dedicated shutdown is provided, fire detection and a fixed fire suppression system shall also be installed in the area, room, or zone under consideration.

III.

By letter dated July 20, 1984, the licensee requested two exemptions from III.G.3 of Appendix R. The first exemption was from the III.G.3 fixed

suppression requirements for six plant fire areas. The second exemption was from the III.G.3 fixed suppression and fire detection requirements for a single fire area. On November 30, 1984, the licensee submitted changes in the method of implementing the alternative shutdown capability and this resulted in identifying additional fire zones where credit was taken for the alternative shutdown capability. By letter dated February 13, 1985, the licensee also requested III.G.3 exemptions from the requirements of fixed suppression and fire detection for these new fire zones. This February 13, 1985 submittal became a "stand-alone" document consolidating exemption requests made in the July 20 and November 30, 1984 submittals. On March 11, 1985, a meeting was held between the licensee and the NRC, and the licensee submitted additional information in a letter dated May 10, 1985. This information was in the form of fire area drawings, fire detection system NFPA code compliance, diesel oil storage tank NFPA code compliance, and cable tray concentration fire loadings. Finally, the licensee amended the III.G.3 Appendix R exemption request by letter dated October 28, 1985.

By letter dated August 17, 1984, the licensee requested an exemption from Section III.G.2.f to the extent that it would require the Rockbestos cables inside containment be kept "free of fire damage." This submittal also provided technical information previously requested by the NRC staff.

By telecon dated August 4, 1986, the licensee provided information relevant to the "special circumstances" finding required by revised 10 CFR 50.12(a) (See 50 Fed. Reg. 50764). The licensee stated that existing and proposed fire protection features at H. B. Robinson accomplish the underlying purpose of the rule. Implementing additional modifications to provide additional suppression systems, detection systems, and fire barriers would require the expenditure of engineering and construction

resources as well as the associated capital costs which would represent an unwarranted burden on the licensee's resources. The licensee stated that the costs to be incurred are as follows:

- III.G.3 Engineering, procurement and installation of additional detection and suppression equipment - $1,656,000.
- III.G.2.f Engineering procurement and installation of radiant energy heat shields - $61,000.

The licensee stated that these costs are significantly in excess of those required to meet the underlying purpose of the rule. The staff concludes that "special circumstances" exist for the licensee's requested exemptions in that application of the regulation in these particular circumstances is not necessary to achieve the underlying purposes of Appendix R to CFR Part 50. See 10 CFR 50.12(a)(2)(ii).

The following exemption requests, therefore, reflect the latest status for the areas/zones listed below:

1. Auxiliary Building (Fire Area A), Limited to Fire Zones 3, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 21, and 23.
   Exemptions were requested from Section III.G.3 to the extent that it requires the installation of fire detection and fixed fire suppression throughout the zones for which an alternative shutdown capability is provided.
2. Charging Pump Room, Volume Control Tank Room, and Non-Regenerative Heat Exchanger Room (Fire Area B), limited to Fire Zone 4.
   Exemptions were requested from Section III.G.3 to the extent that it requires the installation of fire detection and fixed fire suppression throughout the zones for which an alternative shutdown capability is provided.

3. Exterior Area (Fire Area G), limited to Fire Zones 25, 28, 30, 31, 32, and 33.

   Exemptions were requested from Section III.G.3 to the extent that it requires the installation of fire detection and fixed fire suppression throughout the zones for which an alternative shutdown capability is provided.

4. Containment Outside the Missile Barrier from approximately 90^{o} to 270^{o} and from 120^{o} to 290^{o} at General Elevations 230 Feet to 235 Feet.

   An exemption was requested from III.G.2.f to the extent that it would require the Rockbestos cables (serving as a radiant energy heat shield) to be kept free of fire damage.

The licensee requested an exemption from Section III.G.3 to the extent that it requires the installation of fire detection and fixed fire suppression systems throughout the fire zones for which an alternative shutdown capability is provided. These fire zones include 3, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 21, and 23.

Fire Zones 3, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 21, and 23 are all within Fire Area A, the auxiliary building. Construction is composed of reinforced concrete. The fire loadings for all of these zones is low to moderate and in no case is the fire loading such that a fire severity greater than 30 minutes would result.

In the fire zones under consideration, each one contains redundant trains of normal safe shutdown systems. However, alternative safe shutdown capability is proposed for each area. In each case, the alternative safe shutdown capability will be electrically independent from the zone under consideration. Passive safe shutdown equipment, such as tanks, heat exchangers, and manually operated valves, which are relied upon in their current location, have been evaluated and shown to be available.

The existing fire protection includes early warning fire detection except for fire zones 12 and 13, fire extinguishers in each zone as well as hose station coverage. Fire Zone 7 has a partial area preaction sprinkler system.

The fire protection in these fire zones does not comply with the technical requirements of Section III.G.3 of Appendix R because fire detection and fire suppression systems have not been installed throughout the fire zones for which an alternative shutdown capability is provided.

The staff was concerned that a fire in one of these fire zones could cause a loss of normal shutdown capability. However, the fuel load in Fire Zones 3, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 21, and 23 is low (less than 38,000 Btu per square foot). Because of the low to moderate combustible loading, the staff does not anticipate a fire of significant magnitude or duration to occur. Except for Fire Zones 12 and 13, fire detection is available in each of these zones and elsewhere throughout the auxiliary building. Therefore, we have reasonable assurance that a fire in these locations will be detected during its early stages and extinguished by the fire brigade before adjacent safety-related areas are threatened.

In Fire Zones 3, 11, 12, and 16, passive safe shutdown equipment is located and relied upon for the protection of redundant safe shutdown trains. In the case of valves, manual action is not needed for over 1 hour and, since the fire loadings are low (maximum of a 23-minute fire severity), ample time exists for the fire brigade to extinguish the fire and manually operate the valve(s). Heat exchangers are filled with water and exposed to only low fire loading; therefore, the staff has reasonable assurance that anticipated fires would not damage them.

Should a fire damage any normal safe shutdown components in Fire Zones 6, 7, 8, 13, 15, 17, 18, 21, and 23 before the fire brigade extinguishes the fire, alternative shutdown capability is available to be used to achieve and maintain safe shutdown.

Based on the staff's evaluation, the staff concludes that the existing fire protection features already in place combined with the alternative shutdown capability in the above described fire zones provide a level of protection equivalent to the technical requirements of Section III.G.3 of Appendix R.

The licensee also requested an exemption from Section III.G.3 to the extent that it requires installation of fire detection and fixed fire suppression systems throughout Fire Zone 4 and Fire Area B for which alternative shutdown capability is provided.

Fire Zone 4 of Fire Area B is enclosed by 3-hour fire barriers. The fire loading is 18,500 Btu per square foot and this translates into a 13-minute fire severity as represented by the ASTM E-119 fire test curve. Hence, this is a low fire loading.

Fire Zone 4 contains safe shutdown equipment; however, the designated alternative shutdown method for Fire Area B is alternative train B. Train B is completely independent of Fire Area B.

The existing fire protection includes fire extinguishers, hose station coverage, and a fire detection system using heat and ionization detectors.

The staff was concerned that a fire in this fire zone could cause a loss of normal shutdown capability. However, the fire load in Fire Zone 4 is low (less than 19,000 Btu per square foot). Because of the low combustible fire loading, the staff does not expect a fire of significant

magnitude or duration to occur. Should a fire damage normal safe shutdown components in this fire zone before extinguishment by the fire brigade, the alternative shutdown capability is available to be used to achieve and maintain safe shutdown.

Based on our evaluation, the staff concludes that the existing fire protection features already in place, combined with the alternative shutdown capability in the above described fire zone, provide a level of protection equivalent to the technical requirements of Section III.G.3 of Appendix R.

The licensee also requested an exemption from Section III.G.3 to the extent that it requires installation of fire detection and fixed fire suppression systems throughout Fire Zones 25, 28, 30, 31, 32, and 33 for which an alternative shutdown capability is provided.

Fire Zones 25, 28, 30, 31, 32, and 33 are all within Fire Area G. The fire load per square foot was not calculated for the exterior areas in Fire Zones 25 and 30. The other fire zones have a negligible fire loading.

Each of the fire zones under consideration contains redundant trains of normal safe shutdown systems. However, alternative safe shutdown capability is proposed for each area. In each case, the alternative safe shutdown capability (alternative train B) will be electrically independent from the zone under consideration except for Fire Zones 30, 31, and 33. These three zones contain train B safe shutdown components. Fire Zone 30 contains the 25,000-gallon diesel fuel oil tank and diesel oil transfer pumps that fuel diesel generators A and B. The A and B diesel day tanks are independent of Fire Area G, and they contain a 16-hour supply of fuel. However, the dedicated

shutdown diesel (a third diesel) has an independent fuel supply and this equipment is more than 500 feet away from Fire Zone 30. Therefore, emergency power is available from two separate locations given a fire in Fire Zone 30.

Fire Zone 31 contains the refueling water storage tank, which is required for the alternative safe shutdown system. This tank is located outside. This is true also for the condensate storage tank in Fire Zone 33. For the other fire zones in Fire Area G, alternative shutdown is completely independent.

Fire protection exists in Fire Zone 25 in the form of an early warning fire detection system and a partial deluge fire suppression system. Also, fire extinguishers and hose stations are available. The other fire zones under consideration in Fire Area G are open to the outside environment and there are yard hydrants available with fire hoses.

The staff was concerned that a fire in one of these fire zones could cause a loss of normal shutdown capability. However, the fire loads in Fire Zones 25, 28, 30 (except for the diesel fuel), 31, 32, and 33 are low and, therefore, the staff does not anticipate that a fire of significant magnitude or duration would occur. In the case of Fire Zone 25, a fire detection system exists and, hence, a fire would be detected in its early stages and extinguished by the fire brigade before adjacent safety-related areas are threatened. In the other fire zones, the fire would be in the exterior, and heat would escape and dissipate directly without threatening safety-related equipment.

Should a fire damage any normal safe shutdown components in Fire Zones 25, 28, 30, 31, 32, and 33 before the fire brigade extinguishes the fire, the alternate shutdown capability is available and/or remains in tact to be used to achieve and maintain safe shutdown.

Based on our evaluation, the staff concludes that the existing fire protection features already in place, combined with the alternate shutdown capability in the above described fire zones, provide a level of protection equivalent to the technical requirements of Section III.G.3 of Appendix R.

The licensee also requested exemption from Section III.G.2.f to the extent that it would require the Rockbestos cables (serving as a radiant energy heat shield) to be kept free of fire damage in the containment.

The licensee has committed to use Rockbestos cables for service of the alternate shutdown system steam generator level transmitters and steam generator A hot leg and cold leg resistance temperature detectors. There is about a 14- to 19-foot vertical separation between the Rockbestos cables and the cable trays above. These alternate shutdown instruments are used to provide data input to indicators located on the charging pump room panel and the turbine deck panel.

The fire loading in containment includes 960 pounds of charcoal for a fire load of 2000 Btu per square foot and 200 gallons of lube oil per reactor coolant pump, which results in a 20,000 Btu per square foot per pump bay. A fire severity of less than 20 minutes would be associated with the above fire loadings.

Fire protection is in the form of fire extinguishers and manual hose stations. The electrical penetration area has fire detection and a preaction sprinkler system. Each reactor coolant pump has a preaction sprinkler system which minimizes the oil fire hazards.

The technical requirements of Section III.G.2.f are not met in the containment area because certain alternate shutdown-related instrument cables, delineated in the licensee's August 17, 1984 letter, are not

protected by a radiant energy heat shield and would not be free of fire damage after being involved in a fire.

The staff had a number of concerns with the use of "fire-rated" cable in lieu of a conventional radiant energy heat shield. The first was that, when exposed to the effects of a fire, the cable would not perform its intended function. By letter dated June 13, 1984, the Licensee submitted the results of a fire test conducted by Underwriter's Laboratories. In the procedure, representative samples of the cable were subjected to a 1-hour fire endurance and hose stream test in accordance with the method in ASTM E-119. During the fire test and for a period of 93 hours beyond, electrical measurements were taken to confirm the cable's electrical performance. The results confirm that the acceptance criteria of ASTM E-119 were met or exceeded. We, therefore, have reasonable assurance that the cables will function as designed until the fire is extinguished.

We were also concerned that the heat produced in a fire would cause structural features such as cable trays to collapse. The falling debris might impact the cable and cause its failure. The Rockbestos cables will be in conduits and supported on the missile wall on unistrut type supports, which keep the cable/conduit close to the wall. Therefore, falling debris will not pull it down and, because of the low fire loading, insufficient heat will be generated to cause support failure. The fire brigade could easily extinguish the fire using manual equipment.

With regard to voltage, the subject cable will be used at 24 Vdc, and the Rockbestos cables have been fire tested at voltages of 110 Vac, 480 Vac, and 960 Vac. Therefore, there is no concern about its use at high voltages.

Because the fire-rated cable would be damaged by a fire, we were concerned that this damage would affect the performance of the shutdown functions for a time period that is significantly longer than the time period for which the

function is required. The proposed use of this cable is to provide a radiant energy heat shield for use inside containment. The cables were subjected to an ASTM E-119 fire test, and the circuit integrity was maintained and kept functional for a period of 93 hours. Rockbestos cables were previously evaluated and accepted by the NRC for use where a 1-hour fire-rated barrier was required by Appendix R. This acceptance was granted for TMI via an NRC letter dated April 19, 1985. The intent of a radiant energy heat shield for use inside containment was to offer a lesser level of passive fire protection than a 1-hour barrier. This was in recognition of the fact that the containment fire hazards tended to be low and containment was not susceptible to the degree of transient fires expected to occur outside of containment. Therefore, we conclude that the Rockbestos cable is quite conservative for the heat shield application, given minor fire damage that would be expected to occur inside containment.

For the distributed fire load in this area, it would be difficult to achieve a real fire that would result in temperatures approaching the E-119 time-temperature curve over a large portion of the fire area. Prompt action by the fire brigade would further reduce the time-temperature curve. The hose stream tests with repeated application of hose stream forces have resolved this concern.

We were concerned that thermal expansion forces, and post-fire mechanical forces due to fire fighting and recovery operations, were not simulated. We were also concerned that "wet short" conditions were not simulated, in that cables in cable trays may be immersed in water for a significant time. The installation proposed by the Licensee is for conduits, and hose streams would not disrupt the cables. These cables, being in conduit, would not be immersed in water. These two concerns are resolved.

Based on the above evaluation, the staff concludes that the use of Rockbestos fire rated cables in lieu of a radiant energy heat shield inside containment provides a level of fire protection equivalent to the technical requirements of Section III.G.2.f of Appendix R.

IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), that (1) these exemptions as described in Section III are authorized by law, will not present an undue risk to the public health and safety, and are consistent with the common defense and security and (2) special circumstances are present for the exemptions in that application of the regulation in these particular circumstances is not necessary to achieve the underlying purposes of Appendix R to 10 CFR Part 50. Therefore, the Commission hereby grants the following exemptions from the requirements of Section III.G of Appendix R to 10 CFR Part 50:

1. Auxiliary Building (Fire Area A), limited to Fire Zones 3, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 21, and 23 to the extent that automatic fire detection and suppression systems are not installed throughout the zones pursuant to III.G.3.
2. Charging Pump Room, Volume Control Tank Room, and Non-Regenerative Heat Exchanger Room (Fire Area B) limited to Fire Zone 4 to the extent that automatic fire detection and suppression systems are not installed throughout the zones pursuant to III.G.3.
3. Exterior Area (Fire Area G), limited to Fire Zones 25, 28, 30, 31, 32, and 33 to the extent that automatic fire detection and suppression systems are not installed throughout the zones pursuant to III.G.3.

4. Containment Outside the Missile Barrier from approximately 90° to 270° and from 120° to 290° at General Elevations 230 Feet to 235 Feet to the extent that the Rockbestos cables be kept free of fire damage pursuant to III.G.2.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of these exemptions will have no significant impact on the environment (51 FR 32979) dated September 17, 1986.

A copy of the Safety Evaluation dated September 17 , 1986, related to this action is available for public inspection at the Commission's Public Document Room, 1717 H Street, NW, Washington, D.C. and at the local public document room located at the Hartsville Memorial Library, Home & Fifth Avenue, Hartsville, South Carolina 29550. A copy may be obtained upon written request addressed to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of PWR Licensing-A.

This Exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Thomas M. Novak, Acting Director
Division of PWR Licensing-A
Office of Nuclear Reactor Regulation

Dated at Bethesda, Maryland,
this 17th day of September, 1986

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

ENCLOSURE 2

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATIVE TO APPENDIX R EXEMPTIONS REQUESTED BY

CAROLINA POWER & LIGHT COMPANY

H. B. ROBINSON STEAM ELECTRIC PLANT

DOCKET NO. 50-261

1.0 INTRODUCTION

By letter dated July 20, 1984, the Licensee requested two exemptions from Section III.G.3 of Appendix R to 10 CFR 50 that affected seven plant areas. On November 30, 1984, the Licensee modified its method of implementing the alternative safe shutdown capability and this increased the number of plant areas requiring a III.G.3 exemption request. By letter dated February 13, 1985, the Licensee submitted a new exemption request document that superseded the July 20, 1984, submittal and also covered the newly identified plant areas. This revised submittal was supplemented by Licensee letters dated May 10, 1985, and October 28, 1985. The Licensee also submitted an exemption request from Section III.G.2 of Appendix R via letter dated August 17, 1984. This request also contained technical data previously requested by the NRC staff.

This safety evaluation is based in part on the attached Technical Evaluation Report (TER) generated by a NRR contractor Franklin Research Center (FRC). This TER has been reviewed by the staff and it is in agreement with the conclusions reached in the FRC TER.

Section III.G.1 of Appendix R requires fire protection features to be provided for structures, systems, and components important to safe shutdown, capable of limiting fire damage so that:

a. One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage; and

b. Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.

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 nonsafety 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 nonsafety 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.

c. Enclosure of cable and equipment and associated nonsafety 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 the above conditions are not met, Section III.G.3 requires that there be an alternative shutdown capability independent of the fire area of concern. It also requires that fire detection and a fixed suppression system be installed in the fire area of concern. These alternative requirements are not deemed to be equivalent; however, they provide an acceptable level of fire protection for those configurations in which they are approved by the staff.

Because it is not possible to predict the specific conditions under which fires may occur and propagate, the design-basis protective features rather than the design-basis fire are specified in the rule. Plant-specific features may require protection different from 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. Either fire protection configurations must meet the specific requirements of Section III.G or an alternative fire protection configuration must be justified by a fire hazard analysis. Generally, the staff will accept an alternative fire protection configuration if:

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

- o Fire-retardant coatings are not used as fire barriers.
- o Modifications required to meet Section III.G would not enhance fire protection safety levels 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 FIRE AREA A AUXILIARY BUILDING

- o (Fire Zone 3) Safety Injection Pump Room, Auxiliary Building
- o (Fire Zone 6) Auxiliary Feedwater Pump Room, Auxiliary Building
- o (Fire Zone 7) Auxiliary Building Hallway on Ground Floor, Auxiliary Building
- o (Fire Zone 8) Boron Injection Tank Room, Auxiliary Building
- o (Fire Zone 11) Pipe Alley Injection Tank Room, Auxiliary Building
- o (Fire Zone 12) Waste Holdup Tank, RHR Heat Exchangers, Auxiliary Building
- o (Fire Zone 13) Chemical Storage Area, Boric Acid Batching Tank, Auxiliary Building
- o (Fire Zone 15) Auxiliary Building Second Level Hallway, Auxiliary Building
- o (Fire Zone 16) Battery Room, Auxiliary Building
- o (Fire Zone 17) HVAC Equipment Room for Control Room, Auxiliary Building
- o (Fire Zone 18) Unit No. 1 Cable Spreading Room, Auxiliary Building
- o (Fire Zone 21) Rod Control Room, Auxiliary Building
- o (Fire Zone 23) Hagan Room, Auxiliary Building

2.1 Exemption Requested

Exemptions were requested from Section III.G.3 to the extent that it requires installation of fire detection and fixed fire suppression systems in the zones for which an alternative shutdown capability is provided.

2.2 Discussion

Fire Zones 3, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 21, and 23 are all within Fire Area A, the auxiliary building. Construction is composed of reinforced concrete. The fire loadings for all of these zones would be considered low and in no case is the fire loading such that a fire severity greater than 30 minutes would result. The fire loads and fire severity for each zone are listed below.

Zone	Fire Load (BTU/ft^2)	Equivalent Fire Severity (min)
3	31,400	23
6	29,400	22
7	37,000	28
8	18,000	14
11	16,000	12
12	Negligible	Negligible
13	3,300	3
15	28,000	21
16	13,000	10
17	8,000	6
18	32,000	24
21	14,000	10
23	31,600	24

Per the request of the NRC staff, the Licensee identified the fire zones within the auxiliary building that had more than six cable trays equivalent to 24-inch-wide trays. Only Fire Zones 3, 7, and 21 were listed and are pertinent to this discussion. Other fire zones listed either had fire suppression and detection or were not the subject of this exemption request or both. For the Fire Zones 3, 7, and 21, the number of cable trays did not represent a concentrated or high fire hazard because the total fuel load was low.

In the fire zones under consideration, each one contains redundant trains of normal safe shutdown systems. However, alternative safe shutdown capability is proposed for each area. In each case, the alternative safe shutdown capability will be electrically independent from the zone under consideration. Passive safe shutdown equipment, such as tanks, heat exchangers, and manually operated valves, which are relied upon in their current location, have been evaluated and shown to be available. These instances are discussed below.

In Fire Zone 3 (safety injection pump room), there are two refueling water storage tank (RWST) outlet valves, SI-864A and SI-864B. These valves are required to be shut for safe shutdown and can be manually operated. Fire Zone 11 (pipe alley) contains component cooling water supply and return valves FCV-626, CC-716A, and CC-716B in the flow path to and from the reactor coolant pump (RCP) thermal barriers. RCP seal water return valve CVC-381 is also located within this zone. These valves are required to establish either component cooling water (CCW) flow or RCP seal water flow for safe shutdown. The seal water flow system is independent of the CCW flow system.

Fire Zone 12 (waste holdup tank and residual heat removal (RHR) heat exchangers) has two RHR heat exchangers, and only one is required for safe shutdown. Fire Zone 16 (battery room) has power feeds to auxiliary panels DC and GC. Finally, Fire Zone 23 has the component cooling surge tank on the upper elevation (267 feet 0 inch).

The existing fire protection includes fire extinguishers in each zone as well as hose station coverage. Also, fire detection in the form of heat or products-of-combustion detectors are in each zone except for Fire Zones 12 and 13. Fire Zone 7 has a partial area preaction sprinkler system.

2.3 Evaluation

The fire protection in these fire zones does not comply with the technical requirements of Section III.G.3 of Appendix R because fire detection and fire suppression systems have not been installed in zones for which an alternative shutdown capability is provided.

We were concerned that a fire in one of these fire zones could cause a loss of normal shutdown capability. However, the fuel load in Fire Zones 3, 6, 7, 8, 11, 12, 13, 15, 16, 17, 18, 21, and 23 is low (less than 38,000 Btu per square foot). Because of the low combustible loading, we do not expect a fire of significant magnitude or duration to occur. Except for Fire Zones 12 and 13, fire detection is available in each of these zones and elsewhere throughout the auxiliary building. Therefore, we have reasonable assurance that a fire in these locations will be detected during its early stages and extinguished by the fire brigade before adjacent safety related areas are threatened.

In Fire Zones 3, 11, 12, and 16, passive safe shutdown equipment is located and relied upon for safe shutdown. In the case of valves, manual action is not needed for over one hour and, since the fire loadings are low (maximum of a 23-minute fire severity), ample time exists for the fire brigade to extinguish the fire and manually operate the valve(s). Heat exchangers are filled with water and exposed to only a low fire loading; therefore, the staff has reasonable assurance that anticipated fires would not damage them.

Should a fire damage any normal safe shutdown components in Fire Zones 6, 7, 8, 13, 15, 17, 18, 21, and 23 before the fire brigade extinguishes the fire, alternative shutdown capability is available to be used to achieve and maintain safe shutdown.

2.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection features already in place combined with the alternative shutdown capability in the above described fire zones provide a level of protection equivalent to the technical requirements of Section III.G.3 of Appendix R. Therefore, the exemptions should be granted.

3.0 FIRE AREA B

(Fire Zone 4) Charging Pump Room, Volume Control Tank (VCT) Room, and Non-Regenerative Heat Exchanger Room

3.1 Exemption Requested

An exemption was requested from Section III.G.3 to the extent that it requires installation of fire detection and fixed fire suppression systems in the zone for which an alternative shutdown capability is provided.

3.2 Discussion

Fire Zone 4 of Fire Area B is enclosed by 3-hour fire barriers. The fire loading is 18,500 Btu per square foot and this translates into a 13-minute fire severity as represented by the ASTM E-119 fire test curve. Hence, this is a low fire loading.

Fire Zone 4 contains safe shutdown equipment; however, the designated alternative shutdown method for Fire Area B is alternative train B. This alternative train uses the safety injection pumps and pressurizer power-operated relief valves. Train B is completely independent of Fire Area B.

The existing fire protection includes fire extinguishers, hose station coverage, and a fire detection system using heat and ionization detectors.

3.3 Evaluation

The fire protection in Fire Zone 4 of Fire Area B does not comply with the technical requirements of Section III.G.3 of Appendix R because fire detection and fixed fire suppression systems have not been installed in a zone for which an alternative shutdown capability is provided.

The staff was concerned that a fire in this fire zone could cause a loss of normal shutdown capability. However, the fire load in Fire Zone 4 is low (less than 19,000 Btu per square foot). Because of the low combustible fire loading, we do not expect a fire of significant magnitude or duration to occur. Fire detectors, although not installed on an area-wide basis, are located in the zone. Therefore, we have reasonable assurance that a fire in these locations will be detected during its early stages and extinguished by the fire brigade. Also, the 3-hour fire rated barriers enclose the area and, therefore, the adjacent safety-related areas are not threatened. Should a fire damage normal safe shutdown components in this fire zone before extinguishment by the fire brigade, the alternative shutdown capability is available to be used to achieve and maintain safe shutdown.

3.4 Conclusion

Based on the above evaluation, the staff concludes that the existing fire protection features already in place, combined with the alternative shutdown capability in the above described fire zone, provides a level of protection equivalent to the technical requirements of Section III.G.3 of Appendix R. Therefore, the exemptions should be granted.

4.0 FIRE AREA G

- o (Fire Zone 25) Turbine Building
- o (Fire Zone 28) New Fuel Storage Fuel Handling Area, Hot Machine Shop, Holdup Tanks
- o (Fire Zone 30) Diesel Oil Storage Tank
- o (Fire Zone 31) Refueling Water Storage Tank
- o (Fire Zone 32) Primary Water Storage Tank
- o (Fire Zone 33) Condensate Storage Tank

4.1 Exemption Requested

Exemptions were requested from Section III.G.3 to the extent that it requires installation of fire detection and fixed fire suppression systems in the zones for which an alternative shutdown capability is provided.

4.2 Discussion

Fire Zones 25, 28, 30, 31, 32, and 33 are all within Fire Area G. The fire load per square foot was not calculated for the exterior areas in Fire Zones 25 and 30. The other fire zones have a negligible fire loading.

Each of the fire zones under consideration contains redundant trains of normal safe shutdown systems. However, alternative safe shutdown capability is proposed for each area. In each case, the alternative safe shutdown capability (alternative train B) will be electrically independent from the zone under consideration except for Fire Zones 30, 31, and 33. These three zones contain train B safe shutdown components. Fire Zone 30 contains the 25,000-gallon diesel fuel oil tank and diesel oil transfer pumps that fuel diesel generators A and B. The A and B diesel day tanks are independent of Fire Area G, and they contain a 16-hour supply of fuel. However, the dedicated shutdown diesel (a third diesel) has an independent fuel supply and this equipment is over 500 feet away from Fire Zone 30. Therefore, emergency power is available from two separate locations given a fire in Fire Zone 30. Also, the diesel fuel oil tank is within a diked area sufficient to hold the tank contents, meets NFPA standard

No. 30, and is located at least 50 feet away from safety-related equipment. Fire Zone 31 contains the RWST, which is required for the alternative safe shutdown system. This tank is located outside. This is true also for the condensate storage tank (CST) in Fire Zone 33. For the other fire zones in Fire Area G, alternative shutdown is completely independent.

Fire protection exists in Fire Zone 25 in the form of a fire detection system, which has heat detectors and ionization detectors, and a partial deluge fire suppression system. Also, fire extinguishers and hose stations are available. The other fire zones under consideration in Fire Area G are open to the outside environment and there are yard hydrants available with fire hoses.

4.3 Evaluation

The fire protection in these fire zones does not comply with the technical requirements of Section III.G.3 of Appendix R because fire detection and fixed fire suppression systems have not been installed in zones for which an alternative shutdown capability is provided.

We were concerned that a fire in one of these fire zones could cause a loss of normal shutdown capability. However, the fuel loads in Fire Zones 25, 28, 30 (except for the diesel fuel), 31, 32, and 33 are low and, therefore, we do not expect a fire of significant magnitude or duration to occur. In the case of Fire Zone 25, a fire detection system exists and, hence, a fire would be detected in its early stages and extinguished by the fire brigade before adjacent safety-related areas are threatened. In the other fire zones, the fire would be in the exterior, and heat would escape and dissipate directly without threatening safety-related equipment. Fire Zones 30, 31, and 33 contain safe shutdown equipment that forms part of alternative shutdown train B. Should a fire occur in Fire Zone 30 and disrupt the fuel oil supply to diesel A and B, then a third dedicated emergency diesel is available. Also, the diesel A and B day tanks contain enough fuel for a 16-hour supply. Therefore, emergency power is available independent of Fire Zone 30. The RWST tank in Fire Zone 31 contains water and, hence, a fire would not damage this tank (the fire load in this zone is negligible). The same is true for the CST in Fire Zone 33.

Should a fire damage any normal safe shutdown components in Fire Zones 25, 28, 30, 31, 32, and 33 before the fire brigade extinguishes the fire, the alternative shutdown capability is available and/or remains in tact to be used to achieve and maintain safe shutdown.

4.4 Conclusion

Based on the evaluation, the staff concludes that the existing fire protection features already in place, combined with the alternate shutdown capability in the above described fire zones, provide a level of protection equivalent to the technical requirements of Section III.G.3 of Appendix R. Therefore, the exemptions should be granted.

5.0 CONTAINMENT OUTSIDE THE MISSILE BARRIER FROM APPROXIMATELY 90° TO 270° AND FROM 120° TO 290° AT GENERAL ELEVATION 230 FEET TO 235 FEET

5.1 Exemption Requested

An exemption was requested from Section III.G.2.f to the extent that it would require the Rockbestos cables (serving as a radiant energy heat shield) to be kept free of fire damage.

5.2 Discussion

The Licensee has proposed the use of Rockbestos cables for service of the alternative shutdown system steam generator level transmitters and steam generator A hot leg and cold leg resistance temperature detectors (RTDs). The cable routings will be outside the missile barrier from approximately 90° to 270° for the level transmitters and from 120° to 290° for the RTDs. The Rockbestos cables will be routed in conduit after the cable leaves the vicinity of the electric cable penetrations where automatic suppression is installed. The normal instrumentation cables are routed in cable trays within the same area at elevation 248 feet, 11 inches (21 feet from the floor at grade). The Rockbestos cables will be at elevations 230 to 235 feet, which will place these cables at 2 to 7 feet above the floor. Therefore, there is about a 14- to 19-foot vertical separation between the Rockbestos cables and the cable trays above. The RTD cables then enter the steam generator and RCP area A.

These alternate shutdown instruments are used to provide data input to indicators located on the charging pump room panel and the turbine deck panel.

The fire loading in containment includes 960 pounds of charcoal for a fire load of 2000 Btu per square foot and 200 gallons of lube oil per RCP, which results in a 20,000 Btu per square foot per pump bay. A fire severity of less than 20 minutes would be associated with the above fire loadings.

Fire protection is in the form of fire extinguishers and manual hose stations. The electrical penetration area has fire detection and a preaction sprinkler system. Each RCP has an oil collection systems which minimizes the oil fire hazards.

5.3 Evaluation

The technical requirements of Section III.G.2.f are not met in this area because certain alternate shutdown-related instrument cables, delineated in the Licensee's August 17, 1984 letter, are not protected by a radiant energy heat shield and would not be free of fire damage after being involved in a fire.

We had several concerns with the use of "fire-rated" cable in lieu of a conventional radiant energy heat shield.

The first was that, when exposed to the effects of a fire, the cable would not perform its intended function. By letter dated June 13, 1984, the Licensee submitted the results of a fire test conducted by Underwriter's Laboratories. In the procedure, representative samples of the cable were subjected to a 1-hour fire endurance and hose stream test in accordance with the method in ASTM E-119. During the fire test and for a period of 93 hours beyond, electrical measurements were taken to confirm the cable's electrical performance. The results confirm that the acceptance criteria of ASTM E-119 were met or exceeded. We, therefore, have reasonable assurance that the cables will function as designed until the fire is extinguished.

We were also concerned that the heat produced in a fire would cause structural features such as cable trays to collapse. The falling debris might impact the cable and cause its failure. The Rockbestos cables will be in conduits and supported on the missile wall on unistrut type supports, which keep the cable/conduit close to the wall. Therefore, falling debris will not pull it down and, because of the low fire loading, insufficient heat will be generated to cause support failure. The fire brigade could easily extinguish the fire using manual equipment.

With regard to voltage, the subject cable will be used at 24 Vdc, and the Rockbestos cables have been fire tested at voltages of 110 Vac, 480 Vac, and 960 Vac. Therefore, there is no concern about its use at high voltages.

Because the fire-rated cable would be damaged by a fire, we were concerned that this damage would affect the performance of the shutdown functions for a time period that is significantly longer than the time period for which the function is required. The proposed use of this cable is to provide a radiant energy heat shield for use inside containment. The cables were subjected to an ASTM E-119 fire test, and the circuit integrity was maintained and kept functional for a period of 93 hours. Rockbestos cables were previously evaluated and accepted by the NRC for use where a 1-hour fire-rated barrier was required by Appendix R. This acceptance was granted for TMI via an NRC letter dated April 19, 1985. The intent of a radiant energy heat shield for use inside containment was to offer a lesser level of passive fire protection than a 1-hour barrier. This was in recognition of the fact that the containment fire hazards tended to be low and containment was not susceptible to the degree of transient fires expected to occur outside of containment. Therefore, we conclude that the Rockbestos cable is quite conservative for the heat shield application, given minor fire damage that would be expected to occur inside containment.

For the distributed fire load in this area, it would be difficult to achieve a real fire that would result in temperatures approaching the E-119 time-temperature curve over a large portion of the fire area. Prompt action by the fire brigade would further reduce the time-temperature curve. The hose stream tests with repeated application of hose stream forces have resolved this concern.

We were concerned that thermal expansion forces, and post-fire mechanical forces due to fire fighting and recovery operations, were not simulated. We were also concerned that "wet short" conditions were not simulated, in that cables in cable trays may be immersed in water for a significant time. The installation proposed by the Licensee is for conduits, and hose streams would not disrupt the cables. These cables, being in conduit, would not be immersed in water. These two concerns are resolved.

5.4 Conclusion

Based on the above evaluation, the staff concludes that the use of Rockbestos fire rated cables in lieu of a radiant energy heat shield inside containment provides a level of fire protection equivalent to the technical requirements of Section III.G.2.f of Appendix R. Therefore, the exemptions should be granted.

6.0 SUMMARY

Based on this evaluation, it is found that the level of fire safety in the areas listed below is equivalent to that achieved by compliance with the technical requirements of Section III.G of Appendix R and, therefore, the Licensee's request for exemptions in these areas should be granted:

1. (Fire Zone 3) lack of complete area wide fire detection and fixed suppression
2. (Fire Zone 6) lack of complete area wide fire detection and fixed suppression
3. (Fire Zone 7) lack of complete area wide fire detection and fixed suppression
4. (Fire Zone 8) lack of complete area wide fire detection and fixed suppression
5. (Fire Zone 11) lack of complete area wide fire detection and fixed suppression
6. (Fire Zone 12) lack of complete area wide fire detection and fixed suppression
7. (Fire Zone 13) lack of complete area wide fire detection and fixed suppression
8. (Fire Zone 15) lack of complete area wide fire detection and fixed suppression
9. (Fire Zone 16) lack of complete area wide fire detection and fixed suppression
10. (Fire Zone 17) lack of complete area wide fire detection and fixed suppression
11. (Fire Zone 18) lack of complete area wide fire detection and fixed suppression
12 (Fire Zone 21) lack of complete area wide fire detection and fixed suppression
13. (Fire Zone 23) lack of complete area wide fire detection and fixed suppression
14. (Fire Zone 4) lack of complete area wide fire detection and fixed suppression
15. (Fire Zone 25) lack of complete area wide fire detection and fixed suppression

16. (Fire Zone 28) lack of complete area wide fire detection and fixed suppression
17. (Fire Zone 30) lack of complete area wide fire detection and fixed suppression
18. (Fire Zone 21) lack of complete area wide fire detection and fixed suppression
19. (Fire Zone 32) lack of complete area wide fire detection and fixed suppression
20. (Fire Zone 33) lack of complete area wide fire detection and fixed suppression
21. (Containment) Fire rated cables in lieu of radiant energy heat shield

Principal Contributor: J. Stang

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