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Docket No. 50-272

Mr. Richard A. Uderitz, Vice President -
Nuclear
Public Service Electric and Gas Company
P. O. Box 236
Hancocks Bridge, New Jersey 08038

Dear Mr. Uderitz:

**SUBJECT: SALEM NUCLEAR GENERATING STATION, UNIT NO. 1, FIRE PROTECTION -
REQUEST FOR EXEMPTION FROM REQUIREMENTS OF APPENDIX R TO 10 CFR
50, SECTION III.G**

The Commission has issued in Enclosure 1, 12 exemptions to certain requirements of Section 50.48 and Appendix R to 10 CFR 50 in response to your letter dated March 19, 1981. These exemptions pertain to fire protection of safe shutdown capability.

By letter dated March 19, 1981, PSE&G requested 16 exemptions from 10 CFR Part 50, Appendix R, Item III.G for Salem Nuclear Generating Station, Unit 1. These requests are summarized as follows:

1. Use of fire doors and/or fire dampers rated for 1 1/2 hours rather than a 3-hour fire barrier as required by Item III.G.2a.
2. Use of 1 hour fire barriers without an automatic fire suppression system in 13 fire areas for Unit No. 1 as required by Item III.G.2.
3. Substitution of redundant automatic fire suppression systems for barriers or barriers plus an automatic fire suppression system as required by Items III.G.2a and 2c.
4. Substitution of portable fire extinguishers for a fixed fire suppression system in the control room areas of Unit No. 1 as required by Item III.G.3.

Subsequently, during a series of meetings between the NRC staff and PSE&G from April 30, 1981 to May 6, 1981, the need for request 3 was removed since the licensee decided to provide a one hour fire barrier for one train of auxiliary feedwater trays.

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DATE ▶

Mr. Richard A. Uderitz

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By previous letter dated September 16, 1982, we granted Exemption from the requirements of 10 CFR Part 50, Appendix R, Item III.G.2a for your first request and from Item III.G.3 for your fourth request.

The enclosed Exemption grants relief in 12 fire areas from the requirements of Item III.G.2, your second request. The bases for this Exemption are given in the enclosed Safety Evaluation. For one fire area, the RHR heat exchanger area, it was determined that no exemption is required.

The Exemption is being forwarded to the Office of the Federal Register for publication.

Sincerely,

Original signed by:
S. A. Varga

Steven A. Varga, Chief
Operating Reactors Branch No. 1
Division of Licensing

Enclosures:

- 1. Exemption
- 2. Safety Evaluation

cc w/enclosures:
See next page

all comments

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UNITED STATES NUCLEAR REGULATORY COMMISSION

In the Matter of

Public Service Electric and Gas
Company(Salem Nuclear Generating Station
Unit No. 1)

Docket No. 50-272

EXEMPTION

I.

Public Service Electric and Gas Company (the licensee) and three other co-owners are the holders of Facility Operating License No. DPR-70, which authorized operation of the Salem Nuclear Generating Station Unit No. 1 (Salem or the facility). This license provides, among other things, that it is subject to all rules, regulations and Orders of the Nuclear Regulatory Commission (the Commission) now or hereafter in effect.

The facility is a pressurized water reactor located at the licensee's site in Salem County, New Jersey.

II.

Section III.G.2 of Appendix R to 10 CFR Part 50 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;

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- 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 cables and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

If these conditions are not met, Section III.G.3 requires alternative shutdown capability independent of the fire area of concern. It also requires a fixed suppression system in the fire area of concern if it contains a large concentration of cables or other combustibles.

III.

The licensee requested in its letters dated March 19, 1981, April 29, 1982, and November 1, 1982, relief from providing automatic fire suppression systems in 13 fire areas in Unit 1. These areas are identified in the Safety Evaluation. For configurations similar to these fire areas, Section III.G requires that a 1-hour rated fire barrier be provided in combination with a detection and an automatic suppression system. Five of the 13 areas did not have fire detection systems and one did not have a 1-hour fire barrier. By letter dated December 22, 1982, the licensee committed to provide detection systems in the five areas and the 1-hour fire barrier. Thus, for 11 fire areas identified as areas P1C-1, -3, -4, -5, P1F-1, -3, -4, -5, P1E, P1H and P1M fire protection consisted of smoke detectors and 1-hour fire barriers.

Our evaluation of the fire protection in the 11 areas determined that the in-situ combustible loading in these fire zones is low; therefore, any postulated fires would involve transient combustible materials. Hazardous quantities of transient combustibles would not be expected in these fire areas for several reasons. First, the areas are not adjacent to or near any major plant traffic route. Second, maintenance and operations in these areas do not involve the use of combustible materials. Third, accessibility to these areas is restricted to personnel performing essential duties because of potential radiation hazards. On this basis, we agree with the licensee that any fires in these areas resulting from transient combustibles would be of limited severity and duration. The installed early warning detection system in conjunction with the 1-hour fire barriers for the protection of one train of redundant cables, provides reasonable assurance that one train of components needed for safe shutdown in each area will be maintained free of fire damage.

Based on our evaluation, we conclude that the level of fire protection in the 11 designated areas is equivalent to the level required in Section III.G of Appendix R. Therefore, the licensee's request to be exempted from the requirements to provide automatic fire suppression system in these areas should be granted.

The remaining two areas where exemptions were requested are discussed below:

Fire Area 11B - 4 kv. Switchgear Room

The technical requirements of Section III.G are not met because the fire suppression is manual rather than automatic. There are two concerns within this area: (1) Safe shutdown equipment located on the floor; (2)

Safe shutdown cabling located at various heights above the floor. The fire exposure threat to both the cabling and equipment is presented by the metal-enclosed switchgear and control cabinets and the overhead cable tray and conduit system. The combustible material associated with the switchgear and cabinets, which would contribute to a potential fire, is insignificant. The cabling is qualified to IEEE-383. Although this cable is not considered as a fire barrier, it does reduce the ease of ignition of the insulation and should retard the rate of burning.

A fire in this area would be slow in developing by virtue of the limited amount of combustibles, isolated location, and reduced flammability of the combustible material in the area. The presence of a smoke detection system will provide reasonable assurance of early fire awareness and response by operating technicians and fire brigade members in a reasonable time to activate the manual total flood carbon dioxide system. These factors, considered in association with the physical separation and partial-height walls between the redundant switchgear, achieves a sufficient level of defense-in-depth. We agree with the licensee that the 1-hour barriers and partial-height barriers, along with the existing area-wide fire detection and suppression system, provide reasonable assurance that one train of equipment and cables required for safe shutdown will be free of fire damage.

It is our judgment, based on (1) assessment of the location of redundant shutdown systems, (2) the presence of an early fire warning detection system, and (3) the presence of a fire suppression system and other fire protection features of the plant, that the fire exposure hazard represented by the combustible materials in this area is not sufficiently great as to affect both redundant shutdown divisions.

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 licensee's request for exemption for the 4kv Switch-gear Room should be granted.

Fire Area PIA-1 - Elevation 55' Auxiliary Building RHR Heat Exchange Area

This area does not comply with Section III.G because automatic fire detection and automatic fire suppression have not been installed. There is no alternative shutdown capability independent of this area.

The redundant systems in this area are the component cooling water valves and associated cabling which control the component cooling water flow to the RHR heat exchangers. The RHR heat exchangers are not required for hot shutdown. The valves controlling the component cooling water flow to the RHR exchanger can be manually aligned to the correct cold shutdown position.

We find this to be acceptable and in accordance with Section III.G of Appendix R.

Based on the above evaluation, the level of existing protection for this area is in accordance with the technical requirements of Section III.G of Appendix R. Therefore, an exemption for the RHR Heat Exchanger Area is not required.

IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12, these exemptions from the requirement to provide automatic fire suppression systems in the areas identified above are authorized by law and will not

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endanger life or property or the common defense and security, are otherwise in the public interest, and are hereby granted.

The Commission has determined that the granting of this Exemption will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with this action.

This Exemption is effective upon issuance.

FOR THE NUCLEAR REGULATORY COMMISSION


Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

Dated at Bethesda, Maryland
this 17th day of June 1983



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR EXEMPTION FROM 10 CFR 50 APPENDIX R

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

SALEM GENERATING STATION UNIT 1

DOCKET NO. 50-272

1.0 Introduction

By letter dated March 19, 1981 the licensee requested generic exemptions for Unit 1 from the requirements of Section III.G, "Fire Protection of Safe Shutdown Capability," of Appendix R to 10 CFR 50.

Our consultant, Gage-Babcock & Associates, Inc., under a technical assistance contract reviewed the licensee's exemption request. We concur with our consultant's findings. We recommended granting the licensee's request for relief from providing a fixed suppression system in the control room, and providing 1 1/2 hour fire rated dampers in 3-hour fire rated walls. We also recommended that the licensee's request for relief from providing 1-hour fire rated barriers in the Auxiliary Feedwater Pump Room and automatic fire suppression systems in 12 areas in Unit 1 be denied.

On July 23, 1981, November 5, 1981, March 8, 1982, and September 1982, we met with representatives of the licensee. As a result of these meetings, the licensee withdrew their exemption request for the Auxiliary Feedwater Pump Room and agreed to make modifications to meet Section III.G of Appendix R. By letters dated April 29, 1982 and November 1, 1982, the licensee provided additional information. By letter dated December 22, 1982, the licensee committed to the following modifications:

- a. Install Automatic Fire Detection Systems in the following areas:
Fire Zone PIC-1 Elevation 64' Auxiliary Building Monitor Tank and
Corridor Area

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Fire Zone PIC-3 Elevation 64' Auxiliary Building #21 Waste Hold
Up Tank

Fire Zone PIC-4 Elevation 64' Auxiliary Building #22 Waste Hold
Up Tank Room

Fire Zone PIC-5 Elevation 64' Auxiliary Building #23 Waste Hold
Up Tank Room

Fire Zone PIF-1 Elevation 84' Auxiliary Building Corridor and Spent
Fuel Pool Pit Pump Area

- b. To completely enclose one train of redundant cables in a one hour barrier in the following area.

Fire Zone PIH Elevation 100' Auxiliary Building Corridor

Section III.G.2 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 cables and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

If these conditions are not met, Section III.G.3 requires alternative shutdown capability independent of the fire area of concern. It also requires a fixed suppression system 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 for all configurations, 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.

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 Analytical Method

The licensee employed an analytical model to demonstrate the inherent protection afforded to existing safe shutdown systems. The purpose of the model is to determine the expected severity of a fire occurring in a room of given configuration and combustible loading on a gross or average room basis. The development of a fire that consumes all of the room in situ combustibles is assumed to occur due to the introduction and ignition of a transient combustible. Five gallons

of heptane has been selected as the transient combustible for this model. Electrical cabling is considered the only in situ combustible. The quantity of lubricating oil contained in pumps is considered to be small compared to the total combustible electrical cabling load.

A computer program has been developed to perform a transient energy balance of the room air and combustible contents to obtain a room air temperature-time curve. The predicted temperature-time curve is compared to the ASTM E-119 temperature-time profile to establish an equivalency to the E-119 curve by a method recognized by the National Fire Protection Association (NFPA). The temperatures on the inside surface of the cable wrap employed on protected cable trays are also determined to verify that the predicted fire severity will not affect the integrity of the wrap and cause damage to the protected cables.

An additional objective of the model is to determine if the results obtained from the computer program can be used to develop a simplified correlation between combustible loading and resulting fire severity for nuclear generating stations. If possible, an assessment of the fire hazard in a given room could then be accomplished in a manner similar to that suggested by the NFPA Fire Protection Handbook.

We and our contractor, Brookhaven National Laboratory, have reviewed the analytical model. We find the licensee's analytical model a useful tool in determining the expected fire severity in a room based on the in situ fuel load and a transient combustible of 5 gallons of heptane. However, we have not relied solely upon the results of the licensee's analysis in our evaluation. We have evaluated each 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
- c. Determine if the overall level of safety is equivalent to that provided by Section III.G of Appendix R.

3.0 Fire Zone P1A-1 Elevation 55' Auxiliary Building RHR Heat Exchanger Area

3.1 Exemption Requested

The licensee requests an exemption from Section III.G of Appendix R to the extent that it requires automatic fire detection and automatic fire suppression systems.

3.2 Discussion

Fire Zone P1A-1 is separated from adjoining areas of the plant by non-fire rated concrete barriers. Fire protection in the area is provided by manual hose stations and portable fire extinguishers.

The combustible in the area is cable insulation comprising a concentrated fuel load of 2,785 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 2 minutes on the ASTM E-119 standard time-temperature curve.

Fire Zone P1A-1 contains redundant cabling associated with valves controlling component cooling water (ccw) flow to the RHR heat exchangers. The redundant cables are separated by 7'-6". One train of cables has been enclosed in a one-hour fire rated barrier.

3.3 Evaluation

This area does not comply with Section III.G because automatic fire detection and automatic fire suppression have not been installed. There is no alternative shutdown capability independent of this area.

The redundant system in this area is the component cooling water valves and associated cabling which control the component cooling water flow to RHR heat exchangers. The RHR heat exchangers are not required for hot shutdown. The valves controlling the component cooling water flow to the RHR exchanger can be manually aligned to the correct cold shutdown position.

We find this to be an acceptable repair in accordance with Section III.G of Appendix R.

3.4 Conclusion

Based on the above evaluation, the level of existing protection for this area is in accordance with the technical requirements of Section III.G of Appendix R. Therefore an exemption for Fire Zone P1A-1, RHR Heat Exchanger Area, is not required.

4.0 Fire Zone PIC-1 Elevation 64' Auxiliary Building Monitor Tank and Corridor Area

Fire Zone PIC-3 Elevation 64' Auxiliary Building #21 Waste Hold Up Tank Room

Fire Zone PIC-4 Elevation 64' Auxiliary Building #22 Waste Hold Up Tank Room

Fire Zone P1C-5 Elevation 64' Auxiliary Building #23 Waste Hold
Up Tank Room

Fire Zone P1E Elevation 84' Auxiliary Building Electrical Penetra-
tion Area

Fire Zone P1F-1 Elevation 84' Auxiliary Building Corridor and
Spent Fuel Pool Pit Pump Area

Fire Zone P1F-3 Elevation 84' Auxiliary Building Safety Injection
Pump Room

Fire Zone P1F-4 Elevation 84' Auxiliary Building #21 Component
Cooling Heat Exchanger Room

Fire Zone P1F-5 Elevation 84' Auxiliary Building Component
Cooling Heat Exchanger #22 Room

Fire Zone P1H Elevation 100' Auxiliary Building Corridor

Fire Zone P1M Elevation 84' Auxiliary Building Mechanical
Penetration Area

4.1 Exemption Requested

The licensee requests exemptions from Section III.G of Appendix R to the extent that it requires the installation of automatic fire suppression systems.

4.2 Discussion

Fire Zone P1C-1 Elevation 64' Auxiliary Building Monitor Tank and
Corridor Area

Fire Zone P1C-1 is a corridor approximately 130 feet long connecting two open areas on elevation 64'-0" of the auxiliary building. The

area is separated from adjoining areas by non-fire rated concrete barriers. The ceiling height is 18 feet. The fire protection in the area is provided by manual hose stations and portable fire extinguishers. By letter dated December 22, 1982, the licensee committed to provide early warning fire detection in this area.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in open horizontal trays between 12 and 16 feet above the floor. The cable insulation in the area comprises a concentrated fuel load of 16,591 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 13 minutes on the ASTM E-119 standard time-temperature curve.

The cabling is associated with the service water, auxiliary feedwater, chemical volume and control and diesel generator systems. The separation between redundant cable trays is as little as 2'-7". One train of redundant cables is enclosed in a one-hour fire rated barrier.

Fire Zone P1C-3 Elevation 64' Auxiliary Building #21 Waste Hold Up Tank Room

Fire Zone P1C-3 is separated from adjoining plant areas by non-fire rated concrete barriers. The ceiling height is 18 feet. Fire protection in the area is provided by manual hose stations and portable fire extinguishers. By letter dated December 22, 1982 the licensee committed to install early warning fire detection in this area.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in open horizontal trays between 12 and 16 feet above the floor. The cable insulation in

the area comprises a fuel load of 8,300 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 6 minutes on the ASTM E-119 standard time-temperature curve.

Redundant cabling associated with the component cooling, service water, auxiliary feedwater and the diesel generator systems has been routed through this area. The separation between redundant cable trays is as little as 12'-3". One train of redundant cables is enclosed in a one-hour fire rated barrier.

Fire Zone PLC-4 Elevation 64' Auxiliary Building #22 Waste Hold Up Tank Room

Fire Zone PLC-4 is separated from adjoining areas of the plant by non-fire rated concrete barriers. The ceiling height in the area is 18 feet. Fire protection in the area is provided by manual hose stations and portable fire extinguishers. By letter dated December 22, 1982 the licensee committed to provide early warning for detection in this area.

The combustibles in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in horizontal trays between 12 and 16 feet above the floor. The cable insulation in the area comprises a fuel load of 9,000 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 7 minutes on the ASTM E-119 standard time-temperature curve.

Redundant cabling associated with the service water, auxiliary feedwater and diesel generator systems has been routed through this area. The separation between redundant cable trays is as little as 10'-0". One train of redundant cables has been enclosed in a one-hour fire rated barrier.

Fire Zone P1C-5 Elevation 64' Auxiliary Building #23 Waste Hold Up Tank Room

Fire Zone P1C-5 is separated from adjoining areas of the plant by non-fire rated concrete barriers. The ceiling height in the area is 18 feet. Fire protection in the area is provided by manual hose stations and portable fire extinguishers. By letter dated December 22, 1982 the licensee committed to install early warning fire detection in this area. The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in horizontal trays between 12 and 16 feet above the floor. The cable insulation in the area comprises a fuel load of 8,000 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 6 minutes on the ASTM E-119 standard time-temperature curve.

Redundant cabling associated with the service water and diesel generator systems has been routed through this area. The separation between redundant trays is as little as 12'-3". One tray of cables has been enclosed in a one-hour fire rated barrier.

Fire Area P1E Elevation 84' Auxiliary Building Electrical Penetration Area

Fire Area P1E is separated from adjoining areas of the plant by 3-hour fire rated barriers. The ceiling height is 20 feet. Fire protection in the area is provided by smoke detectors, a manually operated total flooding carbon dioxide extinguishing system, manual hose stations and portable fire extinguishers.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in horizontal trays between 10 and 18 feet above the floor. There are also two

vertical trays. The cable insulation in the area comprises a fuel load of 22,725 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 17 minutes on the ASTM E-119 standard time-temperature curve.

This fire area contains redundant cabling associated with the component cooling, auxiliary feedwater, chemical volume and control, fan coil, diesel generator, RHR and the primary systems. The separation between redundant cable trays is approximately one foot. One train of redundant cables is enclosed in a one-hour fire rated barrier.

Fire Zone P1 F-1 Elevation 84' Auxiliary Building Corridor and Spent Fuel Pool Pit Pump Area

Fire Zone P1 F-1 is a corridor approximately 130 feet long which opens into the spent fuel pool pit area. The area is separated from adjoining areas by non-fire rated concrete barriers. The ceiling height is 14 feet. Fire protection in the area is provided by manual hose stations and portable fire extinguishers. By letter dated December 22, 1982 the licensee committed to install early warning fire detection in this area.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in open horizontal trays between 9 and 13 feet above the floor. The cable insulation in the area comprises a fuel load of 14,232 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 11 minutes on the ASTM E-119 standard time-temperature curve.

Redundant cabling associated with the component cooling, service water, auxiliary feedwater, chemical volume and control, fan coil, diesel generator, RHR, and primary systems is routed through this area. The separation between redundant cables is as little as 1'-9". One train of redundant cables is enclosed in a one-hour fire rated barrier.

Fire Zone P1F-3 Elevation 84' Auxiliary Building Safety Injection Pump Room

Fire Zone P1F-3 is separated from adjoining areas of the plant by non-fire rated concrete barriers. The ceiling height is 14 feet. Fire protection in the area is provided by early warning fire detectors, manual hose stations and portable fire extinguishers.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in open horizontal trays between 9 and 13 feet above the floor. The cable insulation in the area comprises a fuel load of 9,000 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 7 minutes on the ASTM E-119 standard time-temperature curve.

Redundant cabling associated with the component cooling, chemical volume and control and primary systems is routed through this area. The separation between redundant cable trays is as little as one foot. One train of redundant cables is enclosed in a one-hour fire rated barrier.

Fire Zone P1F-4 Elevation 84' Auxiliary Building Component Cooling Heat Exchanger #21 Room

Fire Zone P1F-4 is separated from adjoining areas by non-fire rated concrete barriers. The ceiling height is 14 feet. Fire protection in the area is provided by early warning fire detectors, manual hose stations and portable fire extinguishers.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in open horizontal trays between 9 and 13 feet above the floor. The cable insulation in the area comprises a fuel load of 4,500 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 4 minutes on the ASTM E-119 standard time-temperature curve.

Redundant cabling associated with the component cooling and primary systems is routed through this area. The separation between redundant cable trays is as little as 2'-9". One train of redundant cables is enclosed in a one-hour fire rated barrier.

Fire Zone P1F-5 Elevation 84' Auxiliary Building Component Cooling Heat Exchanger #22 Room

Fire Zone P1F-5 is separated from other plant areas by non-fire rated concrete barriers. The ceiling height is 14 feet. Fire protection is provided by early warning fire detectors, manual hose stations and portable fire extinguishers.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in open horizontal trays between 9 and 13 feet above the floor. The cable insulation in the area comprises a fuel load of 6,000 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 5 minutes on the ASTM E-119 standard time-temperature curve.

Redundant cabling associated with the component cooling and primary systems is routed through this area. The separation between redundant cable trays is as little as 2'-9". One train of redundant cables is enclosed in a one-hour fire rated barrier.

Fire Zone P1H Elevation 100' Auxiliary Building Corridor

Fire Zone P1H is a corridor approximately 130 feet long. The area is separated from adjoining areas by non-fire rated concrete barriers. The ceiling height is 20 feet. Fire protection in the area is provided by early warning fire detectors, manual hose stations and portable fire extinguishers.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are in open installed horizontal trays between 9 and 18 feet above the floor. The cable insulation in the area comprises a fuel load of 26,918 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 20 minutes on the ASTM E-119 standard time-temperature curve.

Redundant cabling associated with the auxiliary feedwater and diesel generator systems is routed through this area. The separation between redundant cable trays is as little as one foot. By letter dated December 22, 1982 the licensee committed to enclose one train of redundant cables in a one-hour fire rated barrier.

Fire Area P1M Elevation 84' Auxiliary Building Mechanical Penetration Area

Fire Area P1M is separated from other plant areas by 3-hour fire rated barriers. The ceiling height is 20 feet. Fire protection in the area is provided by early warning fire detection, manual hose stations and portable fire extinguishers.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in open horizontal trays between 15 and 18 feet above the floor. There are also two vertical trays. The cable insulation in the area comprises a fuel load of 9,391 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 7 minutes on the ASTM E-119 standard time-temperature curve.

Redundant cabling associated with component cooling, chemical volume and control, and the RHR systems is routed through this area. The separation between redundant cables is as little as 2'-7". One train of redundant cables is enclosed in a one-hour fire rated barrier.

The licensee justifies these exemptions on the following:

- a. The in-situ combustible loading is light.
- b. Early warning fire detection is provided.
- c. An analytical model was employed to show that the magnitude of an exposure fire needed to cause damage to the redundant division of cabling enclosed in the one-hour fire rated barriers is significantly higher than reasonably expected.

4.3 Evaluation

For configurations similar to these fire zones, Section III.G requires that a one-hour rated fire barrier be provided in combination with a detection and an automatic suppression system. The licensee has installed one train of redundant cables in each area in a one-hour barrier, but contends that the limited fire hazard in each area does not warrant automatic suppression.

The in-situ combustible loading in these fire zones is low, therefore, any postulated fires would involve transient combustible materials. Such a fire would most likely be of limited severity because little maintenance activities are performed. The installed early warning detection system in conjunction with the one-hour fire barriers for the protection of one train of redundant cables, provides reasonable assurance that one train of components needed for safe shutdown in each area will be maintained free of fire damage.

4.4 Conclusions

Based on the above evaluation, we conclude that the level of protection in:

Fire Zone P1C-1 Elevation 64' Auxiliary Building Monitor Tank and Corridor Area

Fire Zone P1C-3 Elevation 64' Auxiliary Building #21 Waste Hold Up Tank Room

Fire Zone P1C-4 Elevation 64' Auxiliary Building #22 Waste Hold Up Tank Room

Fire Zone P1C-5 Elevation 64' Auxiliary Building #23 Waste Hold Up Tank Room

Fire Zone P1E Elevation 84' Auxiliary Building Electrical Penetration Area

Fire Zone P1F-1 Elevation 84' Auxiliary Building Corridor and Spent Fuel Pool Pit Pump Area

Fire Zone P1F-3 Elevation 84' Auxiliary Building Safety Injection Pump Room

Fire Zone P1F-4 Elevation 84' Auxiliary Building #21 Component Cooling Heat Exchanger Room

Fire Zone P1F-5 Elevation 84' Auxiliary Building Component Cooling Heat Exchanger #22 Room

Fire Zone P1H Elevation 100' Auxiliary Building Corridor

Fire Zone P1M Elevation 84' Auxiliary Building Mechanical Penetration Area

provides levels of fire protection equivalent to Section III.G of Appendix R. Therefore, the exemptions should be granted.

5.0 Fire Area P1B 4kv Switchgear Room

5.1 Exemption Requested

The licensee requests an exemption from Section III.G of Appendix R to the extent that it requires an automatic fire suppression system.

5.2 Discussion

Fire Area PIB is separated from adjoining areas of the plant by 3-hour fire rated barriers. Fire protection in the area is provided by a manually operated carbon dioxide extinguishing system, smoke detectors, manual hose stations, and portable fire extinguishers.

The combustible in the area is cable insulation. The cables are qualified to IEEE-383. They are installed in open horizontal trays between 10 and 16 feet above the floor. The cable insulation in the area comprises a fuel load of 11,793 BTU/sq. ft. which, if totally consumed, would correspond to a fire severity of about 9 minutes on the ASTM E-119 standard time-temperature curve.

This fire area contains three redundant trains of 4kv switchgear and associate cabling. The redundant switchgear is installed on 20-foot centers. The ceiling height in the switchgear room is 18 feet. Partial height barriers approximately 15'-6" high have been installed between each set of switchgear.

Separation between redundant cable trays is as little as 3'-9". Cable trays above the partial height barrier are intervening combustibles between the redundant switchgear. The cabling associated with each of two trains is enclosed in a one-hour fire rated barrier.

5.3 Evaluation

The technical requirements of Section III.G are not met because the fire suppression is manual rather than automatic. There are two concerns within this area: 1) Safe shutdown equipment located on the floor; 2) Safe shutdown cabling located at various heights above the floor. The fire exposure threat to both the

cabling and equipment is represented by the metal enclosed switchgear and control cabinets and the overhead cable tray and conduit system. The combustible material associated with the switchgear and cabinets, which would contribute to a potential fire, is insignificant. The cabling is qualified to IEEE-383. Although this cable is not considered as a fire barrier, it does reduce the ease of ignition of the insulation and should retard the rate of burning.

A fire, if one should occur, would be slow in developing by virtue of the limited amount of combustibles, isolated location, and reduced flammability of the combustible material in the area. The presence of a smoke detection system will provide reasonable assurance of early fire awareness and response by operating technicians and fire brigade members in a reasonable time to activate the manual total flood carbon dioxide system. This, considered in association with the physical separation and partial height walls between the redundant switchgear, achieves a sufficient level of defense-in-depth. We agree with the licensee that the one-hour barriers and partial height barriers along with the existing area-wide fire detection and suppression systems provide reasonable assurance that one train of equipment and cables required for safe shutdown will be free of fire damage.

It is our judgment, based on assessment of the location of redundant shutdown systems; our collective knowledge and experience of fires involving electrical equipment; the presence of an early fire warning detection system; the presence of a fire suppression system and other fire protection features of the plant; that the fire exposure hazard represented by the previously identified combustible materials is not significantly as great so as to effect both redundant shutdown divisions.

5.4 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 licensee's request for exemption for the 4kv Switchgear Room should be granted.

Summary

Based on our evaluation, the licensee's request for exemptions from Section III.G of Appendix R for the following areas should be granted:

- . Fire Zone P1C-1 Elevation 64' Auxiliary Building Monitor Tank and Corrdior Area
- . Fire Zone P1C-3 Elevation 64' Auxiliary Building #21 Waste Hold Up Tank Room
- . Fire Zone P1C-4 Elevation 64' Auxiliary Building #22 Waste Hold Up Tank Room
- . Fire Zone P1C-5 elevation 64' Auxiliary Building #23 Waste Hold Up Tank Room
- . Fire Zone P1E Elevation 84' Auxiliary Building Electrical Penetra-
tion Area
- . Fire Zone P1F-1 Elevation 84' Auxiliary Building Corridor and Spent Fuel Pool Pit Pump Area
- . Fire Zone P1F-3 Elevation 84' Auxiliary Building Safety Injection Pump Room
- . Fire Zone P1F-4 Elevation 84' Auxiliary Building #21 Component Cooling Heat Exchanger Room
- . Fire Zone P1F-5 Elevation 84' Auxiliary Building #22 Component Cooling Heat Exchanger Room

- . Fire Zone P1H Elevation 100' Auxiliary Building Corridor
- . Fire Zone P1H Elevation 84' Auxiliary Building Mechanical Penetration Area
- . Fire Zone P1B 4kv Switchgear Room

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