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Docket Nos. 50-266  
and 50-301

Mr. C. W. Fay  
Assistant Vice President  
Wisconsin Electric Power Company  
231 West Michigan Street  
Milwaukee, Wisconsin 53201

Dear Mr. Fay:

SUBJECT: DRAFT SAFETY EVALUATION ON APPENDIX R EXEMPTION REQUEST

We have completed our review of your Appendix R exemption requests and have enclosed our draft Safety Evaluation (SE).

We request that you review this draft SE for accuracy of technical content and inform us within three weeks of any corrections you consider necessary. With respect to followup action regarding exemption denials, there are three options: (1) appeal denials to NRR management; (2) propose another alternative that requires an exemption; or (3) make modifications to meet the specific requirements of Appendix R. Please inform us within three weeks regarding which action you plan to take.

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

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

If, for denied exemptions, you propose to make modifications which meet the specific requirements, of Section III.G of Appendix R, no additional submittal is necessary, unless the modifications are to provide alternative shutdown capability. In these cases, you will be given 6 months to provide the description of the modifications for alternative shutdown capability.

If you have any questions regarding this letter on the draft SE, please contact your Project Manager.

Sincerely,

Original signed by  
Robert A. Clark  
Robert A. Clark, Chief  
Operating Reactors Branch #3  
Division of Licensing

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Enclosure: Draft SE *JW*

OFFICE	ORB#3:DL	ORB#3:DL	ORB#5:DL	ORB#3:DL		
SURNAME	PMKreutzer	TColburn/pn	TWambach	RAClark		
DATE	1/13/83	1/13/83	1/13/83	1/14/83		

Wisconsin Electric Power Company

cc:

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Glen Ellyn, Illinois 60137

Draft Safety Evaluation by the Office of Nuclear Reactor Regulation  
Exemption Request

Point Beach Nuclear Plant Units 1 & 2

Docket Nos. 50-266 and 50-301

1.0 Introduction

By letters dated June 30 and October 11, 1982, the licensee requested exemptions from Section III.G of Appendix R within 12 plant fire areas.

Units 1 and 2 are not identical. The exemption requests for areas which are different are evaluated separately.

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 alternative fire protection configurations must be justified by a fire hazard analysis.

Our general criteria for accepting alternative fire protection configurations 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.

Most cables in the plant are polyethylene insulated cables with polyvinylchloride jackets (PE/PVC). These cables have not passed the IEEE-383 test, and therefore an electrically initiated fire may propagate.

## 2.0 Analytical Method

The licensee employed an analytical method to demonstrate the inherent protection afforded to existing safe shutdown systems. The intent of this method was to provide common parameters by which individual fire areas could be judged to demonstrate that compliance with Section III.G of Appendix R would not enhance the fire protection for safe shutdown.

The method can be summarized as follows:

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

The analysis determines the heat flux into the room needed to cause electrical failure of redundant cables. This heat flux is converted to a quantity of flammable liquid, usually acetone, of approximately 10 to 20 gallons, in a circular pool configuration.

We and our contractor, Brookhaven National Laboratory, have reviewed the analytical method. Attached as Enclosure 2 is a copy of their report. We have determined that the results of the methodology, as applied, do not demonstrate the equivalence of the protection provided for safe shutdown to the specific alternatives set forth in Section III.G of Appendix R. For example:

- The method does not consider the heat released to the room by secondary fires involving in-situ combustibles. The method uses an electrical failure criteria with the thermal energy release to the room by a single exposure fire. When the cables of concern are at the conditions of electrical failure, other cables within the enclosure are burning and also releasing energy to the room.
- The method does not consider the increased heat release rate of a given fire when it occurs against a wall or in a corner; the method only considers the heat release of a fire as it occurs in an open area.
- The method does not consider the effects of excess pyrolyzate, resulting from the degradation of plastics, burning in the stratified layer.
- The method does not consider all of the alternatives set forth in Section III.G. i.e., 3-hour fire barrier, 1-hour fire barrier with suppression system, twenty-foot separation free of combustibles with automatic suppression and alternate or dedicated shutdown capability independent of the area. The method only considers separation without automatic suppression and uses a stratification model which does not include the effects of separation.

The licensee has not used the results of this analysis to compare the protection provided with that specified in Section III.G. The licensee has only stated that the accumulation of the calculated quantity of flammable liquids in the required configuration is an unrealistic condition, and will be prevented by administrative controls. We do not deem this to be a valid argument because there is no positive

means of preventing the accumulation of transient materials in individual plant areas. As documented in Inspection and Enforcement Branch Reports, recent inspections at plants such as Davis Besse (50-346/82-03, April 1, 1982), Duane Arnold (50-331/81-25, January 11, 1982), D. C. Cook (50-315/82-11, December 21, 1981), and Nine Mile Point (50-220/82-09), have demonstrated that substantial quantities of hazardous substances such as 55 gallon drums of waste oil are located in even highly restricted and controlled entry areas.

We have not relied upon the results of the licensee's analysis in our evaluation. We have evaluated 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 Unit 1 Motor Control Center Room (Fire Zone 1)  
Safety Injection and Containment Spray Pump Room (Fire Zone 2)  
Component Cooling Water Pump Room (Fire Zone 3)  
Unit 2 Motor Control Center Room (Fire Zone 4)  
Containment Spray Additive Tank and Monitor Area (Fire Zone 7)

3.1 Exemption Requested

The licensee requests exemptions from Section III.G.2 to the extent it requires 20 feet of separation without intervening combustibles between redundant trains, and installation of an automatic fire suppression system.

### 3.2 Discussion

#### Fire Zone 1 Motor Control Center Room

Fire Zone 1 is located in the Auxiliary Building at elevation 8'-0". It is separated from adjoining areas by non-fire-rated barriers. The ceiling height is 16 ft.-6 in. Cables associated with safety systems are installed in open horizontal cable trays and conduits. They are located between 12 and 13 feet above the floor. Each division is separated horizontally by 8 ft.-6 in. and installed within 3 feet of the ceiling. The licensee has not delineated the location of all the cable trays in the area.

The licensee is proposing to install a radiant energy shield beneath the portion of the Division B cable tray. The licensee also proposes to wrap Division B conduits with an appropriate fire barrier. The licensee has not indicated the type or fire rating of the barrier.

The fire protection in the area consists of smoke detectors, standpipe hose stations and portable fire extinguishers.

The in-situ in the area is cable insulation comprising a fuel load of 48,000 BTU/Sq. Ft., which if totally consumed would correspond to a fire severity of about 35 minutes on the ASTM-E119 standard time temperature curve.

In our Fire Protection SER, we indicated that cable separation and safe shutdown capability on elevation 8'-0" of the Auxiliary Building was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for this area.

#### Fire Zone 2 Safety Injection and Containment Spray Pump Room

Fire Zone 2 is located in the Auxiliary Building on elevation 8'-0". It is separated from adjoining areas by non-fire-rated walls. Access to the area is by 8 feet high doorless entranceways.

The cables associated with safety systems are installed in open horizontal cable trays and conduits. They are located between 13 and 16 feet above the floor. The redundant cables are separated by approximately 1 foot and installed within 3 feet of the ceiling. The ceiling height is 16 feet 6 inches.

The fire protection in the area is provided by a partial coverage wet pipe sprinkler system, smoke detectors, standpipe hose stations and portable fire extinguishers. This fire zone contains safety injection and containment spray pumps for both units. The safety injection pumps are protected by a wet pipe automatic sprinkler system; however, the system does not extend to where the redundant cables are installed.

The in-situ combustibles in the area are cable insulation and 8 gallons of lubricating oil. The combustibles comprise a fuel load of 55,200 BTU/Sq. Ft. which, if totally consumed, would correspond to a fire severity of about 40 minutes on the ASTM E-119 standard time temperature curve.

In our Fire Protection SER, we indicated that separation and safe shutdown capability on elevation 8'-0" of the Auxiliary Building was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for the area.

The licensee now proposes to install radiant energy shields beneath the Division B cable trays.

### Fire Zone 3 Component Cooling Water Pump Room

Fire Zone 3 is located in the Auxiliary Building on elevation 8'-0". It is separated from adjoining areas by non-fire-rated walls. Access to the area is by 8 feet high doorless entranceways.

The zone contains four component cooling water pumps and associated piping and valves. For each unit, one pump is required to achieve and maintain cold shutdown. Redundant component coolant water pumps serving the same

unit are approximately 7 feet 6 inches apart. Units 1 and 2 pumps are approximately 16 feet 7 inches apart. Automatic sprinkler protection has been installed to protect the component cooling water pump area; however, the system does not extend to protect the redundant cables in the area.

The redundant cables are installed in open horizontal and vertical cable trays and conduit. The redundant cables are separated horizontally by approximately one foot and located within 3 feet of the ceiling. The ceiling height is 16 feet 6 inches.

The fire protection in the area consists of a partial coverage sprinkler system, smoke detectors, standpipe hose stations and portable fire extinguishers.

The combustibile in the area is cable insulation comprising a fuel load of 52,800 BTU/Sq. Ft. which, if totally consumed, would correspond to a fire severity of about 40 minutes on the ASTM E-119 standard time temperature curve.

In our Fire Protection SER, we indicated that separation and safe shutdown capability on elevation 8 feet of the Auxiliary Building was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for this area.

The licensee is proposing the following modifications:

- Provide radiant energy shields beneath Division cable trays.
- Provide appropriate protection for the Division A cables such that they do not contribute to the heat load of the initial fire. The licensee has not delineated the type of protection which would be provided.

- Completely enclose vertical sections of Division A cable trays by radiant energy shields.
- Place fire stops in two Division B cable trays (FV and JE) to prevent fire propagation into safe shutdown sections of the cable trays.

#### Fire Zone 4 Unit 2 Motor Control Center Room

Fire Zone 4 is located in the Auxiliary Building at elevation 8'-0" and is separated from adjoining areas by non-fire-rated walls. Access to the area is via 8-foot-high doorless entranceways. The zone contains Unit 2 safeguard Train A motor control center 2-B32, charging pump instrument rack 2RK24 and the charging pump control station. In addition, redundant safe shutdown cables are present in the area. The Division A cables are installed in open horizontal cable trays and Division B cables are installed in conduit. Both are routed horizontally through the area and are located between 10 and 14 feet above the floor. The redundant cables are separated horizontally by approximately 1 foot and installed within 3 feet of the ceiling. The ceiling height is 16 ft. 6 in.

The fire protection in the area is provided by smoke detectors, standpipe hose stations and portable fire extinguishers. The in-situ combustible in the area is cable insulation, comprising a fuel load of 48,000 BTU/Sq. Ft. which, if totally consumed, would correspond to a fire severity of about 36 minutes on the ASTM E-119 standard time temperature curve.

In our Fire Protection SER, we indicated that separation and safe shutdown capability on elevation 8'-0" of the Auxiliary Building was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for this area.

The licensee is now proposing to cover all Division B conduit with an appropriate fire barrier. The licensee has not delineated the type or

fire rating of the barrier. The licensee is not separating the Division 3 Motor Control Center and Transformer which contain termination of redundant Division B cables.

Fire Zone 7 Containment Spray Additive Tank and Monitor Area

Fire Zone 7 is located in the Auxiliary Building at elevation 26'-0". The area is separated from adjoining areas by non-fire-rated walls. Access to the area is provided by 8 feet high open archways. The area contains an open stairwell and hatch which allow direct communication with areas above and below.

This fire zone contains redundant cables for Units 1 and 2 charging pump and pressurizer heater power, both required for hot shutdown. The cables are installed in conduit and open horizontal and vertical cable trays. The vertical cable trays are routed from floor to ceiling. The horizontal cable trays are installed between 7 and 16 feet above the floor. Redundant trays are separated by a minimum of 4 feet. The ceiling height is 18 ft. 6 in. Fire protection in the area is provided by smoke detectors, standpipe hose stations and portable fire extinguishers.

The combustibles in the area is cable insulation comprising a fuel load of 36,000 BTU/Sq. Ft. which, if totally consumed, would correspond to a fire severity of about 27 minutes on the ASTM E-119 standard time temperature curve.

In our Fire Protection SER, we indicated that separation and safe shutdown capability on elevation 26 feet of the Auxiliary Building was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for this area.

The licensee now proposes to enclose the 3 open sides of Division A vertical cable trays CK and CN and Division B vertical trays FL and FX

with radiant energy shields. The licensee states that the shields will assure that at least one train of safe shutdown cables for each unit will not fail due to the radiation effects from an exposure fire. The licensee has not provided the information necessary to substantiate such a claim. The licensee has not discussed the effects of convection from exposure fire on the vertical cable trays enclosed with the radiant energy shields. The licensee justifies these alternatives on the basis of (1) the in-situ combustible loadings are moderate, (2) early warning fire detection is provided, and (3) an analytical model was employed to show that the magnitude of an exposure fire needed to damage redundant components is significantly higher than reasonably expected.

### 3.3 Evaluation

These areas do not comply with Section III.G because they do not have automatic suppression systems and twenty feet of separation free of intervening combustibles or one hour fire rated barriers. There is no alternative shutdown capability independent of these areas.

There are generally two mechanisms by which fire damage is propagated; either an exposure fire in close proximity to the redundant equipment or an exposure fire at any point in the room of sufficient magnitude to form a stratified layer of hot gases at the ceiling level, which descends to the floor level at a rate correlated to the room volume, the burning time and fuel quantity. In the case of a fire which produces a stratified layer of hot gases at the ceiling level, the most severe damage will occur to cables and equipment located within several feet of the ceiling. The redundant cables in each fire zone are installed within three feet of the ceiling. This configuration does not provide reasonable protection from a descending hot gas layer. A local exposure or electrically initiated fire could cause damage to the redundant cables if they are exposed to a heat flux of sufficient intensity.

The features in the fire zones which are offered as compensation for the lack of Section III.G protective features are the radiant energy shields. These

cannot be considered equivalent to a one-hour fire rated barrier as they may only inhibit fire damage for several minutes. The fire zones do not present any other features that would compensate for the lack of protective features specified by Section III.G or provide reasonable assurance that one train will be maintained free of fire damage.

Because of the close proximity of redundant safe shutdown cables that are not protected by an automatic suppression system, an exposure fire in any of the fire zones could damage both trains prior to the response of the fire brigade. There will be a time lag between the ignition of the fire, detector response, and the arrival of the fire brigade. The existing protection does not provide reasonable assurance that redundant cables of both trains will not be damaged in this time interval. Cable trays which the licensee proposes to install radiant energy shields on will provide some resistance to exposure fires; however, an incident heat flux of sufficient magnitude will cause the thermal degradation and ultimate failure of the cable in the trays. Therefore, the existing protection in these fire zones does not provide a level of fire protection equivalent to Section III.G. Modifications such as the installation of an automatic sprinkler system and one-hour fire rated barriers would provide the requisite levels of safety.

### 3.4 Conclusion

Based on the above evaluation, the level of existing protection for Fire Zone 1, Unit 1 Motor Control Center Room; Fire Zone 2, Safety Injection and Containment Spray Pump Room; Fire Zone 3, Component Cooling Water Pump Room; Fire Zone 4, Unit 2 Motor Control Center Room; and Fire Zone 7, Containment Spray Additive Tank and Monitor Area, does not provide a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R and, therefore, the exemption should be denied.

### 4.0 Auxiliary Feedwater Pump Room (Fire Area 5)

#### 4.1 Exemption Requested

- The licensee requests an exemption from Section III.G.2.b to the extent that it requires 20 feet of separation without intervening combustibles between redundant trains.

#### 4.2 Discussion

Fire Area 5 is located in the Control Building on elevation 8'-0". The area is separated from other plant areas by 3-hour fire rated barriers. The Fire Area contains the following redundant safe shutdown equipment:

- Four auxiliary feedwater pumps (two steam-driven, two electric motor-driven) for both Units 1 and 2.
- Remote shutdown panels for operation of the electric auxiliary feedwater pumps and containment cooling fans.
- Other redundant safe shutdown cables.

The auxiliary feedwater system is required for safe shutdown. Each steam-driven pump is 100% capacity and dedicated to a single unit while each electric motor-driven pump is 50% capacity and capable of supplying feedwater to a steam generator of either Unit 1 or 2. Each auxiliary feedwater pump is installed in an individual bay and isolated from the other pumps by concrete partitions which run floor to ceiling, but the partitions do not separate the pumps from each other or the fire area by fire rated barriers. The pumps are installed approximately 14 feet on centers. Redundant safe shutdown cabling in the area is installed in both open horizontal cable trays and conduit. The redundant open cable trays are installed between 13 and 16 feet above the floor, are separated by a minimum of 3 ft. 6 in, and installed within 3 feet of the ceiling. The licensee has proposed to wrap Division B conduit 1P2C1 with a one-hour fire rated barrier over its

entire length through the area. The licensee also proposes to install radiant energy shields beneath the lowest Division B cable trays FU and FV. The ceiling height is 17 ft. 2 in. The fire protection in the area is provided by an automatic Halon 1301 fire suppression system, smoke detectors, standpipe hose stations and portable fire extinguishers. The combustibles in the area are cable insulation and lubricating oil. The combustibles comprise a fuel load of 24,000 BTU/Sq. Ft. which, if totally consumed, would correspond to a fire severity of approximately 20 minutes on the ASTM E-119 standard time temperature curve. The licensee justifies this alternative on the basis of (1) smoke detection is provided, (2) the in-situ fuel load is moderate, (3) automatic Halon 1301 fire extinguishing system has been provided, and (4) an analytical model shows that the magnitude of an exposure fire needed to damage redundant components is significantly higher than reasonably expected.

In our Fire Protection SER, we indicated that separation and safe shutdown capability in the Auxiliary Feedwater Pump Room was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for this area.

#### 4.3 Evaluation

The area is not in compliance with Section III.G because the minimum separation distance free of intervening combustibles between redundant trains of cables is less than 20 feet and there is no alternate shutdown capability independent of this room.

The compensatory features provided are the fire propagation retardants in the form of radiant energy shields installed beneath the lowest Division B cable trays. Except for the above compensatory features, the configuration of the area, the quantity of in-situ combustibles, the type of cable insulation, the potential for the accumulation of combustible materials, and the installed fire protection systems are what is typically found in auxiliary feedwater pump rooms. Because

of the configuration of cables and components in this area, an exposure or electrically initiated fire could cause damage to both trains of safe shutdown equipment. The mitigating feature the licensee has proposed, namely radiant energy shields, does not compensate for the required protective features. Although these mitigating features may retard somewhat the onset of fire damage, they do not provide an equivalent level of protection as Section III.G.

The automatic Halon 1301 extinguishing system will mitigate the fire hazard but may not provide fast total coverage of cabling and/or the floor area. Without the required separation distance, or the installation of a one-hour fire rated barrier, as required by Section III.G.2, we would not have reasonable assurance that damage to redundant trains would not occur pending activation of the suppression systems. The existing protection in this fire area does not provide a level of fire protection equivalent to Section III.G. Modifications such as the installation of one-hour fire rated barriers or alternate shutdown capability would provide the requisite level of safety.

#### 4.4 Conclusion

Based on our evaluation, the level of existing protection for the auxiliary feed-water pump room does not provide a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R and, therefore, the exemption should be denied.

#### 5.0 4160V Switchgear Room (Fire Area 6)

##### 5.1 Exemption Requested

The licensee requests an exemption from Section III.G.2.b to the extent that it requires 20 feet of separation without intervening combustibles between redundant trains.

5.2 Discussion

Fire Area 6 is located in the Control Building on elevation 8'-0". The area is separated from other plant areas by 3-hour fire rated barriers. The fire area contains redundant switchgear, distribution panels, battery chargers and cabling required for safe shutdown for Units 1 and 2. The redundant switchgear is separated by as little as 3 feet. Redundant safe shutdown cabling is installed in conduit and open horizontal and vertical cable trays at various elevations throughout the area. The redundant cable trays are separated by a minimum of 2 feet. The ceiling height is 17 feet 2 in.

The fire protection is provided by an automatic Halon 1301 fire suppression system, smoke detectors, standpipe hose stations and portable fire extinguishers. The combustible in the area is cable insulation. The cables in the area are installed in open horizontal and vertical cable trays. The cable insulation comprises a fuel load of 108,000 BTU/Sq. Ft. which, if totally consumed, would correspond to a fire severity of about 81 minutes on the ASTM E-119 standard time temperature curve.

In our Fire Protection SER, we indicated that separation and safe shutdown capability in the 4160V Switchgear Room was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for this area.

The licensee has now proposed the following modifications:

	<u>Division A</u>	<u>Division B</u>	<u>Proposed Modifications</u>
<u>Common plant conduit</u>	1A05-3	1A06-1	wrap all of 1A06-1 in 1 hr. barrier
	1A05-4	1A06-2	wrap all of 1A06-2 in 1 hr. barrier
	D01-1	D02-1	no modifications required greater than 15 ft of separation

	<u>Division A</u>	<u>Division B</u>	<u>Proposed Modifications</u>
<u>Common plant conduit</u>	D01-2	D02-2	no modifications required greater than 15 ft of separation.
	D01-3	D02-3	no modifications required greater than 15 ft of separation
	G01-1	G02-1	wrap all G02-1 in 1 hr. barrier
	G01-2	G02-2	wrap all G02-1 in 1 hr. barrier
<u>Unit 1 Conduit</u>	1x13	1x14	wrap all of 1x14 in 1 hr. barrier
	D11-5	D13-5	wrap all of D13-5 in 1 hr. barrier
<u>Unit 2 Conduit</u>	2x-13	2x-14	wrap 2x-14 in 1 hr. until 15 ft of separation
	D11-6	D13-6	wrap D13-6 in 1 hr. barrier until 15 ft. of separation
<u>Unit 2 Cable Tray</u>	2ET03&2EW01;02	2EK02,03	radiant energy shields: 1) enclose EK until 8 ft. of separation 2) beneath EK&ET until 15 ft. of separation

The licensee justifies this alternative on the basis of (1) smoke detection is provided, (2) the insitu fuel load is moderate, (3) an automatic Halon 1301 fire extinguishing system has been provided, and (4) an analytical model shows that the magnitude of an exposure fire needed to damage redundant components is significantly higher than reasonably expected.

### 5.3 Evaluation

The 4160V switchgear room does not comply with Section III.G because it does not have twenty feet of separation between redundant trains free of intervening combustibles or alternate shutdown capability.

The licensee's model shows that an exposure fire does not have the potential to cause significant damage to redundant switchgear separated by 3 feet prior to response of the area detection and suppression systems and the response of the fire brigade.

In regard to exposure fires, the licensee's analysis demonstrates that a fire of only 5 gallons of acetone for 30 seconds duration will not cause fire damage to the internal parts of the redundant switchgear. Because an exposure fire from the accumulation of transient combustibles could be of significantly longer duration than 30 seconds, the metal electrical cabinets do not provide protection equivalent to twenty feet of separation free of combustibles or a one-hour fire barrier, or an alternate shutdown capability independent of the area. The existing protection in this fire area does not provide a level of fire protection equivalent to Section III.G. Modifications such as the installation of alternate shutdown capability would provide the requisite level of safety.

#### 5.4 Conclusion

Based on our evaluation the level of existing protection for the 4160V switchgear room does not provide a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R. Therefore, the exemption should be denied.

#### 6.0 Cable Spreading Room (Fire Area 8)

##### 6.1 Exemption Requested

The licensee requests an exemption from Section III.G.2.b to the extent that it requires 20 feet separation without intervening combustibles

##### 6.2 Discussion

Fire Area 8 is located in the Control Building at elevation 26'-0". The area is separated from other plant areas by 3-hour fire rated barriers. The fire

area contains redundant safety-related control and instrument cable, transformers, distribution panels and relay cabinets for Units 1 and 2. Cable trays are of total steel construction. The trays are totally enclosed with solid bottoms and screwed on covers. Cable tray loading is limited to 40 percent full and each tray is provided with a 1/2-inch thick full-width Kaowool insulating blanket between the cables and the tray cover. Most cable trays are installed approximately 6 feet above the floor. The separation between cable trays is as little as four feet. The ceiling height is 16 feet 6 inches. The licensee has not provided information on the location of redundant equipment.

The fire protection in the area is provided by an automatic Halon 1301 fire suppression system, smoke detectors, standpipe hose stations and portable fire extinguishers.

The combustible in the area is cable insulation. The cable insulation comprises a fuel load of 142,400 BTU/Sq. Ft. which, if totally consumed, would correspond to a fire severity of approximately 1-hour and 47 minutes on the ASTM E-119 standard time temperature curve. The licensee has not proposed any modifications for this area. The licensee justifies the alternative on the basis of (1) smoke detection is provided, (2) the in-situ fuel load is moderate, (3) an automatic Halon 1301 fire extinguishing system has been provided, (4) the cable trays in the area are totally enclosed and provided with a 1/2-inch thick Kaowool insulating blanket between the cables and the tray cover, and (5) an analytical model shows that the magnitude of an exposure fire needed to damage redundant components is significantly higher than reasonably expected.

In our Fire Protection SER, we indicated that separation and safe shutdown capability in the Cable Spreading Room was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for the area.

### 6.3 Evaluation

These areas are not in compliance with Section III.G because the minimum separation distance free of intervening combustibles between redundant trains of cables is 4 feet, and there is no alternate shutdown capability independent of this room.

The cable spreading room contains the majority of the control and instrumentation cables necessary for operation and for shutdown of both Units. Without adequate protection a single fire of significant magnitude would damage cables of redundant divisions. If such a fire occurred, there is no capability to achieve shutdown independent of the cable spreading room.

The compensatory features provided are in the form of kaowool blankets laid on the cables with metal tray covers on the cable trays. Except for the above compensatory features, the configuration of the room, the quantity of in-situ combustibles, the type of cable insulation, the potential for the accumulation of combustible materials, and the installed fire protection systems are what is typically found in cable spreading rooms. Because most, if not all, safety and shutdown systems could be affected by a single fire in this area, the compensatory features do not provide equivalent protection to an alternate shutdown system independent of this area.

Recent tests\* conducted at Underwriters Laboratories for the NRC showed that in a configuration similar to that in this area, the heat flux from an exposure fire could cause fire damage to cables in horizontal cable trays located twenty feet from the fire source. The target cables in the tests were covered with metal covers and each tray provided with a 1/2-inch thick full-width Kaowool blanket between the cables and tray covers. Although the metal covers and Kaowool blanket may provide a greater degree of protection for the cable trays, it does not provide reasonable assurance that one train will be maintained free of fire damage.

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\*Interim Report, "Evaluation of Twenty-foot Separation As a Fire Protection System" Sandia National Laboratories, May 1982, Contract #68-8711.

The automatic Halon 1301 extinguishing system will mitigate the fire hazard but may not provide fast total coverage of cabling and/or the floor area. Without the required separation distance, or the installation of a one-hour fire rated barrier, as required by Section III.G.2, we would not have reasonable assurance that damage to redundant trains would not occur pending activation of the suppression systems.

The existing protection in this fire area does not provide a level of fire protection equivalent to Section III.G. Modifications such as the installation of one-hour fire rated barriers or alternate shutdown capability would provide the requisite level of safety.

#### 6.4 Conclusion

Based on our evaluation, the level of existing protection for the cable spreading room does not provide a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R and, therefore, the exemption should be denied.

#### 7.0 Control Room

##### 7.1 Discussion

By letters dated June 30 and October 11, 1982, the licensee requested an exemption from Section III.G, "Fire Protection of Safe Shutdown Capability" of Appendix R to 10 CFR Part 50 to the extent that it requires the installation of a fixed suppression system in the control room.

The control room has a fire detection system, hose station, and fire extinguishers. An alternate safe shutdown system is also available for the control room. The room is continuously manned and the fire load in the control room is low.

## 7.2 Evaluation

Because the fire hazard is light, and the control room continuously manner, there is reasonable assurance that a fire would be promptly extinguished.

## 7.3 Conclusion

Based on our evaluation, we conclude that the installation of a fixed fire suppression system will not significantly increase the level of fire protection in the control room. Therefore, the exemption should be granted.

## 8.0 Unit 1 Southeast Containment Sector at Elevation 21 feet (Fire Zone 10)

### 8.1 Exemption Requested

The licensee requests an exemption from Section III.G.2 to the extent that it requires 20 feet separation without intervening combustibles.

### 8.2 Discussion

The Containment Building is one large common area. For purposes of analysis, the licensee has subdivided the Containment Building into several zones. The ceiling height is approximately 24 feet. Fire protection inside containment is provided by smoke detectors, manual hose stations and portable fire extinguishers.

In our Fire Protection SER, we indicated that separation and safe shutdown capability inside of containment was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for this area.

The fire zone contains redundant cables for pressurizer level, pressurizer instrumentation and pressurizer heaters. Redundant pressurizer level and

instrumentation cables are installed in conduit between 14 and 16 feet above the floor level. The redundant cables are separated horizontally by 16 feet. The redundant pressurizer heater cables are installed in an open cable tray approximately 16 feet above the floor level and are separated by less than 20 feet. The licensee proposes to install non-combustible radiant energy shields beneath the common cable tray containing the pressurizer heater cables.

The combustible in the area is cable insulation. The cables in the area are installed in open horizontal and vertical cable trays. The cable insulation comprises a fuel load of 16,000 BTU/Sq. Ft. which, if totally consumed, would correspond to a fire severity of approximately 12 minutes on the ASTM E-119 standard time temperature curve. The licensee justifies this alternative on the basis of (1) smoke detection is provided, (2) the in-situ fuel load is moderate, and (3) an analytical model shows that the magnitude of an exposure fire needed to damage redundant components is significantly higher than reasonably expected.

### 8.3 Evaluation

With implementation of the proposed modifications, the Southwest Containment section will not comply with the requirements of Section III.G.2 because redundant cables are not horizontally separated by 20 feet, an automatic fire suppression system has not been provided, and noncombustible radiant energy shields have not been provided between redundant trains.

The licensee did not consider electrically initiated fires in cables. The cable insulation on the cables is not qualified in accordance with the IEEE 383 flame test. As discussed in Section 1.0, nonqualified electrical cabling is susceptible to electrically initiated fires. Therefore, an electrically initiated fire in the single cable tray containing the redundant pressurizer heater cables would result in fire damage to the redundant cables. Therefore, we find the existing configuration and proposed modifications do not provide reasonable assurance that one means of achieving safe shutdown conditions will be free of fire damage.

The existing protection in this fire area does not provide a level of fire protection equivalent to Section III.G. Modifications such as rerouting redundant cables to provide 20 feet of separation would provide the requisite level of safety.

#### 8.4 Conclusion

Based on our evaluation, the level of existing protection for the Unit 1 Southeast Containment sector at elevation 21 feet does not provide a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R and, therefore, the exemption should be denied.

#### 9.0 Unit 2 Southeast Containment Sector at Elevation 21 Feet (Fire Zone 11)

##### 9.1 Exemption Requested

The licensee requests an exemption from Section III.G.2 to the extent that it requires 20 feet of separation without intervening combustibles.

##### 9.2 Discussion

The Containment Building is one large common area. For purposes of analysis, the licensee has subdivided the Containment Building into several zones. The fire zone contains redundant pressurizer instrumentation and pressurizer heaters cables. The pressurizer heaters cables outside the pressurizer heater cubicle are protected in accordance with Section III.G.2. Inside the pressurizer heater cubicle, the pressurizer heaters cables are installed in open cable trays with less than one foot of horizontal separation. The licensee proposes no modifications. The ceiling height is approximately 24 feet.

Fire protection inside containment is provided by smoke detectors, manual hose stations and portable fire extinguishers. The combustible in the area is cable insulation. The cables in the area are installed in open horizontal and vertical cable trays. The cable insulation comprises a fuel load of 16,000 BTU/Sq.Ft.

which, if totally consumed, would correspond to a fire severity of approximately 12 minutes on the ASTM E-119 standard time temperature curve.

In our Fire Protection SER, we indicated that separation and safe shutdown capability inside of Containment was inadequate. By letter dated October 21, 1980, we informed the licensee that to meet the intent of Section III.G of Appendix R, the licensee should provide alternate shutdown capability for this area.

The request for exemption is based on the licensee's assumption that an exposure fire in the pressurizer heater cubicles should not be postulated during normal power operation.

### 9.3 Evaluation

Fire Zone 11 does not comply with the requirements of Section III.G.2 because redundant cables are not horizontally separated by 20 feet, an automatic fire suppression system has not been provided and noncombustible radiant energy shields have not been provided between redundant trains. The configuration and type of cable in Fire Zone 11 is similar to the one in Fire Zone 10. As discussed in Section 8.3, an electrically initiated fire could cause damage to the redundant pressurizer heaters cables in the pressurizer heaters cubicle where they are separated by approximately one foot. Therefore, we find the existing configuration does not provide reasonable assurance that one means of achieving safe shutdown conditions will be free of fire damage.

The existing protection in this fire area does not provide a level of fire protection equivalent to Section III.G. Modifications such as rerouting redundant cables to provide 20 feet separation would provide the requisite level of safety.

### 9.4 Conclusion

Based on our evaluation, the level of existing protection for the Unit 2 Containment, Southeast Containment Sector at elevation 21 feet does not provide

a level of fire protection equivalent to the technical requirements of Section III.G of Appendix R. Therefore, the exemption should be denied.

#### 10.0 Hydrogen Hazard Protection

In our SER, we were concerned about the potential damage from an explosion or fire resulting from hydrogen gas leaking from hydrogen piping installed in the Auxiliary Building in areas containing redundant safe shutdown equipment.

By letter dated September 26, 1979, the licensee proposed to:

1. install an excess flow and manual isolation valves in the auxiliary building hydrogen supply header at its point of entry into the auxiliary building, and
2. provide a sketch showing the rerouting of the hydrogen line that avoids passing over the turbine lube oil reservoir.

By letter dated June 30, 1982, the licensee requested an exemption from providing fire barriers to separate the hydrogen lines in the Auxiliary Building on elevations 8 and 26 feet from safety-related cables and equipment.

We find that the fire protection for the hydrogen lines in areas containing safety related equipment meet the guidelines of Section C.5.d.(5) of BTP CMEB 9.5-1 and, therefore, is acceptable.

Based on the above evaluation, we conclude that the level of protection for the hydrogen piping in the Auxiliary Building on elevations 8'-0" and 26'-0" provides a level of fire protection equivalent to Section III.G of Appendix R. Therefore, the exemption should be granted.

Summary

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

- Control Room
- Hydrogen Hazard Fire Protection (3.1.17 in the Fire Protection SER)

The licensee's request for exemptions from Section III.G of Appendix R for the following areas should be denied:

- Fire Zone 1 (Unit 1 Motor Control Center Room)
- Fire Zone 2 (Safety Injection, Containment Spray Pump Room)
- Fire Zone 3 (Component Cooling Water Pump Room)
- Fire Zone 4 (Unit 2 Motor Control Center Room)
- Fire Zone 5 (Auxiliary Feedwater Pump Room)
- Fire Area 6 (4160V Switchgear Room)
- Fire Zone 7 (Monitor Tank Room)
- Fire Area 8 (Cable Spreading Room)
- Fire Zone 10 (Unit 1 Containment, Southeast Quadrant)
- Fire Zone 11 (Unit 2 Containment, Southeast Quadrant)