



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO EXEMPTIONS FROM APPENDIX R TO 10 CFR PART 50  
SOUTHERN CALIFORNIA EDISON COMPANY  
SAN DIEGO GAS AND ELECTRIC COMPANY  
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1  
DOCKET NO. 50-206

1.0 INTRODUCTION

By letter dated October 4, 1985, Southern California Edison Company (the licensee) requested exemptions from the technical requirements of Section III.G of Appendix R to 10 CFR 50 for San Onofre Nuclear Generating Station, Unit 1 (SONGS 1). The staff met with the licensee on November 14, and 15, 1985 to review the exemption requests and by letter dated December 10, 1985, requested additional information. By letter dated December 31, 1985, the licensee responded to the staff's request for additional information and submitted revised exemption requests. The staff and its contractor, Franklin Research Center (FRC), visited the plant site on January 13, 1986 to review the revised exemption requests. By letter dated April 23, 1986, the licensee provided additional information and resubmitted two revised exemption requests.

A region based Appendix R inspection of SONGS 1 was conducted during the week of May 19 through 23, 1986. During the inspection, the NRC inspection team identified five additional fire zones that did not meet the technical requirements of Section III.G of Appendix R to 10 CFR 50. By letter dated May 30, 1986, the licensee requested additional exemptions for these fire zones, and resubmitted one revised exemption request.

This safety evaluation is based, in part, on a technical evaluation report (TER) dated April 23, 1986, prepared by FRC. This safety evaluation is in agreement with the conclusions reached in the FRC TER.

In addition to the aforementioned licensee submittals and the FRC TER, the staff used the following documents in its review of the licensee's exemption requests: Fire Protection Safety Evaluation Report for SONGS 1, dated July 19, 1979; Safety Evaluation Report for SONGS 1 addressing compliance with Appendix R to 10 CFR 50, Sections III.G.3 and III.L, dated May 7, 1986; Updated Fire Hazards Analysis for San Onofre Nuclear Generating Station, Units 1, 2, and 3, Revision 1, dated January 1985; and San Onofre Nuclear Generating Station, Unit 1, 10 CFR 50 Appendix R, Section III.G Compliance Evaluation, dated September 1985. Moreover, during the Appendix R inspection, the staff walked down each of the fire zones and areas for which the licensee requested an exemption to verify the evaluations and conclusions contained in this report.

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Section III.G.1 of Appendix R to 10 CFR 50 requires that fire protection features be provided for structures, systems, and components important to safe shutdown; These features are required to be capable of limiting fire damage so that:

- a. One train of systems necessary to achieve and maintain hot standby 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 to 10 CFR 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 fire resistance rating. Structural steel forming a part of or supporting such fire barriers is required to 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 are required to be installed in the fire area;
- c. Enclosure of cables and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour fire rating. In addition, fire detectors and an automatic fire suppression system are required to be installed in the fire area.

If these requirements are not satisfied, Section III.G.3 requires that alternative or dedicated shutdown capability independent of the area, room, or zone under consideration be provided. It also requires that a fire detection and a fixed fire suppression system be installed in the area, room, or zone under consideration.

Because it is not possible to predict the specific conditions under which fires may occur and propagate, design basis protective features are specified in the rule. 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

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safe shutdown are free of fire damage. Fire protection configurations must either meet the specific requirements of Section III.G of Appendix R to 10 CFR 50 or alternative fire protection configurations must be justified by a fire hazards analysis.

The staff's general criteria for accepting alternative fire protection configurations are:

- ° The alternative assures that one train of equipment necessary to achieve hot standby 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.
- ° Modifications required to meet Section III.G would not increase the level of fire protection safety above that provided by either existing or proposed alternatives.
- ° Modifications required to meet Section III.G could be detrimental to overall facility safety.

## 2.0 Reactor Auxiliary Building Lower Level (Fire Zone 1-AB-(-3)-2A)

Reactor Coolant Filter Enclosure (Fire Zone 1-AB-20-2N)

East Penetration Area (Fire Zone 1-YD-20-4A)

West Penetration Area (Fire Zone 1-YD-20-4B)

Yard Area (Fire Zone 1-YD-14-4D)

Circulating Water Pump Well (Fire Zone 1-YD-(-7)-4E)

Turbine Building Ground Floor (Fire Zone 1-TB-8-9A)

Turbine Deck (Fire Zone 1-TB-35-9B)

Control Room Complex (Fire Area 1-PB-42-16)

Power Block Roof (Fire Area 1-PB-56-33)

## 2.1 Exemption Requested

The licensee requested exemptions from the technical requirements of Section III.G.3 of Appendix R to 10 CFR 50 to the extent that it requires the installation of fire detection and fixed fire suppression systems in areas and zones for which an alternative or dedicated shutdown capability has been provided.

## 2.2 Discussion

Fire area 1-AB-(-3)-2 consists of ten fire zones in the reactor auxiliary building including fire zones 1-AB-(-3)-2A and 1-AB-20-2N.

Fire zone 1-AB-(-3)-2A consists of the boric acid injection pump room and the lower level of the reactor building, which contains the charging pump room, radwaste processing rooms, and the radwaste tank rooms. Below grade, the wall separating this zone from the pipe tunnel (fire area 1-AB-11-34) is 3-hour fire rated. Other below grade walls are 18-inch thick reinforced concrete. The ceiling is a 21-inch-thick precast concrete slab. The above grade walls are either 3-hour fire rated, 8-inch-thick filled concrete block, or 24-inch-thick reinforced concrete. A non-fire rated door assembly separates the boric acid injection pump room from the yard area. The ventilation penetrations to the yard area and waste baling room are not equipped with fire dampers.

The safe shutdown components located in this zone include the redundant charging pumps and refueling water storage tank (RWST) isolation valves, motor control center 2A, and associated power and control cables. If a fire in this zone disables the redundant charging pumps, alternative shutdown capability is provided by the safety injection system (SIS). The SIS is physically and electrically independent of fire area 1-AB-(-3)-2.

The fuel load of cable insulation, plastics, Class A materials, and charging pump lube oil yields an equivalent fire severity of less than 5 minutes on the ASTM E-119 standard time-temperature curve.

Existing fire protection includes fire extinguishers and hose stations and smoke detectors for the charging pump room, motor control center 2A, radwaste control board, radwaste tank rooms, and the boric acid injection pump room. The licensee proposes to install a sprinkler system in the charging pump room.

Fire zone 1-AB-20-2N is the reactor coolant filter enclosure. The floor, walls, and ceiling are constructed of reinforced concrete. There are several small floor and wall penetrations as described in the licensee's May 30, 1986 letter. The west wall has a 2-ft by 9-ft opening with a locked gate that serves as an entrance to the yard area. This zone is not equipped with fire detectors or an automatic fire suppression system.

Fire zone 1-AB-20-2N contains redundant components associated with the charging pump RWST suction isolation valves, volume control tank isolation valve, and charging pump trip signal. Due to the lack of separation of the redundant components noted, alternative shutdown capability is also provided for this fire zone by the SIS.

The in situ combustible loading in fire zone 1-AB-20-2N yields an equivalent fire severity of less than 10 minutes on the ASTM E-119 standard time temperature curve.

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Fire area 1-YD-20-4 is the yard area. This area consists of seven fire zones including fire zones 1-YD-20-4A, 1-YD-20-4B, 1-YD-14-4D, and 1-YD-(-7)-4E, which are all exterior fire zones that comprise the east penetration area, the west penetration area, the yard area, and the circulating water pump well, respectively.

The east and west penetration areas (fire zones 1-YD-20-4A and 1-YD-20-4B) are bounded by the steel containment sphere, the enclosure building, the turbine building, and the power block (east penetration area) or the fuel handling building (west penetration area). The yard area (fire zone 1-YD-14-4D) consists of the yard surrounding the sphere enclosure building, and the area west of the fuel and turbine buildings. This zone is bounded by the vital area fence and is separated from the 480V switchgear room by a 1-hour fire rated wall, the west penetration area by the enclosure building, and the resin slurry tank room by a concrete block wall. The circulating water pump well (fire zone 1-YD-(-7)-4E) is located below grade in the yard area west of the turbine building. The nonfire rated penetrations in the zone boundaries are as described in the licensee's December 31, 1985 submittal.

The east and west penetration areas contain cables for the following systems used to achieve hot standby and cold shutdown:

- Reactor Coolant System (RCS)
- Chemical and Volume Control System (CVCS)
- Main Steam System (MSS)
- Auxiliary Feedwater System (AFW)
- Component Cooling Water System (CCW)
- Containment Ventilation System (CVS)
- Gaseous Nitrogen System (GNI)
- Residual Heat Removal System (RHR)
- Essential Electrical System

The dedicated shutdown system will be used to achieve and maintain safe shutdown in the event of a fire in either the east and west penetration areas. Cables for certain components of the dedicated shutdown system, i.e., primary system temperature transmitters, PORVs, pressurizer pressure transmitter, pressurizer level transmitter, and steam generator level transmitters, are routed through the west penetration area. The licensee proposes to protect these cables with a 3-hour fire rated barrier. Cables for the primary system hot leg temperature instruments, which provide indication at the dedicated shutdown panel, are routed through the east penetration area. The licensee proposes to abandon these cables and route new cables independent of the zone to the dedicated shutdown system panel.

The yard area (fire zone 1-YD-14-4D) contains components of the RCS, CVCS, AFW, MSS, CCW, saltwater cooling system (SWC), GNI, and essential electrical system used to achieve hot standby and cold shutdown. The licensee proposes to reroute cables for the train 1 charging pump to achieve a separation of greater than 20 feet between redundant charging pump cables. The licensee also proposes to reroute power circuits for one AFW pump and to either reroute

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control circuits for the pump or provide a new disconnect switch to allow manual start of the pump from a separate fire area.

The three CCW pumps are located adjacent to one another. Should a fire damage all three pumps, the motor driven AFW pump, which is separated from the CCW pumps by greater than 100 feet, including 20 feet free of intervening combustibles, will be used to provide alternative shutdown capability. In addition, cables for the redundant saltwater cooling pumps could be damaged by the fire. In this case, the auxiliary saltwater cooling pump, which is located over 100 feet from the saltwater cooling pump circuits, will be used to provide alternative shutdown capability.

Circuits associated with seal water return and letdown isolation valves CV-528 and CV-526 are routed through this fire zone west of the fuel handling building and into the west penetration area. Redundant seal water return and letdown isolation valves CV-527 and CV-525 are located in fire zone 1-YD-20-4A greater than 40 feet away from the circuits for CV-528 and CV-526 in fire zone 1-YD-20-4A and 1-YD-20-4B without intervening combustibles.

The circulating water pump well (fire zone 1-YD-(-7)-4E) contains the saltwater cooling pumps and associated cables which are used to achieve safe shutdown. Alternative shutdown capability is provided by auxiliary saltwater pump G-13C which is located more than 100 feet from the zone boundary.

Existing fire protection for these zones includes hose stations and fire extinguishers. In addition, fire detection has been provided for the enclosure building, the east entrance to fire zones 1-YD-20-4A and 1-YD-20-4B, and the station service transformers. Fire suppression systems are provided for the station service transformers and for cable trays that pass through the west boundary of fire zone 1-YD-20-4B into the adjacent yard area (fire zone 1-YD-14-4D).

Other fire protection features include curbing to contain oil spills at the transformers, fire barriers for selected cables, and spatial separation between components located in open yard areas.

The turbine building ground floor (fire zone 1-TB-8-9A) is separated from the 4160V switchgear room by a 3-hour fire rated wall. The lube oil storage shed walls are also 3-hour fire rated. The walls adjoining the east and west penetration areas and the east and south walls of the 480V switchgear room are 1-hour fire rated. The remaining zone walls are concrete block or reinforced concrete. Nonfire rated doors open to the yard area (fire zone 1-YD-14-4D). Three-hour fire doors are installed in the 4160V and 480V switchgear rooms, and the lube oil storage shed. A 1½-hour rated door and a non fire rated door open to the adjacent condensate storage tank area (fire zone 1-YD-14-4F).

The in situ combustible loading in the turbine building ground floor, which consists primarily of turbine lube oil, cable insulation and the hydrogen seal oil unit, yields and equivalent fire severity of about 85 minutes on the ASTM E-119 standard time-temperature curve.

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The turbine building ground floor contains the auxiliary feedwater pumps, motor control center 3, and cabling for the RCS, CVCS, MSS, AFW, CCW, SWC, RHR, reactor cavity cooling fans, and essential electric systems used to achieve hot standby and cold shutdown. In the event of a fire in this zone, the dedicated shutdown system will be used to achieve and maintain safe plant shutdown.

Existing fire protection consists of portable fire extinguishers, fire hose stations, fire detection systems for the lube oil reservoir pump and conditioner areas, the hydrogen seal oil unit, emergency air compressor, the lowest cable trays above the lube oil reservoir area, the lube oil reservoir area, and the south end of building in the area of the exciter, and fixed automatic fire suppression systems for the chemical feed area, chemical treatment area, the east wall and a portion of the south wall of the 480V switchgear room, the north wall of the chemical treatment area, and the structural steel at north end of the fire zone, lube oil reservoir and conditioner areas, cable trays routed in the north portion of the zone near the lube oil and chemical feed areas, and the hydrogen seal oil unit.

Fire zone 1-TB-35-9B (the turbine deck) is an exterior fire zone which consists of the feedwater heater deck (elevation 35 ft.) and the turbine deck (elevation 42 ft.). The walls separating this zone from the control room complex are 3-hour fire rated. The north end of this zone adjoins the steel containment sphere. The remaining walls are reinforced concrete or concrete block. The floor is reinforced concrete. Unsealed opening in the zone boundaries are as described in the referenced licensee submittals. The fuel load in this zone is negligible.

Circuits for hot leg temperature and pressurizer pressure indication used to achieve and maintain safe shutdown are routed in this zone. Should a fire occur on the turbine deck, alternative hot leg temperature indication and pressurizer pressure indication are provided at the dedicated shutdown panel independent of the fire zone.

Existing fire protection consists of portable fire extinguishers and fire hose stations. Smoke detectors and automatic fire suppression are not installed in the zone.

Fire area 1-PB-42-16 (the control room complex) is located at the 42 ft elevation of the power block building. The control room walls and floor are 3-hour fire rated. The control room roof is concrete with an approximate thickness of seven inches. There are no unsealed openings located in the control room boundary. Fire area 1-PB-56-33 (power block roof) is located directly over the control room complex and is open to the atmosphere.

The fire load in the control room is about 80,000 Btu per square foot, which translates into an equivalent fire severity of 60 minutes on the ASTM E-119 standard time-temperature curve. The fire load on the power block roof is negligible.

The control room complex contains the control consoles, vital bus cabinets, and cabling for all safe shutdown systems. Redundant trains of the primary system hot leg temperature transmitters are located on the power block roof.

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Dedicated safe shutdown capability is provided for the control room. Alternative hot leg temperature indication is available in both the control room and at the dedicated shutdown panel in the event of a fire on the power block roof.

Fire protection for the control room consists of fire detection in the technical support center, back panel area, the kitchen, computer room, and within the vital bus and main control console; fire extinguishers; and hose stations. The power block roof area only has a fire extinguisher.

### 2.3 Evaluation

The technical requirements of Section III.G.3 of Appendix R to 10 CFR 50 are not met in these fire areas and zones because fire detection and fixed fire suppression systems have not been installed throughout the area or zone for which an alternative or dedicated shutdown capability has been provided.

The staff was concerned that a fire in any of the subject fire areas or zones would damage redundant safe shutdown components such that safe shutdown could not be achieved or maintained. However, with the exception of fire zone 1-TB-8-9A (turbine building ground floor) and fire area 1-PB-42-16 (control room), the fire loads are low (less than 35,000 Btu per square foot) and are well distributed. Therefore, in the staff's judgement a fire of significant magnitude or duration would not occur. If a fire were to occur, the staff has reasonable assurance that it would be detected by existing partial coverage fire detection systems or plant operators and extinguished by the plant fire brigade using available equipment or burn itself out before spreading beyond the area/zone boundaries and/or damaging redundant shutdown components. If rapid fire growth occurs in an area equipped with a partial sprinkler system prior to brigade arrival, the staff expects the automatic sprinklers to operate and control or extinguish the fire. Moreover, the existing and proposed fire barriers, containment dikes, and spatial separation would provide passive protection and would restrict fire spread and/or prevent damage by direct flame impingement and radiant heat energy. For those zones and areas that are not enclosed, the effects of the fire will largely vent to atmosphere.

In the case of Fire Area 1-TB-8-9A, all of the principal fire hazards are protected by automatic fire detection and suppression systems. Therefore, in the event of a fire, it would be detected during its early stages and controlled or extinguished by the fire suppression systems before redundant components are damaged.

The control room (Fire Area 1-PB-42-16) is continuously manned and has partial automatic fire detection capability. Therefore, the staff has reasonable assurance that any fire would be readily detected during its incipient stages. Moreover, because the control room is completely accessible and fire fighting equipment is available, the staff has reasonable assurance that a fire would be extinguished by plant operators before significant fire damage occurs.

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Furthermore, should a fire damage redundant safe shutdown system components in fire zone 1-YD-20-4A, 1-YD-20-4B, or 1-TB-8-9A, or fire area 1-PB-42-16 or 1-PB-56-33, the dedicated safe shutdown system can be used to achieve and maintain safe plant shutdown. In the event of fire damage to redundant components in fire zone 1-AB-(-3)-2A, 1-AB-20-2N, 1-YD-14-4D, 1-YD-(-7)-4E, or 1-TB-35-9B, the alternative shutdown capability can be used to achieve and maintain safe shutdown. In the staff's opinion, the installation of additional automatic fire detection and suppression capabilities would not significantly increase the level of safety provided by the existing and proposed systems.

#### 2.4 Conclusion

On the basis of its evaluation, the staff has concluded that the existing level of fire protection with the proposed modifications for fire zones 1-AB-(-3)-2A, 1-AB-20-2N, 1-YD-20-4A, 1-YD-20-4B, 1-YD-14-4D, 1-YD-(-7)-4E, 1-TB-8-9A, and 1-TB-35-9B and fire areas 1-PB-42-16 and 1-PB-56-33 provides an adequate level of fire safety. The licensee's requests for exemptions from the technical requirements of Section III.G.3 of Appendix R to 10 CFR 50 in these fire areas and zones should, therefore, be granted.

#### 3.0 Containment (Fire Area 1-CO-(-10)-1)

The licensee requested an exemption from the technical requirements of Section III.G.3 of Appendix R to 10 CFR 50 to the extent that it requires the installation of fire detection and fixed fire suppression systems in an area for which dedicated shutdown capability has been provided, and to the extent that it requires that the dedicated shutdown capability be independent of the area for which it has been provided.

#### 3.2 Discussion

The containment fire area is a steel sphere that houses the reactor, the steam generators, the reactor coolant pumps, the residual heat removal pumps, and other support systems. Components of the reactor coolant, chemical and volume control, main steam, component cooling water, and containment ventilation systems, which are used to achieve hot standby, are located within containment.

The separation and/or fire protection of the redundant primary system temperature, pressurizer level and pressure and steam generator level instruments, and associated cables does not meet the technical requirements of Section III.G.2 of Appendix R to 10 CFR 50. Therefore, the licensee has provided a dedicated safe shutdown capability for the containment. However, pressurizer pressure and level, steam generator level and primary temperature instruments and their associated cables, which are required to provide indication at the dedicated safe shutdown panel, are not independent of the containment fire area. The cables for these instruments are all mineral insulated unshielded fire resistant cable. Inside containment, these dedicated shutdown system cables are protected by

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radiant energy shields in the vicinity of the penetration boxes where transitions from the penetration boxes to the conduit runs occurs.

The instruments that provide indication for pressurizer pressure and level at the dedicated shutdown panel are located in a single steel cabinet. This cabinet, which is located outside the bioshield wall, forms a radiant energy shield that separates these instruments from the redundant pressurizer pressure and level instruments located in adjacent cabinets.

Only one steam generator is required to achieve shutdown. Therefore, in the event of a fire in containment, the primary temperature instruments and the steam generator level instruments for only one loop must survive the fire. The three sets of instruments that provide indication of primary system temperature and steam generator level at the dedicated shutdown panel are located within the individual reinforced concrete structures that house the steam generators.

The in situ combustible loading inside containment, which consists principally of oil and grease for the three reactor coolant pumps, cable insulation, and charcoal contained in the containment ventilation units, yields an equivalent fire severity of about 20 minutes on the ASTM E-119 standard time-temperature curve.

Existing fire protection includes ionization type smoke detectors installed over each steam generator, in the electrical penetration area, over each of the reactor coolant pumps, and under the pressurizer, and infrared flame detectors on the crane rails above the operating floor and in the residual heat removal pump area, fire hose stations, and fire extinguishers. In addition, each reactor coolant pump is equipped with an oil collection system in accordance with Section III.0 of Appendix R to 10 CFR 50.

### 3.3 Evaluation

The technical requirements of Section III.G.3 of Appendix R to 10 CFR 50 are not met in this fire area because fire detection and fixed fire suppression systems have not been installed throughout the area and because certain instruments required to provide indication at the dedicated safe shutdown panel are not independent of the fire area.

The staff was concerned that a fire in the containment would damage redundant safe shutdown components resulting in loss of safe shutdown capability. However, because the combustible loading in the area is low (about 24,000 Btu per square foot), because each reactor coolant pump is equipped with an oil collection system, and because the charcoal component of the overall fuel load is totally contained within the metal filter enclosures, the staff does not expect a fire of significant magnitude or duration to occur. Moreover, because automatic fire detection has been provided for the principal fire hazards, the staff has reasonable assurance that anticipated fires will be detected in their early stages by these systems. Plant operators could then take appropriate action to minimize the impact of the fire. The safe shutdown-related equipment in this area consists primarily of metal components,

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valves, and piping which are not prone to damage from fires anticipated for this area. Therefore, the staff does not expect a fire in this area to adversely affect normal safe shutdown from the control room.

In the unlikely event that fire damages components required to achieve safe shutdown from the control room before it is extinguished or burns itself out, the dedicated safe shutdown system is available to achieve and maintain safe shutdown. However, the dedicated safe shutdown system is not completely independent of the fire area.

The pressurizer pressure and level instruments, the steam generator level instruments and the primary temperature instruments, including 18" lengths of non-fire rated cable between splice boxes and the temperature elements, are well separated by distance, radiant energy shields, and major structural components within containment, e.g., the concrete steam generator enclosures. Therefore, although the instruments are not independent of the area as required by Section III.G.3 of Appendix R to 10 CFR 50, the staff has reasonable assurance that the required number of instruments will function during and after a containment fire. The staff was, however, concerned about the use of a mineral insulated fire resistant cable for these instruments in lieu of a more conventional fire-rated cable wrap.

The staff concern was that, when exposed to a fire, the mineral insulated cables would not perform their intended functions both during and after the fire exposure. By letter dated December 31, 1985 the licensee submitted the results of a fire test conducted by Underwriters Laboratories, Inc. on the subject cables. Representative samples of the mineral insulated cable were subjected to a one hour fire endurance test in accordance with the ASTM E-119 test method. During the one hour fire exposure and for 93 hours afterwards, electrical measurements were taken. These measurements demonstrated that the mineral insulated cables will not experience any loss of function during or following fire exposure. Because of the low in situ combustible loading inside containment, low likelihood of accumulation of transient combustibles inside containment due to its inaccessibility during power operation, and the containment's large open area, the staff does not expect a fire of the intensity or duration of an ASTM E-119 fire to occur inside containment. Therefore, the staff has reasonable assurance that the cables will continue to function as designed during a fire event and at least until cold shutdown is achieved.

### 3.4 Conclusion

Based on its evaluation, the staff concludes that the existing fire protection with the proposed modifications provides an acceptable level of fire safety. The licensee's request for exemptions from the technical requirements of Section III.G.3 of Appendix R to 10 CFR 50 in fire area 1-CO-(-10)-1 should, therefore, be granted.

### 4.0 Doghouse (Fire Zone 1-YD-20-4C)

Condensate Storage Tank Area (Fire Zone 1-YD-14-4F)

Main Transformer Area (Fire Zone 1-TB-20-9D)

Ramp (Fire Zone 1-TB-14-9E)

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#### 4.1 Exemption Requested

The licensee requested exemptions from the technical requirements of Section III.G.2 of Appendix R to 10 CFR 50 to the extent that it requires the separation of redundant safe shutdown components by a horizontal distance of more than 20 feet with no intervening combustibles, and automatic fire detection and fire suppression systems.

#### 4.2 Discussion

Fire zone 1-YD-20-4C, which is a part of fire area 1-YD-20-4, is located at the west end of the reactor building enclosure structure at elevation 20'-0". The walls and ceiling are reinforced concrete about 2 feet thick. There are approximately 43 unsealed penetrations in the west wall of this zone that communicate with fire zone 1-YD-14-4D. These penetrations range in size from 1 inch to 10 inches in diameter and carry instrument lines, conduits, or pipes. There is also a gate opening into fire zone 1-YD-20-4B.

This zone contains letdown isolation valve CV-526, seal water return isolation valve CV-528, and their associated circuits. The redundant valves for letdown isolation (CV-525) and seal water return isolation (CV-527), and their associated circuits are located in the same fire area, but in fire zone 1-YD-20-4A. These redundant components are separated by more than 130 feet of which at least 40 feet are free of intervening combustibles.

The fuel load in fire zone 1-YD-20-4C consists of plastic coated flexible conduit and miscellaneous Class A and plastic materials. The estimated equivalent fire severity is approximately 5 minutes on the ASTM E-119 standard time temperature curve.

Ultraviolet flame detectors are provided in this fire zone. Portable fire extinguishers and fire hose stations are available for manual fire fighting. Automatic fire suppression is not provided.

Fire zone 1-YD-14-4F is also a part of fire area 1-YD-20-4. This zone is located outdoors at the southwest end of the turbine building. It is separated from the turbine building by 8-inch concrete block walls on the north and east sides. The south and west boundaries are delineated by the vital area fence. The non-fire rated penetrations in the zone boundary that communicate with fire area 1-TB-8-9 are as described in the licensee's May 30, 1986 letter.

Circuits for MOV-1100D are routed through this fire zone. The circuits for redundant valve MOV-1100B are routed in the same fire area, but in fire zone 1-YD-14-4F, approximately 120 feet away. Automatic fire detection and suppression is not provided.

Fire area 1-TB-8-9 consists of fire zones 1-TB-8-9A, 1-TB-35-9B, 1-TB-10-9C, 1-TB-20-9D, and 1-TB-14-4E. Fire zone 1-TB-20-9D, the main transformer area, is located adjacent to the turbine building ground floor in the southeast corner of the fire area. This zone is enclosed by an 8-inch high curb to contain transformer oil leakage and is open to the atmosphere. Automatic fire detection and suppression systems are not provided in this zone.

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Cables for charging pump RWST suction isolation valve MOV-1100D and for charging pump RWST suction valve MOV-883 are located in fire zone 1-TB-20-9D. Cables for the redundant charging pump RWST suction isolation valve (MOV-1100B) and for the redundant charging pump RWST suction valve (MOV-1100C) are located within adjacent fire zone 1-TB-8-9A, turbine building ground floor. (Fire Zone 1-TB-8-9A is discussed in Section 2 of this report.) These redundant components are separated by at least 40 feet and by the turbine building walls.

The in situ combustible loading in fire zone 1-TB-20-9B consists of the transformer oil in the three transformers located in the zone.

Fire zone 1-TB-14-9E is the ramp located on the east side of the turbine building. This zone is open to the atmosphere. Cables for the thermal barrier pump are routed in this zone. The redundant cables for component cooling water pump (G-15A) are routed in adjacent fire zone 1-TB-8-9A, over 70 feet from fire zone 1-TB-14-9E.

The in situ combustible loading in fire zone 1-TB-14-9E consists of cables in a partially covered cable tray. This tray is separated from the closest combustibles in adjacent fire zone 1-TB-8-9A by a horizontal distance of 24 feet free of intervening combustibles and open to the atmosphere. The north end of fire zone 1-TB-8-9A is provided with automatic suppression and detection over the circuits for redundant pump G-15A.

#### 4.3 Evaluation

The technical requirements of Section III.G.2 of Appendix R to 10 CFR 50 are not met in fire areas 1-YD-20-4 and 1-TB-8-9 because of the lack of automatic fire detection and suppression systems.

The staff was concerned that because of the lack of areawide automatic fire detection and suppression systems, a fire could spread throughout one of the subject fire areas resulting in damage to redundant safe shutdown systems such that safe shutdown could not be achieved and maintained. However, with the exception of the main transformer area (fire zone 1-TB-20-9D) the fuel loads are negligible. Therefore, the staff does not expect a fire of significant magnitude or duration to occur. In the event of a transformer oil fire in the main transformer area, rapid fire growth is expected. However, because this fire zone is surrounded by a curb and is open to the atmosphere, the staff has reasonable assurance that any transformer fire will be confined to the zone and that the effects of the fire will largely vent to atmosphere. The relatively large spatial separation of the redundant components within the subject fire areas provides further assurance that one train of redundant components will survive any postulated fire.

In the staff's opinion, under these conditions, any postulated fire, could, at most, cause damage to one train of shutdown components but would not propagate horizontally and damage redundant counterparts.

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#### 4.4 Conclusion

On the basis of its evaluation, the staff concludes that the installation of additional fire detection and/or automatic fire suppression capabilities in fire areas 1-YD-20-4 and 1-TB-8-9 would not significantly increase the level of fire safety. The licensee's request for exemption from Section III.G.2 of Appendix R to 10 CFR 50 for these areas should, therefore, be granted.

#### 5.0 Summary

Based on its evaluation, the staff concludes that exemptions from the technical requirements of Section III.G of Appendix R to 10 CFR 50 should be granted in the following areas and zones:

1. Reactor auxiliary building lower level (fire zone 1-AB-(-3)-2A)
2. Reactor coolant filter enclosure (fire zone 1-AB-20-2N)
3. East penetration area (fire zone 1-YD-20-4A)
4. West penetration area (fire zone 1-YD-20-4B)
5. Yard area (fire zone 1-YD-14-4D)
6. Circulating water pump well (fire zone 1-YD-(-7)-4E)
7. Turbine building ground floor (fire zone 1-TB-3-9A)
8. Turbine deck (fire zone 1-TB-35-9B)
9. Control room complex (fire area 1-PB-42-16)
10. Power block roof (fire area 1-PB-56-33)
11. Containment (fire area 1-CO-(-10)-1)
12. Doghouse (fire zone 1-YD-20-4C)
13. Condensate Storage Tank Area (fire zone 1-YD-14-4F)
14. Main Transformer Area (fire zone 1-TB-20-9D)
15. Ramp (fire zone 1-TB-14-9E)