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Supplement No. 23

Safety Evaluation Report

related to the operation of
Diablo Canyon Nuclear Power Plant,
Units 1 and 2

Docket Nos. 50-275 and 50-323

Pacific Gas and Electric Company

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

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ABSTRACT

Supplement 23 to the Safety Evaluation Report for Pacific Gas and Electric Company's application for licenses to operate Diablo Canyon Nuclear Power Plants, Units 1 and 2 (Docket Nos. 50-275 and 50-323) has been prepared by the Office of Nuclear Reactor Regulation of the U.S. Nuclear Regulatory Commission. This supplement addresses the applicant's requests for approval of 22 deviations from the requirements of Section III.G of Appendix R of Title 10 of the Code of Federal Regulations Part 50.

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1 INTRODUCTION

By letter dated March 2, 1983, the licensee committed to provide a report* comparing the existing and the proposed fire protection features in Diablo Canyon Unit 1 (Docket No. 50-275) to the technical requirements of Sections III.G, III.J, III.L, and III.O in Appendix R of Title 10 of the Code of Federal Regulations Part 50 (10 CFR 50).

The licensee provided this evaluation by letter dated July 15, 1983, and supplemental letters dated September 23 and 27, and October 3, 6, 11 and 14, 1983, and May 16, 1984.* Thirty-two fire areas were determined to be in compliance with Section III.G, and two areas will be brought into compliance after plant modifications are completed. The licensee requested approval for 22 deviations from the requirements of Section III.G. Approval was requested for two other deviations from Section III.G for conditions that were not area specific, and the licensee also requested approval deviations from the technical requirements of Sections III.J and III.O.

Section III.G.2 of Appendix R requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

(1) Separation of cables and equipment and associated nonsafety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier.

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

(3) Enclosure of cable and equipment and associated nonsafety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

If these conditions are not met, Section III.G.3 requires that there be an alternative shutdown capability independent of the fire area of concern. It also requires that a fixed suppression system be installed in the fire area of concern if it contains a large concentration of cables or other combustibles. These alternative requirements are not deemed to be equivalent; however, they provide equivalent protection for those configurations in which they are accepted.

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*Information related to this review (Docket No. 50-275) is available for inspection and copying for a fee at the NRC Public Document Room, 1717 H Street NW, Washington, D.C. (see also the inside front cover of this report).

Because it is not possible to predict the specific conditions under which fires may occur and propagate, the design-basis protective features rather than the design-basis fire are specified in the rule. Plant-specific features may require protection different from the measures specified in Section III.G. In such a case, the licensee must demonstrate, by means of a detailed fire hazards analysis, that existing protection or existing protection in conjunction with proposed modifications will provide a level of safety equivalent to the technical requirements of Section III.G of Appendix R.

In summary, Section III.G is related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain safe shutdown are free of fire damage. Either fire protection configurations must meet the specific requirements of Section III.G or an alterative fire protection configuration must be justified by a fire hazard analysis. Generally, the staff will accept an alternative fire protection configuration if

(1) The alternative ensures that one train of equipment necessary to achieve hot shutdown from either the control room or emergency control stations is free of fire damage.

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

(3) Fire-retardant coatings are not used as fire barriers.

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

(5) Modifications required to meet Section III.G would be detrimental to overall facility safety.

Section 9.6.1 of this Supplement 23 to the Safety Evaluation Report for the Diablo Canyon Nuclear Power Plants addresses each of the licensee's requests for deviations, presents the staff's evaluation and conclusion regarding each request, and then summarizes the staff's review of the licensee's requests.

9 AUXILIARY SYSTEMS

9.6 Other Auxiliary Systems

9.6.1 Fire Protection Systems

The subsections below address each of the licensee's requests for deviations, present the staff's evaluation and conclusion regarding each request, and summarize the staff's review of the licensee's requests.

9.6.1.1 Containment (Fire Area 1)

Requested Deviation

The licensee requested approval for a deviation from Section III.G.2 to the extent that it requires a noncombustible radiant energy shield between redundant shutdown divisions when divisional separation is less than 20 feet.

Discussion

Fire area 1 consists of all elevations of the containment building. It is divided into three fire zones: the containment penetration area (zone 1-A), the reactor coolant pump area (zone 1-B), and the control rod drive area (zone 1-C).

Fire zone 1-A is an annular region within the containment between the floor of the containment at elevation 91 feet and the operating deck at elevation 140 feet. The outer wall of this zone is the containment wall. The inner wall and ceiling of this zone are unrated, reinforced-concrete shield walls. Open steel floor gratings and open stairways provide personnel access to various elevations within this zone. Fire zone 1-B is a cylinder in the central part of the containment. It is separated from fire zone 1-A by the unrated reinforced-concrete shield wall, which also serves as the support structure for the polar crane. This zone is separated from fire zone 1-C by the reinforced-concrete operating deck at elevation 140 feet. Fire zone 1-C includes the reactor pit and area above the reactor to elevation 140 feet and above. The outer wall of this zone is the steel-lined reinforced-concrete containment wall. The floor of fire zone 1-C is constructed of reinforced concrete with openings for stairways and open floor gratings for equipment access.

The equipment and cables required for safe shutdown that are located in the fire area are

(1) residual heat removal (RHR) pump suction valves

(2) valves in the charging and boration flow path and related cabling

(3) reactor coolant system (RCS) and steam generator instrumentation and circuitry

(4) steam generator blowdown isolation valves and RCS temperature elements

(5) safe shutdown circuits listed in Table 3-4 of the licensee's July 15, 1983 Appendix R report.

The in situ combustible fire loading in the area is approximately 26,200 Btu/ft^2 or an equivalent severity of 19.6 minutes on the time-temperature curve of Standard E-119 of the American Society for Testing and Materials (ASTM E-119). The fire load consists primarily of oil in reactor coolant pumps, cable in cable trays, grease in valve operators, oil and grease in the crane and fan cooler motors, oil and grease in cranes, and charcoal, HEPA, and roughing filters.

Fire protection for the area includes fire detection systems throughout zone 1-A, at each reactor coolant pump, and on the operating deck in zone 1-C; a wet-pipe automatic sprinkler system at each reactor coolant pump; portable fire extinguishers; and manual hose stations.

By letter dated September 23, 1983, the licensee committed to provide either a radiant energy shield or a 1-hour fire-rated barrier between reactor coolant temperature instrumentation where redundant divisions are less than 20 feet apart.

Evaluation

With the installation of a 1-hour fire-rated barrier or radiant energy shield between redundant reactor coolant temperature instrumentation, the technical requirements of Section III.G.2 will be met in containment.

Originally, the staff was also concerned with the fire protection for the above instrumentation as well as the pressurizer liquid level instrument lines. However, in the September 23, 1983, letter, the licensee indicated that upon reinspection it was discovered that redundant instrument lines were separated by 20 feet without intervening combustibles, as required by Section III.G.2 of Appendix R.

Conclusion

This area now meets the staff guidelines and, therefore, a deviation from the requirements of Section III.G.2 of Appendix R in containment is no longer necessary.

9.6.1.2 RHR Pump 1-1 and Heat Exchanger Room (Fire Area 3-B-1)
RHR Pump 1-2 and Heat Exchanger Room (Fire Area 3-B-2)

Requested Deviation

The licensee requested approval for deviations in these areas from Section III.G.2(a) to the extent that it requires that redundant shutdown divisions be separated by complete 3-hour-fire-rated barriers.

Discussion

- Fire Area 3-B-1

The RHR pump 1-1 and heat exchanger room is bounded by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

(1) an overflow opening in the perimeter wall at elevation 54 feet

(2) three duct penetrations without fire dampers and a door opening with a 1½-hour-fire door in the perimeter wall at elevation 64 feet

(3) an open doorway and unprotected penetrations in the perimeter wall at elevation 75 feet

(4) a duct penetration without fire damper in the perimeter wall at elevation 104 feet

These openings are in walls that form the perimeter of adjoining plant locations that the licensee has designated as separate fire areas.

Safe shutdown equipment located in this area consists of RHR pump 1-1, RHR heat exchanger 1-1, and circuits listed in Table 3-4 of the licensee's Appendix R report.

The in situ combustible loading in the area is approximately 862 Btu/ft^2 with an equivalent severity of 0.6 minute on the ASTM E-119 time-temperature curve. The fire load consists primarily of oil and grease evenly distributed throughout the entire 675-square-foot area.

Existing fire protection includes an area-wide smoke detection system, portable fire extinguishers, and manual hose stations.

- Fire Area 3-B-2

The RHR pump 1-2 and heat exchanger room is bounded by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

(1) an overflow opening in the perimeter wall at elevation 54 feet

(2) five duct penetrations without fire dampers and a door opening with a 1½-hour-fire door in the perimeter walls at elevation 64 feet

(3) a duct penetration without a fire damper in the perimeter wall at elevation 85 feet

(4) a duct penetration without a fire damper in the perimeter wall at elevation 104 feet

These openings are in walls that form the perimeter of adjoining plant locations that the licensee has designated as separate fire areas.

Safe shutdown equipment that is located in this area consists of RHR pump 1-2, RHR heat exchanger 1-2, and circuits listed in Table 3-4 of the licensee's Appendix R report.

The in situ fire loading in the area is approximately 862 Btu/ft^2 with an equivalent severity of 0.6 minute on the ASTM E-119 time-temperature curve. The fire load consists primarily of oil and grease evenly distributed throughout the entire 675-square-foot area.

Existing fire protection includes an area-wide smoke detection system, portable fire extinguishers, and manual hose stations.

The licensee justified the deviations on the basis of the low fire load, the spatial separation between redundant shutdown divisions, and the existing fire protection.

Evaluation

The technical requirements of Section III.G.2(a) are not met in these areas because of the unprotected penetrations and the non-3-hour-fire-rated doors in the perimeter walls.

The requirement for a 3-hour-fire-rated barrier between redundant shutdown divisions is intended to provide reasonable assurance that one division will remain free of damage as a result of a fire that originates on either side of the barrier. The fire hazard within these areas is minimal. Because of the limited quantities and dispersed location of combustibles, any postulated fire would tend to propagate slowly and with initially low heat generation. The damage-producing effects of such a fire (i.e., the radiant and convective heat and other products of combustion) would, to a significant extent, be confined to the area of fire origin by the fire-rated perimeter walls, floor, and ceiling. A small quantity of smoke and hot gases would be expected to propagate beyond the perimeter of these fire areas because of the unprotected penetrations. However, most of these penetrations are located away from the redundant shutdown systems. Therefore, hot gases passing through the penetrations would not affect components or cabling of the redundant division. The remaining products of combusion would be so diluted by ambient air conditions and the temperature of the air mass would be so diminished that they would not present a threat to the redundant division.

Because these areas have been provided with an area-wide fire detection capability and because they are located in an easily accessible area within the auxiliary building, the staff has reasonable assurance that a fire would be detected and controlled before significant propagation and damage would occur.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection provides an acceptable level of fire safety equivalent to that provided by Section III.G.2, and, therefore, the licensee's request for approval for deviations in the RHR pump and heat exchanger rooms (fire areas 3-B-1 and 3-B-2) is approved.

9.6.1.3 Centrifugal Charging Pumps 1-1 and 1-2 Room (Fire Area 3-H-1)
Reciprocal Charging Pump Room (Fire Area 3-H-2)
Turbine-Driven Auxiliary Feed Pump (Fire Area 3-Q-1)
4.16-kV Switchgear Ventilation Fan Room (Fire Area 13-E)

Requested Deviation

The licensee requested approval for deviations from Section III.G.2.(a) in these areas to the extent that it requires that redundant shutdown divisions be separated by complete 3-hour-fire-rated barriers.

Discussion

- Fire Area 3-H-1

  The centrifugal charging pump room is bounded by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

  (1) an open doorway with security gate and two sets of 1½-hour-fire doors with monorail cutouts in the perimeter walls

  (2) four duct penetrations without fire dampers in the perimeter walls and floor

  These openings are in walls and floor that form the perimeter of adjoining plant locations that the licensee has designated as separate fire areas.

  Safe shutdown equipment located in this area consists of centrifugal charging pumps 1-1 and 1-2, their auxiliary lube oil pumps, and circuits listed in Table 3-4 of the licensee's Appendix R report.

  The in situ fire loading in the area is approximately 6980 Btu/ft^2 with an equivalent severity of 5.2 minutes on the ASTM E-119 time-temperature curve. The fire load consists primarily of oil and grease evenly distributed over the entire 1000-square-foot area.

  Existing fire protection includes an automatic wet-pipe sprinkler system over the charging pumps, an area-wide smoke detection system, manual hose stations, and portable fire extinguishers.

- Fire Area 3-H-2

  The reciprocating charging pump room is bounded by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

  (1) an open doorway with security gate in the perimeter wall

  (2) four duct penetrations without fire dampers in the perimeter walls, floor, and ceiling.

  These openings are in fire barriers that form the perimeter of adjoining plant locations that the licensee has designated as separate fire areas.

Safe shutdown equipment located in this area consists of reciprocating charging pump 1-3 and circuits listed in Table 3-4 of the licensee's Appendix R report.

The in situ fire loading in the area is approximately 28,100 Btu/ft^2 with an equivalent severity of 21 minutes on the ASTM E-119 time-temperature curve. The fire load consists primarily of oil and grease evenly distributed over the entire 235-square-foot area.

Existing fire protection includes an automatic wet-pipe sprinkler system over the charging pump, an area-wide smoke detection system, manual hose stations, and portable fire extinguishers.

- Fire Area 3-Q-1

The turbine-driven auxiliary feed pump room is enclosed by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

(1) two 1½-hour-fire-rated doors in the perimeter walls

(2) an unrated concrete shielding wall separating this area from an adjoining plant area

(3) two duct penetrations without fire dampers and one duct penetration with a 1½-hour-fire damper in the perimeter walls and ceiling

Safe shutdown equipment located in this area consists of auxiliary feedwater pump 1-1 and circuits listed in Table 3-4 of the licensee's Appendix R report.

The in situ fire loading in the area is approximately 10,700 Btu/ft^2 with an equivalent severity of 8.0 minutes on the ASTM E-119 time-temperature curve. The fire load consists primarily of cable, oil, and grease evenly distributed over the entire 700-square-foot area.

Existing fire protection consists of area-wide automatic fire detection and suppression systems, manual hose stations, and portable fire extinguishers.

- Fire Area 13-E

The ventilation fan room is located at the north end of the turbine building at elevations 107 and 119 feet. The area is bounded by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

(1) unrated steel hatches covering personnel and equipment openings

(2) 1½-hour-fire rated doors and dampers protecting doorways and dust penetrations

(3) open louvers in the exterior walls

(4) duct penetrations without fire dampers in walls common with other fire areas

(5) an unsealed diesel exhaust stack communicating with a vertically adjoining fire area

This area contains no shutdown-related systems, but the area communicates with other areas that contain redundant divisions through ventilation ducts without fire dampers and through hatches that are not fire rated.

The in situ fire load within this area is approximately 754 Btu/ft^2 with an equivalent fire severity of 0.6 minute on the ASTM E-119 time-temperature curve. The fire load consists primarily of grease, filters, cable, and fan belts.

Existing fire protection includes an automatic smoke detection system and a wet-pipe sprinkler system, manual hose stations, and portable fire extinguishers.

The licensee justified the deviations in these areas on the bases of the low fire load, the spatial separation between redundant shutdown divisions, and the existing fire protection.

Evaluation

The technical requirements of Section III.G.2.(a) are not met in these areas because of the unprotected penetrations in the 3-hour-fire-rated perimeter walls, floor, and ceiling. The staff was concerned that because of the unprotected openings in the perimeter walls, floors, and ceilings of these areas, a fire could spread beyond their boundaries and affect both shutdown divisions of cable and components.

However, the fire hazards in these areas are not significant. Because of the limited quantity and dispersed location of combustible materials, any postulated exposure fire would tend to propagate slowly and with initially low heat generation. With the automatic fire detection systems, the staff expects that a fire would be discovered in its early sages before serious damage occurs. If a fire should generate high air temperatures, the automatic fire suppression systems would activate to suppress it and to protect exposed shutdown systems. Between the times the fire is detected and when it is extinguished as a result of intervention of the fire brigade or the activation of the fire suppression system, the existing passive protection (which consists of the partial fire walls and spatial separation) will provide reasonable assurance that one shutdown division will remain free of fire damage.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection provides an acceptable level of fire safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for deviations in the reciprocal and centrifugal charging pump rooms, the turbine-driven auxiliary feed pump room, and the 4.16-kV switchgear ventilation fan room (fire areas 3-H-1, 3-H-2, 3-Q-1, and 13-E) is approved.

9.6.1.4 Penetration Area (Fire Area 3-BB)

Requested Deviation

The licensee requested approval for a deviation from Section III.G.2 in this area to the extent that it requires the separation of redundant shutdown divisions by 20 feet, free of intervening combustibles, and the installation of area-wide fire detection and suppression systems.

Discussion

Fire area 3-BB consists of three levels that comprise the area between the containment structure and the auxiliary building from elevation 85 feet to elevation 115 feet. This fire area is bounded on the north by the containment building wall, which is separated by an 8-inch seismic and vent gap at each floor level. It is separated from the auxiliary building to the south and the fuel handling building to the east by concrete 3-hour-fire-rated walls with 1½-hour-rated doors. This fire area is separated from the turbine building to the west by a 3-hour-fire-rated barrier. The floor and ceiling of this area are 3-hour-fire-rated barriers. The floors separating the three levels are concrete slabs with numerous unsealed penetrations.

Exceptions to the 3-hour-fire-rated barriers in this area are as follows:

(1) 1½-hour-fire-rated doors in perimeter wall doorway openings at elevations 85 feet, 104 feet, and 115 feet

(2) ventilation louvers without fire dampers in the northwest external wall at all three elevations

(3) unsealed pipe penetrations in the south ceiling at elevation 140 feet

(4) duct penetrations without fire dampers in perimeter walls at elevation 85 feet

These openings are in walls and ceiling that form the perimeter of adjoining plant locations that the licensee has designated as separate fire areas.

Safe shutdown equipment located in the area includes piping and valves associated with the auxiliary feedwater system, RHR system, charging and boration system, component cooling water system, and main steam system, as well as shutdown-related circuits listed in Table 3-4 of the licensee's Appendix R report.

The fire loads in the area, by elevation, are given below; they consists primarily of cable, grease, rubber, and hydrogen.

Elevation, ft	Combustible Btu/ft^2	Equivalent fire severity, min.
85	negligible	negligible
100	9900	7.4
115	9900	7.4

Existing fire protection includes a partial smoke detection system that covers the post-loss-of-coolant-accident (LOCA) sampling room at elevation 85 feet and approximately 75% and 60% of the floor area at elevations 100 feet and 115 feet, respectively. Additional protection consists of an automatic, wet-pipe sprinkler system that provides area-wide coverage at elevations 100 and 115 feet, manual hose stations, and portable fire extinguishers.

By letter dated September 23, 1983, the licensee committed to provide 1-hour fire-rated barriers for three embedded pullbox covers located in the ceiling at elevation 100 feet to protect steam generator 1-3 and 1-4 pressure instrumentation circuits, pressurizer level and reactor coolant pressure instrumentation circuits, and steam generator 1-3 and 1-4 level instrumentation circuits. The licensee also committed (1) to install additional smoke detectors at elevation 115 feet to provide an early fire-warning capability throughout the area where shutdown-related instrumentation is located and (2) to provide a 1-hour fire-rated barrier for one train of reactor coolant pressure instrumentation where the provision for 20 feet of separation without intervening combustibles is not met.

The licensee justifies the deviations on the bases of the low fire load, the proposed and existing fire protection, the fire stopping installed in cable trays, the enclosure of shutdown-related cabling in steel conduit, and the degree of spatial separation and/or noncombustible barriers between redundant shutdown divisions.

Evaluation

The technical requirements of Section III.G.2 are not met in this area because of

(1) the absence of a fire detection and a fire suppression system throughout elevation 85 feet

(2) the partial smoke detection systems at elevations 100 feet and 115 feet

(3) the lack of 20 feet of separation distance free of intervening combustibles between redundant trains of reactor coolant temperature instrumentation and steam generator 1-3 and 1-4 pressure transmitter instrumentation at elevation 115 feet

(4) the absence of 3-hour-fire-rated doors and dampers to protect the openings in the 3-hour-fire-rated perimeter walls and ceiling

The staff had two concerns about the level of fire protection in this area as follows:

(1) A fire on any elevation might damage redundant shutdown systems. However, the amount of combustible material on all three levels is limited and widely dispersed. Consequently, the staff does not expect a fire to propagate quickly or to produce significant levels of smoke or heat. The partial smoke detection systems in the area would activate after some time delay and would alert the plant fire brigade.

If an unexpectedly severe fire occurred on elevation 85 feet and damaged reactor coolant pressure instrumentation circuits, a redundant circuit is available at elevation 100 feet. Therefore, the absence of area-wide smoke detection and fire suppression systems on this level would not prevent the ability to achieve and maintain safe shutdown.

If such a fire occurred on elevation 100 feet or 115 feet, the automatic sprinkler system would activate to protect redundant shutdown-related systems and to suppress the fire. Until the sprinkler system activated or the fire brigade arrived, the passive protection available to redundant systems, which includes spatial separation and/or 1-hour fire barriers, would provide reasonable assurance that one shutdown division would remain free of fire damage.

(2) The damaging effects of a fire might spread beyond the perimeter walls into adjoining plant locations. However, because of the limited fire load and the existing smoke detection and sprinkler systems on elevations 100 and 115 feet, the staff expect the smoke and heat from a fire to be largely confined within the perimeter of this area. Because all openings in the perimeter walls have not been protected, some smoke would be expected to infiltrate into adjoining plant locations. But this smoke would be diffused and cooled so it would not pose a significant threat to the adjoining areas, other than to reduce visibility to some limited extent.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection, along with the proposed modifications, provides an acceptable level of fire safety equivalent to that provided by Section III.G.2. Therefore, the licensee's request for a deviation in the penetration area (fire area 3.BB) is approved.

9.6.1.5 Chemical Laboratory and Offices (Fire Area 4-A)

Requested Deviation

The licensee requested approval for deviations from Section III.G.2(c) to the extent that it requires one shutdown division to be protected by a 1-hour-fire-rated barrier and requires the installation of area-wide automatic fire detection and fire suppression systems.

Discussion

The floor and ceiling of the chemical lab and offices are 3-hour-fire rated. The perimeter walls are 2-hour-fire rated with the following exceptions:

(1) 1½-hour-rated fire doors in the south and west perimeter walls

(2) duct penetrations without fire dampers and penetrations with 1½-hour-fire dampers in the perimeter walls

Within this area, at elevation 93 feet, there is a continuous-membrane dropped ceiling consisting of a vermiculite plaster on metal lath with acoustical

ceiling tiles attached to the underside. The fire area walls, the continuous-membrane ceiling, and the floor form an envelope to separate this area from safe shutdown circuitry routed in conduit above the dropped ceiling. All ventilation duct register penetrations in the dropped ceiling have been provided with 1½-hour-fire dampers. All access hatches in the dropped ceiling but one are 1½-hour-fire rated.

The area above the dropped ceiling contains redundant shutdown circuits for the following systems:

- auxiliary feedwater
- auxiliary saltwater
- charging and boration
- component cooling water
- emergency power
- residual heat removal
- ventilation equipment

These circuits are listed in Table 3-4 of the Appendix R report.

The fire loading in the chemical laboratory is approximately 4800 Btu/ft^2 with an equivalent severity of 3.7 minutes on the ASTM E-119 time-temperature curve. This load includes flammable liquids and gases, clothing, and ordinary Class A combustibles evenly distributed throughout the laboratory.

The fire load in the store room is approximately 49,400 Btu/ft^2 with an equivalent severity of 37 minutes. This load is primarily flammable liquids, most of which are stored in an approved flammable-liquids storage locker. The remainder of this load includes flammable gases, clothing, and ordinary Class A combustibles evenly distributed throughout the room.

The fire load in the F bus compartment is approximately 5160 Btu/ft^2 with an equivalent severity of 4 minutes. This load is primarily cabling in trays.

In the remainder of this area, the fire load is approximately 7600 Btu/ft^2 with an equivalent severity of 5.7 minutes.

Existing fire protection includes a partial smoke detection system located below the drop ceiling in the laboratory and balance rooms; an automatic, wet-pipe sprinkler system throughout the area below the ceiling; manual hose stations; and portable fire extinguishers.

In the July 15, 1983 Appendix R report, the licensee committed to install a complete smoke detection system above the dropped ceiling in the fire area.

The licensee justifies the deviation on the bases of the negligible fire loading above the ceiling, the enclosure of all safe shutdown cabling in steel conduit, and the existing and proposed fire protection.

Evaluation

The technical requirements of Section III.G.2 are not met in this area because of the absence of an automatic fire suppression system above the dropped ceiling, the lack of an area-wide fire detection system below the ceiling, and the

insufficient physical separation between redundant shutdown divisions. Also, the perimeter walls of the fire area are not 3-hour rated.

The staff has two concerns in this area. The first is that a fire in the room, below the ceiling, would damage cables above the ceiling. The second is that a fire that originates above the ceiling would damage cables from redundant divisions.

If a fire should occur within the chemical laboratory and ancillary areas, the staff would expect the smoke detection system to detect it in its initial stages. This would result in early fire suppresssion by the plant fire brigade before serious damage occurs. Although the smoke detection system does not cover the entire fire area, the rooms that are unprotected are a small fraction of the total floor area. The distance from any location within the fire area to a detector is slight. Thus, if a fire were to occur within an unprotected room, a detector in an adjoining room would activate after a short delay.

If the fire propagates rapidly and room temperatures rise, the automatic sprinkler system will activate automatically to suppress the fire and limit damage. During the time between the start of a fire and the arrival of the fire brigade or the activation of the sprinkler system, the membrane ceiling will provide sufficient passive protection to prevent cables above the ceiling from sustaining damage.

There is no significant quantity of ignitable materials above the ceiling because all cables are enclosed in conduit.

Therefore, if a fire should occur, it would be of limited magnitude and duration and would not produce elevated temperatures that would pose a threat to the shutdown-related cables. Because of the smoke detection system that the licensee has committed to install throughout the concealed ceiling area, a fire would be detected quickly and supressed manually before serious damage would occur. Until a fire were extinguished, the passive protection provided to the cables by the conduit, the heat dissipated by the ventilating air flow through the ceiling, and the separation between cables of redundant divisions (which varies depending on the location in the ceiling) would provide reasonable assurance that one division would remain free of fire damage.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection, along with the proposed modifications, provides an acceptable level of fire safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for a deviation in the chemical laboratory and offices (fire area 4-A) is approved.

9.6.1.6 G Bus Compartment (Fire Area 4-A-1)
H Bus Compartment (Fire Area 4-A-2)

Requested Deviation

The licensee requested approval for deviations from Section III.G.2(a) in these areas to the extent that it requires that redundant shutdown divisions be separated by complete 3-hour-fire-rated barriers.

Discussion

- Fire Area 4-A-1

The G bus compartment is bounded by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

(1) 2-hour-fire-rated south perimeter wall

(2) a 1½-hour-fire door in a doorway in the south wall

(3) two duct penetrations without fire dampers in the perimeter walls

The openings are in walls that form the perimeter of adjoining plant locations that the licensee has designated as separate fire areas.

The area contains cable in conduit for various G bus safe shutdown components and equipment, which are listed in Table 3-4 of the Appendix R report.

The fire load is negligible and consists of cable insulation within conduit.

Existing fire protection includes manual hose stations and portable fire extinguishers. In the July 15, 1983 Appendix R report, the licensee committed to install a complete fire detection system in the area.

- Fire Area 4-A-2

The H bus compartment is bounded by walls, floor, and ceiling of 3-hour fire rated construction with the following exceptions:

(1) 2-hour-fire-rated south perimeter wall

(2) a 1½-hour-fire door in the south wall

(3) two duct penetrations without fire dampers in the perimeter walls

These openings are in walls that form the perimeter of adjoining plant fire areas.

The area contains cable in conduit for various H bus safe shutdown components and equipment listed in Table 3-4 of the Appendix R report.

The fire loading in this area is approximately 6800 Btu/ft^2 with an equivalent fire severity of 5.1 minutes on the ASTM E-119 time-temperature curve. The fire load is comprised of electric cable insulation in cable trays.

Existing fire protection includes manual hose stations and portable fire extinghuishers. As with the G bus compartment, the licensee has committed to install a complete fire detection system.

The licensee justifies the deviations in these areas on the bases of the low fire loading, the enclosure of safe shutdown cables in steel conduit, the spatial separation between redundant shutdown divisions, and the existing and proposed fire protection.

Evaluation

The technical requirements of Section III.G.2.(a) are not met in these areas because of the 2-hour-fire rating of the south perimeter wall, the 1½-hour-rated fire doors, and the unprotected duct penetrations in the perimeter walls.

The staff was concerned that a fire that might originate in either bus compartment might damage cables of the redundant division. However, the ignitable material in these areas is negligible and because of the limited size and restricted access, it is not credible to postulate a significant number of transients. Any fire would be expected to be of limited magnitude and extent. The effects of a postulated fire would, to a great extent, be confined within the area of origin by the fire-rated walls and door. Because of the lack of a fire damper in the duct penetrations of the perimeter walls, a limited amount of smoke and hot gases may enter adjoining areas. But the products of combustion would be cooled and dissipated as they expand into these areas. These areas are equipped with automatic smoke detection and fire suppression systems that should limit damage.

The bus compartments will be equipped with smoke detectors; thus, any postulated fire would be detected early and suppressed by the plant fire brigade. Until the fire brigade arrives, the passive protection (which includes the steel conduits, fire-rated perimeter construction, spatial separation, and the fire suppression systems in adjoining plant locations) would provide reasonable assurance that only cables from one shutdown division would be damaged.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection, with proposed modifications, will provide an acceptable level of fire safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for deviations in the G and H bus compartments (fire areas 4-A-1 and 4-A-2) is approved.

9.6.1.7 Showers, Lockers, and Access Control (Fire Area 4-B)

Requested Deviation

The licensee requested approval for a deviation from Section III.G.2(c) to the extent that it requires the installation of an area-wide automatic fire detection system where one shutdown division is enclosed in a 1-hour-fire barrier and the area is protected by an automatic fire suppression system.

Discussion

Fire area 4-B is the radiological control access area for Units 1 and 2. This area contains personnel showers, lockers, restrooms, offices, and storage

areas. It is bounded by walls, floor, and ceiling with a 3-hour-fire rating with the following exceptions:

(1) a 2-hour-rated north wall separating this area from the chemical laboratory, with 1½-hour-rated fire doors and 1½-hour-rated fire dampers in all but four of the duct penetrations

(2) an unrated door providing access to stairway S-2 and a 1½-hour-fire-rated door providing access to stairway S-1.

(3) several equipment hatches and ceiling penetrations with unrated steel covers

(4) ventilation ducts without fire dampers penetrating the south wall of this area into the Unit 2 containment penetration area

Safe shutdown systems located in the area consist of cables associated with the following systems:

- auxiliary feedwater
- auxiliary saltwater
- component cooling water
- emergency power
- ventilation equipment

The fire loading within this area is approximately 4590 Btu/ft^2 with an equivalent fire severity of 3.4 minutes on the ASTM E-119 time-temperature curve. The combustible load consists primarily of wood counters, electric cable insulation, and anti-contamination clothing and respirators.

Existing fire protection includes an area-wide automatic sprinkler system, manual hose stations, and portable fire extinguishers.

In the July 15, 1983 Appendix R report, the licensee committed to separate redundant diesel generator and fuel transfer pump circuits by a complete 1-hour-fire barrier.

The licensee justified the deviation on the basis of the low fire load, the existing and proposed protection, and the ability to be able to maintain a safe shutdown capability after a fire.

Evaluation

The technical requirements of Section III.G.2(c) are not met in this area because of the lack of an area-wide fire detection system and insufficient physical separation between redundant circuits of the component cooling water (CCW) and auxiliary saltwater (ASW) systems. In addition, the perimeter walls and ceiling are not completely 3-hour-fire rated.

The staff has two concerns in this area. The first is that a fire within the area would damage redundant circuits of the CCW and ASW systems. The second is that a fire might propagate beyond the perimeter of the area.

If a fire should occur, the automatic sprinkler system would be expected to activate and suppress the fire, while protecting vulnerable shutdown systems. When the system activated, a waterflow alarm would be annunciated in the control room that would summon the fire brigade. If the suppression system did not activate or if the fire brigade did not arrive in time to prevent damage to both trains of the ASW system, the system valves can be manually activated outside the fire area. Because one of the CCW system valves is normally open and because fire damage will cause the valves to fail as is, the CCW flow path will be maintained.

The fire load in this area is low. Consequently, the staff does not expect any postulated fire to generate excessive quantities of smoke and hot gases. If it should, the sprinkler system would activate to reduce temperatures and limit damage. The perimeter construction described above provides reasonable assurance that most of the effects of a fire would be confined to the area of origin. Because of the lack of fire dampers in some duct penetrations of the fire walls, a quantity of smoke and hot gases may filter into an adjoining area (fire area 4-A). But the products of combustion would be cooled and dissipated as they expand into this area. Therefore, shutdown systems would not likely be threatened. In addition, fire area 4-A is equipped with automatic smoke detection systems above and below the ceiling, which would provide early fire warning and an automatic sprinkler system. Also, the ceiling registers from the ventilation system in fire area 4-A have been provided with fire dampers. Therefore, if hot gases from a fire in the area were to propagate through the duct system, the fire dampers in the ceiling would close to limit damage below the ceiling.

Conclusion

Based on its evaluation, the staff concludes that the exisitng fire protection with proposed modifications will provide an acceptable level of fire safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for a deviation in the showers, lockers and access control area (fire area 4-B) is approved.

9.6.1.8 Hot Shutdown Panel and Nonvital Switchgear Room (Fire Area 5-A-4) Control Room Complex (Fire Area CR-1)

Requested Deviation

The licensee requested approval for a deviation from Section III.G.3 in these areas to the extent that it requires the installation of an area-wide automatic fire suppression system in an area for which an alternate shutdown capability has been provided.

Discussion

- Fire Area 5-A-4

  The hot shutdown panel and nonvital switchgear room is bounded by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

(1) equipment access openings with unrated steel hatches in the floor and ceiling

(2) a ventilation register without a fire damper in a common wall with stairway S-1

(3) 3-hour-fire-rated doors with filled metal panels in the perimeter walls

(4) ventilation ducts without fire dampers or with 1½-hour-rated dampers penetrating the perimeter walls and ceiling

Safe shutdown systems in the area consist of the hot shutdown panel and cables listed in Table 3-4 of the Appendix R report.

The fire loading in the area is approximately 25,167 Btu/ft^2 or an equivalent severity of 19 minutes on the ASTM E-119 time-temperature curve. The fire load consists primarily of cable in raceways evenly distributed over the entire 2702-square-foot area.

Existing fire protection includes an area-wide smoke detection system, manual hose stations, and portable fire extinguishers.

Fire Area CR-1

The control room complex is bounded by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

(1) 3/4-hour- and 1½-hour-fire-rated doors in the perimeter walls

(2) open louvers and penetrations in the exterior perimeter walls and ceiling

Safe shutdown systems in the area consist of the controls and instrumentation for all safety systems from both divisions located in the control boards and consoles. Shutdown-related circuits are listed in Table 3-4 of the Appendix R Report.

Fire area CR-1 has an approximate floor area of about 7450 square feet. The fire load is approximately 29,420 Btu/ft^2, with an equivalent fire severity of 22 minutes on the ASTM E-119 time-temperature curve. The fire load is comprised primarily of electric cable insulation, paper in books, computer printouts, prints, etc. and combustible vinyl ceiling lighting diffusers.

Existing fire protection includes an area-wide smoke detection system, manual hose stations, and portable fire extinguishers. In addition, an automatic wet-pipe sprinkler system is located in both control room ventilation equipment rooms and over the records storage area in the office.

The licensee justified the deviations on the bases of the availability of an alternate shutdown capability that is independent of these two fire areas and the existing fire protection.

Evaluation

The technical requirements of Section III.G.3 are not met in these areas because of the absence of area-wide fixed fire suppression systems.

The fire hazard in these areas is low. Because of the dispersion of the combustible materials that may ignite, a potential fire would tend to develop slowly. Because of the smoke detection systems and the continuous manning in the control room, a fire would be detected in its initial stages and extinguished before serious damaged occurred.

If serious damage should occur before the arrival of the plant fire brigade, an alternate shutdown capability exists that is independent of each of the rooms. Therefore, safe shutdown could be achieved and maintained.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection provides an acceptable level of safety equivalent to that achieved by compliance with Section III.G.2 and, therefore, the licensee's request for deviations in the control room and hot shutdown panel and switchgear room (fire areas CR-1 and 5-A-4) is approved.

9.6.1.9 Electrical Area West of the Battery Room (Fire Area 6-A-5)

Requested Deviation

The licensee requested approval for a deviation from Section III.G.2 to the extent that it requires that redundant shutdown divisions be separated by complete 3-hour-fire-rated barriers.

Discussion

This area is located in the northwest corner of the auxiliary building at elevation 115 feet. The perimeter walls, floor, and ceiling are 3-hour-rated fire barriers with the following exceptions:

(1) equipment access openings with unrated 1-inch-thick steel hatches in the floor and ceiling in the northwest corner of this area

(2) several ventilation duct penetrations without fire dampers in the perimeter walls and floor. (The ducting within the area and its supports are coated with a 1-hour-fire-rated material.)

These penetrations are in walls that form the boundaries of adjacent fire areas.

Safe shutdown systems in this room are listed in Table 3-4 of the licensee's Appendix R report.

The fire loading within this area is 11,960 Btu/ft^2, or an equivalent fire severity of 9 minutes on the ASTM E-119 time-temperature curve. The fire load consists of electrical cable insulation and small amounts of lubricating oil.

Existing fire protection includes an area-wide smoke detection system, manual hose stations, and portable fire extinguishers.

The licensee justified the exemptions on the bases of the low fire loading, the existing fire protection, and the ability of the steel hatches to limit fire spread.

Evaluation

The technical requirements of Section III.G.2 are not met in this area because of the unprotected penetrations of the perimeter walls and floor and the unrated steel hatches at equipment access openings.

The staff was concerned that a fire might propagate beyond the area boundaries and affect redundant shutdown systems in adjoining plant locations. However, the amount of ignitable materials is limited and widely dispersed. Thus, a fire would not be expected to be of significant magnitude or duration. Because of the smoke detection system, which covers the entire area, a fire would be detected in its initial stages before serious damage occurs. Although the perimeter construction of this room is not completely 3-hour-fire rated, it is substantial enough to confine most of the effects of a fire within the area of fire origin. Because systems of only one shutdown division are located within the room, only one train would be damaged and, therefore, shutdown capability outside of the damaged area would remain.

Because of the lack of fire dampers in the ventilation duct penetrations of the walls, some quantity of smoke and hot gases might flow out of the room through the ventilation system. However, the products of combustion would not pose a threat to shutdown systems in other fire areas because of (1) the limited amount of combustibles, (2) the 1-hour-fire-rated enclosure of the ducts in the room, and (3) early fire detection and early response by the fire brigade. In addition, compensating fire protection is available in adjoining locations to mitigate the hazard posed by damage to the ventilation duct system. This protection includes a sprinkler system (fire area TB-7), enclosure of ducts in a 1-hour-fire-rated barrier (fire area 5-A-4), and fire dampers in the ceiling registers (fire areas 6-A-1 to 6-A-3).

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection will provide an acceptable level of safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for a deviation in the electrical area west of the battery room (fire area 6-A-5) is approved.

9.6.1.10 Corridor Outside the Diesel Generator Room (Fire Area 11-D)

Requested Deviation

The licensee requested approval for a deviation from Section III.G.2.(c) to the extent that it requires the installation of a complete area-wide fire detection system.

Discussion

The corridor is bounded by walls, floor, and ceiling of 3-hour-fire-rated construction with the following exceptions:

(1) an unrated steel hatch and metal door in the perimeter wall

(2) a duct penetration without fire damper in the ceiling

Safe shutdown systems in the corridor consist of cables, in conduit, that are listed in Table 3-4 of the Appendix R report. The cables include vital bus circuitry for all three diesel generators and both diesel fuel transfer pumps. In addition, the diesel generator emergency stop switches are located in this area.

The only fire hazard in the corridor would be transient combustible material consisting of lube oil, solvent, and rags. The fire load equals 16,050 Btu/ft^2 with an equivalent severity of 12 minutes on the ASTM E-119 time-temperature curve.

Existing fire protection includes an area-wide automatic sprinkler system, manual hose stations, and portable fire extinguishers.

In the July 15, 1983 Appendix R report, the licensee committed to enclose each of the circuits for the diesel generators in a 2-hour-fire-rated barrier. A 2-hour barrier already encloses the circuits for the fuel transfer pump. In addition, the licensee committed to enclose the emergency stop push-button switches for two diesel generators in a 1-hour barrier to prevent a short circuit across the push-button contact from prematurely tripping the diesel. The licensee also committed to install isolators for diesel generator indication circuitry to prevent a short circuit there from tripping the diesel generators.

The licensee justified the deviations on the bases of the low fire loading, the existing fire protection, and the proposed modifications.

Evaluation

The technical requirements of Section III.G.2 are not met in the corridor because of the absence of an area-wide fire detection system. In addition, the perimeter construction is not completely 3-hour-fire rated.

The staff was concerned that because of the absence of a smoke detection system, a fire could damage redundant shutdown systems or propagate beyond the boundaries of the fire area. However, if a fire should occur, the automatic sprinkler system would be expected to operate and extinguish the fire as well as

protect the vulnerable systems. When the sprinkler system activated, a water-flow alarm would annunciate in the control room and summon the plant fire brigade. Until the brigade arrived, the circuits for the diesel generators and fuel transfer pumps would be protected by the fire barriers.

Because of the limited amount of combustibles in the corridor and the protection provided by the sprinkler system, even if the perimeter construction were not completely 3-hour-fire rated, it would be sufficient to confine the effects of a fire to the area of origin. Any smoke or hot gases that filter out of the area through the ventilation ducts would be dissipated and cooled so they would not pose a threat to shutdown-related systems in adjoining fire areas.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection plus proposed modifications will provide an acceptable level of fire safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for a deviation in the corridor (fire area 11-D) is approved.

9.6.1.11 Component Cooling Water Heat Exchanger Room (Fire Area 14-E)

Requested Deviation

The licensee requested approval for a deviation from Section III.G.2(c) to the extent that it requires that one train of redundant shutdown equipment be completely enclosed in a 1-hour-fire-rated barrier.

Discussion

This room is in the southeast corner of the Unit 1 turbine building at elevation 85 feet. It is bounded by construction that has a 3-hour-fire-resistance rating with all penetrations protected.

The equipment in this zone includes the two component cooling water (CCW) heat exchangers and the three motor-operated and two air-operated valves associated with the CCW system and auxiliary saltwater system for safe shutdown. In addition, cables associated with the auxiliary saltwater system, CCW system, and diesel generator tachometer indication are located within the area.

A reinforced-concrete missile shield separates the redundant heat exchangers, and extends approximately 2.5 feet beyond the ends of the heat exchangers.

The fire loading in the room is approximately 16,000 Btu/ft^2 with an equivalent fire severity of 12 minutes. The fire load is primarily cables in trays evenly distributed over an area of approximately 1700 square feet.

Existing fire protection includes a smoke detection system and an automatic sprinkler system that provide complete, area-wide coverage. Manual fire fighting equipment includes portable extinguishers and fire hose stations.

In the Appendix R report, the licensee committed to isolate the diesel generator tachometer circuits to prevent the possibility of diesel generator trip.

The licensee justified the deviation on the bases of the low fire loading, existing fire protection, proposed modifications, and the ability to maintain or manually restore flow paths for the component cooling water and auxiliary saltwater system after a fire.

Evaluation

The technical requirements of Section III.G.2 are not met in this area because a complete 1-hour fire barrier has not been provided around one shutdown division. The diesel generator 1-2 and 1-3 tachometer indication circuits are run in conduit within 5 feet of each other. Two auxiliary saltwater valves and the associated conduits are located less than 10 feet apart. Two CCW water motor-operated valves and the associated conduits are located less than 20 feet apart, and the CCW heat exchangers are less than 5 feet apart.

The fire load is low. Combustible materials that could ignite are widely scattered. This provides reasonable assurance that if a fire should occur, it would propagate slowly, with initially low heat generation. Because of a smoke detection system, a fire would be detected and extinguished in its initial stages before serious damage occurred. If a fire were to propagate rapidly and room temperature rise, the automatic sprinkler system would activate, both to suppress the fire and to protect the vulnerable shutdown systems. Until the suppression system would activate or the fire brigade arrive, the concrete shield wall and the existing spatial separation between redundant divisions would provide a degree of passive protection sufficient to keep one division free of damage. If the fire should result in damage to the valve circuits to the CCW motor-operated valves, the valves will fail as is. Because one is normally open and the other normally closed, and because flow through only one CCW heat exchanger is required, safe shutdown capability will be maintained.

If the fire should result in failure of the circuits to the auxiliary saltwater valves, time is available after the fire is extinguished to manually open the valves.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection with the proposed modifications will provide an acceptable level of fire safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for a deviation in the component cooling water heat exchanger room (fire area 14-E) is approved.

9.6.1.12 Auxiliary Saltwater Pumps 1-1 and 1-2 (Fire Areas 30-A-1 and 30-A-2)

Requested Deviation

The licensee requested approval for deviations from Section III.G.2 to the extent that it requires that redundant shutdown divisions be separated by complete 3-hour-fire-rated barriers.

Discussion

Fire area 30-A-1 houses auxiliary saltwater pump 1-1, located in the intake structure. (The area description and exemption request for fire area 30-A-1 are identical to those for fire area 30-A-2, which houses the redundant auxiliary saltwater pump 1-2. Conditions described in this section apply to both fire areas.)

The area is bounded by 3-hour-fire barriers, including a common wall to fire area 30-A-2, and has an unrated-steel watertight door facing southwest to an adjoining fire area. This door is equipped with a security alarm in the control room to ensure the door is kept closed. The ceiling of this area is penetrated by an open metal ventilation stack to the outside and a 3-hour-rated concrete plug to the outside.

The power supply to the auxiliary saltwater pump and its associated exhaust fan is separated from the redundant train by the 3-hour-rated fire barriers and the watertight doors. Each unit has two auxiliary saltwater pumps, only one of which (per unit) is required for safe shutdown, and the auxiliary saltwater systems can be cross-connected between units.

The in situ fire load in these areas consists primarily of lube oil and a rubber boot on the pump discharge, which equals about 1700 Btu/ft^2 with an equivalent severity of 1.2 minutes on the ASTM E-119 time-temperature curve.

Existing fire protection in each of the rooms includes smoke detectors immediately outside the entrance to these areas, portable fire extinguishers, and manual hose stations.

The licensee justified the deviations on the bases of the low fire loading, the ability of the watertight doors to limit fire spread, and the existing fire protection.

Evaluation

The technical requirements of Section III.G.2 are not met in these areas because the watertight doors are not 3-hour-fire rated.

The staff was concerned that the steel watertight door would not prevent the passage of smoke and heat through the doorway.

The fire load within the pump room and on the intake structure side of the door is negligible. Combustible materials are widely dispersed. Consequently, any postulated fire would not produce a temperature rise of sufficient magnitude to affect the stability of the door. The effects of a fire in the intake structure would also be dissipated throughout the area and would not be concentrated near the doorway.

Because of the smoke detection system, if a fire should occur, it would be detected in its initial stages and suppressed by the fire brigade before significant damage occurred. During the delay between the advent of a fire and when it is extinguished, because of the door's substantial steel construction and watertight nature, the door would be able to confine smoke and hot gases

to one side of the barrier, thus providing reasonable assurance that one shutdown division would remain free of damage.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection will provide an acceptable level of fire safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for deviations for the auxiliary saltwater pump rooms (fire areas 30-A-1 and 30-A-2) is approved.

9.6.1.13 Diesel Fuel Oil Transfer Pump Vaults (Fire Areas 35-A and 35-B)

Requested Deviation

The licensee requested approval for deviations from Section III.G.2 to the extent that it requires that redundant shutdown divisions be separated by complete 3-hour-fire-rated barriers.

Discussion

These areas house diesel fuel oil transfer pumps 0-1 (fire area 35-A) and 0-2 (fire area 35-B), associated fuel oil piping, and power control circuitry. These areas lie under the turbine building seismic buttress support, which houses the condensate polishing system, below elevation 85 feet. Conditions described in this section apply to both fire areas.

Each fire area is bounded by minimum 3-hour-rated barriers with the following exceptions:

(1) a curbed personnel hatch in the ceiling of each area that communicates with the buttress area above. A 3/8-inch-thick locked steel cover protects these openings.

(2) concrete hatches providing restricted access to the areas for equipment removal. Caulked gaps of approximately 1/4 inch in width may exist between the concrete hatch pieces.

(3) each fire area communicating with the associated fuel oil piping trench through an open pipeway (less than 30-square-inch area). The pipe trench associated with pump 0-1 is separated from the pipe trench for pump 0-2 by a 6-inch reinforced-concrete vertical barrier. A single pipe penetration in this barrier is sealed. Each pipe trench is provided with concrete trench covers.

Each area has a floor area of about 110 square feet. The fire loading is approximately 141,370 Btu/ft^2 with an equivalent severity of 106 minutes on the ASTM E-119 time-temperature curve. The fire load is comprised of fuel oil in the pump, piping, strainers, and filter.

Existing fire protection includes manual hose stations and portable fire extinguishers.

The licensee justified the deviations on the bases of the ability of the existing construction to withstand a postulated fire exposure, the potential for early fire detection by personnel in the area or by security cameras, and the existing fire protection.

Evaluation

The technical requirements of Section III.G.2 are not met because the personnel and equipment hatches providing access to the vaults are not 3-hour-fire rated.

Although the fire load within the vaults represents a potentially severe fire exposure if combustible material were ignited, the air supply necessary to support vigorous burning is limited. Consequently, the restricted air supply would act to limit the fire and produce large quantities of smoke as a result of incomplete combustion. The smoke would be detected either by security cameras that survey the area or by operating personnel. During the delay between the start of a fire and when it is extinguished, the reinforced-concrete construction of the vault and trench, along with the steel hatches, would provide sufficient passive fire protection to ensure that one division would be free of fire damage.

Another credible fire scenario would be a flammable liquid spill at elevation 85 feet with ignition. However, because of the curbing around the personnel hatch, the caulking for the equipment hatch pieces, and the 25-foot separation with intervening buttress wall between the hatch covers, under worst-case assumptions a fire of this nature would cause damage to only one shutdown division.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection will provide an acceptable level of safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for a deviation in the diesel fuel oil transfer pump vaults (fire areas 35-A and 35-B) is approved.

9.6.1.14 Auxiliary Building and Fuel Handling Building (Fire Area AB-1)

Requested Deviation

The licensee requested approval for two deviations from Section III.G.2(c) in this fire area to the extent that it requires the installation of complete area-wide automatic fire suppression systems.

Discussion

This area encompasses the main portion of the auxiliary building from elevation 54 to elevation 140 feet and the fuel pool and machine shop areas of the fuel handling building from elevation 99 to elevation 140 feet. For purposes of analyses, the licensee divided the area into numerous zones. However, because the boundaries of these zones contain a significant number of unprotected vents, equipment hatches, manways, ducts, pipeways, electrical raceways, and other diverse openings, the staff considers this portion of the plant as a single fire area.

Within this large area the licensee identified two locations where the technical requirements of Section III.G.2 are not met.

(1) At elevation 75 feet of the auxiliary building, circuitry for diesel generator fuel transfer pumps 0-1 and 0-2 is located in the drain recovery and gas decay tanks area (fire zone 3-C) and the Unit 1 component cooling water pump 1-1 area (fire zone 3-J-1). They are separated by a distance of 15 feet. The conduits containing the circuits for fuel transfer pump 0-1 (zone 3-J-1) are completely enclosed in a 2-hour-fire-rated barrier.

The fire load in zone 3-C consists primarily of oil in pumps and compressors and cable insulation. It equals approximately 2800 Btu/ft^2 with an equivalent severity of 2.3 minutes. The fire loading in fire zone 3-J-1, consisting primarily of oil and cable insulation, is 36,900 Btu/ft^2 with an equivalent severity of 27.7 minutes.

Existing fire protection includes an automatic sprinkler system and a smoke detection system in zone 3-J-1, a smoke detection system on this elevation of zone 3-C, manual fire hose stations, and portable fire extinguishers. The common boundary between these fire zones is open but is provided with a 4-inch curb to prevent oil spillage from communicating zones.

(2) On elevation 75 feet of the auxiliary building, the component cooling water pumps are located in individual cubicles. Each cubicle is bounded by walls that have a 3-hour-fire rating, except that the common walls between cubicles contain unprotected pipe and duct penetrations, and the south perimeter wall is open to fire zone 3-C. A 4-inch curb is provided at this opening to prevent oil spillage from spreading to this zone. The pumps themselves are approximately 5 feet apart, separated by the partial fire wall.

The control circuitry for charging pumps 1-1, 1-2, and 1-3 is routed through fire zones 3-J-2 and 3-J-3. However, the starting circuitry for each pump can be bypassed by individual switches located in the switchgear of fire area TB-4 for charging pump 1-1 and fire area TB-5 for charging pumps 1-2 and 1-3.

The fire loading in each of zones 3-J-1, 3-J-2, and 3-J-3 consists primarily of oil and cable insulation. It equals approximately 11,150 Btu/ft^2 for 3-J-1 and 3-J-2 and 6607 Btu/ft^2 for 3-J-3, with equivalent severities of approximately 8.4 minutes and 5 minutes, respectively, on the ASTM E-119 time-temperature curve. The fire load in adjacent zone 3-C is approximately 2800 Btu/ft^2 with an equivalent severity of approximately 2 minutes.

Each pump cubicle is provided with automatic smoke detection and a wet-pipe sprinkler system. Smoke detection is provided throughout zone 3-C at elevations 64 and 75 feet. Additional protection includes portable fire extinguishers and manual hose stations.

The licensee justified the deviations in these two locations on the basis of the limited fire loading, the likely spread of hot gases up into the ceiling

area away from the vulnerable shutdown systems, the existing passive fire protection including spatial separation and fire barriers, the automatic fire protection systems, and manual fire fighting equipment.

Evaluation

The technical requirements of Section III.G.2 are not met in these locations because of the lack of an area-wide automatic fire suppression system in zone 3-C.

There are two concerns with these areas. The first is that a fire within the fire zones may damage systems from both shutdown divisions. The second is that a fire that originates outside of these areas, in fire zone 3-C, may spread into the fire zones and damage vulnerable shutdown systems.

If a fire were to occur within any of the three zones, the existing smoke detection system would activate during the early stages of a fire and summon the fire brigade. If the room temperature rose significantly, the automatic sprinkler system would activate and suppress the fire while protecting the exposed shutdown systems. Until the fire burned itself out, or was extinguished manually by the fire brigade or automatically by the fire suppression system, enough passive fire protection is available to ensure that one train remained free of damage. This protection includes 15 feet of spatial separation and a 2-hour-fire barrier for the fuel transfer pump circuitry. For the component cooling water pumps and related cabling, the protection consists of the partial fire walls separating the cubicles. If a fire were to occur in either zone 3-J-2 or 3-J-3, where no passive protection exists between CCW circuitry, the licensee has identified an independent means of starting the pumps from another fire area.

If a fire were to occur outside of these cubicles in zone 3-C, smoke and heat resulting from the fire would be dissipated throughout the area, which would act as a heat sink. The smoke detection system would activate and summon the fire brigade, which would extinguish the fire before it would threaten the systems within the cubicles. If a significant temperature rise did occur within the cubicles, the sprinkler system would activate to protect the exposed systems. Therefore, a suppression system in zone 3-C would not enhance the fire protection level, and the staff has reasonable assurance that one shutdown division would remain free of fire damage.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection will provide an acceptable level of fire safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for deviations in the auxiliary building and fuel handling building (fire area AB-1) is approved.

9.6.1.15 Diesel Generator Rooms (Fire Areas TB-1, TB-2, and TB-3)

Requested Deviation

The licensee requested approval for deviations from Section III.G.2(a) in these areas to the extent that it requires that redundant shutdown divisions be separated by complete 3-hour-fire-rated barriers.

Discussion

Fire areas TB-1, TB-2, and TB-3 are separate fire areas containing the emergency diesel generators and their associated air supply and exhaust equipment. Two of the three diesel generators are required for safe shutdown. These fire areas are situated side by side, with fire area TB-2 located between fire area TB-3 to the south and TB-1 to the north.

These areas are located at the northwest corner of the Unit 1 turbine building at elevations 85 and 107 feet. They are divided into two fire zones each to differentiate between the generator rooms and the ventilation intake and exhaust rooms.

The areas are bounded by walls, floors, and ceilings of 3-hour-fire-rated construction with the following exceptions:

(1) unprotected louvers to the outside on the north and west perimeter walls

(2) separation from an adjoining fire area at elevation 107 feet by a 3-hour-fire-rated barrier with unrated metal hatches

(3) an unrated steel hatch and 1-inch-thick sliding steel shield door (normally locked shut) in the perimeter walls of fire area TB-3

The fire loading in each area is approximately 150,800 Btu/ft^2 with an equivalent severity of 113 minutes. The fire loading is comprised primarily of diesel fuel and lubricating oil.

Existing fire protection includes complete automatic fire detection and carbon dioxide fire suppression systems in the diesel generator room, manual hose stations, and portable fire extinguishers. The rooms have a floor drain system and are also provided with curbs at door openings at elevation 85 feet to contain oil spills.

In the July 15, 1983 Appendix R report, the licensee committed to upgrade the sheet metal personnel and equipment hatches at elevation 107 feet to a 1-hour-fire rating.

The licensee justified the deviations on the basis of the existing and proposed fire protection.

Evaluation

The technical requirements of Section III.G.2 are not met in these areas because the perimeter construction is not completely 3-hour-fire rated.

The principal concern is that a fire that originates within any one of these areas would propagate beyond the perimeter walls and damage redundant shutdown systems in other fire areas. However, within the generator rooms themselves, any postulated fire would be detected and extinguished by the automatic carbon dioxide system. Activation of the carbon dioxide system would be annunciated in the control room, which would summon the fire brigade. Until the fire brigade arrived, the walls, floor, and ceiling would confine the damage to the area of origin.

Within the ventilation intake and exhaust rooms, the fire hazard is minimal. Because of the limited amount of combustibles, any postulated fire would be of limited magnitude and extent. Smoke and hot gases would either be vented outside through the louvers in the exterior wall or confined within the area by the fire-rated perimeter construction and the steel hatches and door until the fire brigade arrived.

Conclusion

Based on its evaluation, the staff concludes that the existing fire protection will provide an acceptable level of safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for deviations in the diesel generator room (fire areas TB-1, TB-2, and TB-3) is approved.

9.6.1.16 Fire Doors

Requested Deviation

The licensee requested blanket approval for deviations from Section III.G.2 to the extent that it requires that doors installed in fire-rated barriers that separate redundant shutdown divisions have a fire rating equal to the barrier.

Discussion

Approximately 50% of the Underwriters Laboratory (UL)-listed 3- and 1½-hour-fire-rated doors in the plant have been installed in frames that are not UL listed. In addition, doors of metal construction that are not fire rated have been installed in both UL-listed and unlisted frames in several areas. Also, unlisted metal panels, installed in conjunction with doors, have been provided for protection of large fire area barrier openings needed for equipment access.

By letters dated October 6, 11, and 14, 1983, and May 16, 1984, the licensee committed to the following actions:

(1) Underwriters Laboratories (UL) personnel will inspect the unlisted doors and frames. Representative doors will also be destructively tested to verify that they are equivalent to UL-labeled fire doors.

(2) If upon inspection and testing, certain doors and/or frames do not meet UL specifications for listing, the modifications identified in Options 1 through 4, as listed below, will be implemented.

(3) For unlisted wall panels and transoms, the modifications described below will also be implemented.

Option 1: Additional UL-listed rolling fire doors or double fire door assemblies will be installed to protect or replace the existing doors, panels, and transoms.

Option 2: The existing doors, panels, and transoms will be replaced with an assembly that has been tested by an independent authority and found capable of withstanding a fire exposure consistent with the fire rating of the wall.

Option 3: Directional, closed-head automatic sprinkler protection will be provided on both sides of the doors, dampers, or transoms.

Option 4: Local application automatic sprinkler protection will be provided on one side of the doors or panels where the other side is characterized by negligible fire loading.

Option 5: The licensee will utilize other fire resistive configurations that have been previously evaluated and approved by the staff as satisfying the technical requirements of Section III.G.2 of Appendix R (e.g., oversized fire doors that are manufactured to Underwriter's Laboratories specifications).

Evaluation

With the exception of the use of automatic sprinklers as described in Options 3 and 4, the licensee's proposed course of action will achieve compliance with Section III.G.2 of Appendix R. Consequently, a deviation is not required.

The staff was concerned that a door that had not been tested by an approved laboratory would not be able to maintain its integrity when subjected to elevated temperatures during a fire. The use of sprinklers on both sides of unlisted doors, panels, and transoms is intended to inundate the assembly in a spray of water and, thus, prevent the door from being adversely affected by a fire.

Because of the existing fire detection systems and the availability of plant personnel, the staff expects that a fire would be discovered in its early stages, before significant propagation occurs. The fire brigade would then be summoned. Before the arrival of the brigade, the smoke and heat from a fire would initially be generated upward into the ceiling area and away from the doors themselves.

As the stratified hot gas layer descended over time, the doors, panels, and transoms would begin to feel the effects of the elevated temperatures. At that point, the sprinkler system would be expected to operate to protect the doors, panels, and transoms from further damage, thereby maintaining their integrity. The staff, therefore, finds that the unlisted assemblies, in conjunction with directional automatic sprinkler systems, would provide reasonable assurance that they would withstand the effects of a postulated fire in the plant.

For those doors where sprinklers are installed on only one side, the beneficial effects of the sprinkler protection are as described above. On the unprotected side, the amount of combustible materials is limited and widely dispersed. In addition, these locations are equipped with fire detectors or are constantly attended. If a fire should occur, the staff expects it to be detected early and suppressed manually before temperatures rise to a level that would potentially damage the doors. The staff therefore concludes that these unlabeled doors will prevent fire propagation until the fire is extinguished.

Conclusion

Based on its evaluation, the staff concludes that Options 1, 2, and 5 will achieve compliance with Section III.G.2. Options 3 and 4--the use of directional sprinklers in conjunction with the existing steel doors, panels, and

transoms--will achieve a level of fire safety equivalent to Section III.G.2 of Appendix R. Therefore, the licensee's request for a deviation is approved.

9.6.1.17 Steel Hatches

Requested Deviation

The licensee requested approval for deviations from Section III.G.2 to the extent that it requires that hatches installed in fire-rated barriers that separate redundant shutdown divisions have a fire rating equal to the barrier.

Discussion

One-inch thick steel access hatches are located in the following plant areas:

(1) the ceiling of the showers, lockers, and access control area (fire area 4-B)

(2) the floor and ceiling of the hot shutdown and nonvital switchgear room (fire area 5-A-4)

(3) the floor and ceiling of the electrical area west of the battery room (fire area 6-A-5)

(4) the floor of the cable spreading room (fire area 7-A)

Excluding the cable spreading room, the above areas are described in Sections 8, 9, and 10, respectively, of this report.

The cable spreading room is bounded by walls, floors and ceiling of 3-hour-fire-rated construction with the following exceptions:

(1) the unrated steel hatch in the floor

(2) an unprotected duct penetration and unrated fire doors in the perimeter walls

Safe shutdown systems in the room include cables and components for the following systems:

- auxiliary feedwater
- auxiliary saltwater
- charging and boration
- component cooling water
- emergency power
- safe shutdown instrumentation
- main steam
- reactor coolant
- residual heat removal

The shutdown-related circuits are listed in Table 3-4 of the licensee's Appendix R report.

Existing fire protection includes an area-wide automatic carbon dioxide fire suppression system, a complete smoke detection system, manual hose stations, and portable fire extinguishers.

The licensee justified these deviations on the basis of previous staff approval.

Evaluation

The technical requirements of Section III.G.2 are not met in this instance because the steel hatches have not been tested by an independent authority to withstand anticipated fire exposures as defined by the time-temperature curve of ASTM E-119.

The principal concern with the steel hatches is that they would not be able to limit the spread of fire to the area of origin until it is extinguished either manually or automatically.

The staff has addressed the acceptability of the fire protection in fire areas 4-B, 5-A-4, and 6-A-5, including the hatches, in Sections 8, 9, and 10 of this report. The staff concluded that because of the limited fire load and the existing active fire protection systems, the steel hatches would be able to prevent the passage of products of combustion to adjoining areas until the fire brigade arrived or the fire was extinguished automatically.

In the cable spreading room, the hatch is located in the floor. Because the smoke and hot gases from a fire rise to the ceiling, the staff is not concerned that the floor hatch would be breached and products of combustion penetrate into the area below (fire area 6-A-5). Nevertheless, the cable spreading room is equipped with an automatic fire detection and carbon dioxide fire suppression system. Therefore, there is reasonable assurance that if a fire should occur, it would be detected early and extinguished manually by the fire brigade or automatically by the carbon dioxide system before serious damage occurred.

The staff has evaluated the ability of the floor hatch to prevent damage from a fire below (in fire area 6-A-5) in Section 10 of this report.

Conclusion

Based on its evaluation, the staff concludes that the steel hatches in the following areas will provide an acceptable level of safety equivalent to that provided by Section III.G.2 and, therefore, the licensee's request for deviations in these areas is approved:

(1) showers, lockers, and access control area (fire area 4-B)
(2) electrical area west of the battery room (fire area 6-A-5)
(3) hot shutdown and switchgear room (fire area 5-A-4)
(4) cable spreading room (fire area 7-A)

9.6.1.18 Emergency Lighting

Requested Deviation

The licensee requested approval for a deviation from Section III.J to the extent that it requires that emergency lighting units with at least an 8-hour battery

supply be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

Discussion

Emergency lighting at the plant consists of three independent systems:

(1) emergency ac lighting
(2) emergency dc lighting
(3) emergency self-contained lighting (sealed beam lights with an 8-hour battery supply)

Locations required for safe shutdown that are provided with self-contained lighting units are listed in Section 4.1 of the July 15, 1983 Appendix R report. In addition, the licensee evaluated other areas where credit was taken for manual operation of equipment to achieve safe shutdown. These locations are listed in Section 4.2 of the Appendix R report. They were evaluated for potential loss of the emergency ac lighting system to determine if 8-hour battery pack lights were required or a modification of the emergency ac lighting system were necessary to prevent fire damage.

As a result of that analysis, the licensee committed in Section 4.3 of the Appendix R report to provide additional battery-powered emergency lighting units or modify the ac system (by protecting or rewiring circuits) in the areas that were found to be different.

For the remaining areas the licensee concluded on the basis of its analysis that the existing ac lighting was sufficiently reliable to justify the absence of 8-hour battery powered lighting units.

Evaluation

The staff's evaluation of the licensee's emergency lighting system was based upon the licensee's submittals dated July 15, September 23, and November 4, 1983, and April 17, 1984.

The emergency lighting system at the plant consists of the three independent systems, as listed above.

The emergency ac lighting system is powered from vital buses. Upon loss of normal power supply to the vital buses, the emergency diesel generators will provide power to the vital buses. Thus, the emergency ac lighting system will be continuously energized.

The emergency dc lighting system is energized upon loss of the emergency ac lighting system (station blackout) and is de-energized after a 5-second delay, upon return of power to the emergency ac lighting system. These lights are powered from the nonvital station batteries and will provide sufficient emergency lighting for at least 1 hour.

The emergency self-contained lighting units are located in various areas of the plant where lighting may be required to achieve safe shutdown. This lighting is supplemental to the emergency lighting systems (discussed above) so that

light would be available should damage occur to the emergency lighting circuits serving a particular area. The emergency self-contained lights are energized upon failure of the emergency ac lighting system and subsequently de-energized when the emergency ac lighting system is returned to service. These lighting units are provided in the following areas:

Area	Fire Area/Zone
Control room	CR-1
Fuel storage and preparation area	3-R
Containment escape hatch	1
Battery rooms	6-A-1, 6-A-2, 6-A-3
Cable spreading room	7-A
Hot shutdown panel	5-A-4, elevation 104
Vital switchgear rooms	TB-4, TB-5, TB-6
Auxiliary feedwater pump rooms	3-Q-1, 3-Q-2
Diesel generator rooms	TB-1, TB-2, TB-3
Dedicated shutdown instrument panel	3-BB, elevation 100
480-V vital switchgear rooms	5-A-1, 5-A-2, 5-A-3

The licensee has provided the results of an analysis regarding the effects of fire on the emergency ac lighting system that indicates that in the event of a fire, emergency lighting will be available in the necessary areas. The licensee has stated that to ensure lighting along the entire access and egress routes, emergency ac lighting circuitry affected by the fire will not affect other emergency ac lighting circuits. Where interactions have been identified, modifications will be made to those circuits required for areas of access and egress, or safe shutdown functions.

For the two outdoor plant perimeter access and egress areas, emergency lighting will be provided by another plant lighting system that is independent of the offsite power supply.

Further, the applicant has reviewed the plant emergency lighting (including that portion of the security lighting system where credit is taken in order to satisfy the requirements of Appendix R) to verify that the levels of illumination were sufficient for implementing actions required for operation of safe shutdown equipment and along access routes to such equipment. The guidelines of NFPA 101, Section 5-9, "Emergency Lighting," 1981 were used as the bases for this evaluation.

Two separate field tests were conducted as part of this evaluation. These tests were scheduled at night with simulated loss of light due to loss of off-

site power and fire damaged lighting circuits. On the basis of this initial test, additional lighting was provided or existing lighting units re-aimed and a follow-up walk-through was conducted to ensure the adequacy of these charges. As a result, the level of illumination is now sufficient for any required operations of safe shutdown equipment and to traverse the paths of travel to reach this equipment.

Conclusions

Based on its review, the staff concludes that the use of the proposed emergency lighting systems and the field verification of the adequacy of the lighting provides an acceptable margin of safety equivalent to that provided by the technical requirements of Section III.J. Therefore, the licensee's request for a deviation is approved.

9.6.1.19 Reactor Coolant Pump Oil Collection System

Requested Deviation

The licensee requested approval of a deviation from Section III.O to the extent that it requires that any overflow from oil collection tank(s) be drained to a safe location when the collection system is designed to provide capacity to hold the lube oil inventory of one reactor coolant pump (RCP) with margin.

Discussion

The RCPs are located in two areas within containment fire zone 1-B. The biological shield wall separates zone 1-B into two areas (north and south) above elevation 110 feet. Each RCP is above this elevation, and therefore the biological shield serves as a barrier between the north area in which RCPs 1-1 and 1-2 are located and the south area in which RCPs 1-3 and 1-4 are located. The north and south areas communicate through open areas from approximately elevation 110 feet to the containment floor slab at elevation 91 feet and through open ventilation gratings above each RCP at elevation 140 feet. Each RCP is separated from the others by approximately 45 feet.

The lubricating oil system for the RCP motor consists of two parts, the upper oil pot and the lower oil pot (240 gallons) and oil pan (25 gallons).

The oil collection system consists of a series of collection pans surrounding each pump draining to a lube oil collection tank.

The collection pans surrounding each pump consist of 18 gage sheet metal fastened to the platform grating at elevation 110 feet. All openings through and between the collection pans for conduit, pipes, and other such items are surrounded by drip shields draining to the collection pans. A skirt is installed around the pump motor coupling to direct leaks on the outside of the motor casing to the collection pans below. The oil lift pump and piping are enclosed by a sheet metal shield, and spray from a potential oil lift pump leak would be confined within the shield and the spray oil directed to the collection pans. Leaks internal to the motor casing are diverted to the collection pans below by a gutter inside the coupling area or they are collected above the main pump flange. The main pump flange is surrounded by a 2-inch rim with an overflow drain to the collection pans. All joints are caulked to prevent leakage.

Each collection pan is equipped with a drain pipe connected to a drain line. The drain lines for each pump connect to a 2-inch common header and enter the containment annulus through penetrations in the shield wall. The common header drain line is routed to an oil collection tank located under the fuel transfer canal in the containment annulus at elevation 91 feet.

The RCP oil collection tank has a 300-gallon capacity and is equipped with a valved drain, a 2-inch overflow, and a 2-inch vent. The vent is equipped with a flame arrester. The tank is designed to contain the oil inventory of one RCP motor plus a margin of 35 gallons.

The RCP lube oil collection tank overflow pipe discharges downward to a recessed trench in the floor at elevation 91 feet, along the outside of the shield wall. This trench is sloped so that overflow of lube oil from an RCP pump would be to the containment drain sump. The overflow pipe will be designed and installed to withstand the safe shutdown earthquake and provide reasonable assurance that overflowing lube oil will be directed into the trench and not be dispersed through the area.

A wet pipe automatic sprinkler system is provided for each RCP. The water flow alarm annunciates in the continuously manned control room.

A smoke detector is provided each RCP and the corresponding steam generator. Additional detectors are provided in the containment annulus in the exhaust air flow path for zone 1-B.

Additional fire protection includes portable fire extinguishers and manual fire hose stations.

The licensee justifies the deviation on the bases of the design of the oil collection system, the existing fire protection, the use of high flashpoint lube oil, the lack of a source of ignition for the oil, and the routing of safe shutdown circuits in conduit.

Evaluation

The technical requirements of Section III.O are not met because the oil holding tanks are not large enough to hold the entire lube oil system inventory for the four RCPs.

In its original evaluation of this system in the SER, the staff expressed concern that an unmitgated fire involving lube oil could damage safety-related equipment in the vicinity. Consequently, the licensee agreed to install an oil collection system to provide a capability for collecting leakage from vulnerable components, and to provide an automatic sprinkler system to spray the areas around the pumps.

The staff was also concerned that if overflowing lube oil ignited, the resulting fire would damage shutdown systems. However, the overflow line discharges into a trench that is sloped to channel any potential oil spill to the containment drain sump. The oil has a flash point of 480°F and would, therefore, represent a significant hazard only if atomized or if the oil came in contact with a high-energy ignition source. Because the oil collection system is presently designed

to withstand the safe shutdown earthquake and because there are no ignition sources in the anticipated flow path of the overflowing oil, the staff does not expect the oil to ignite.

If a fire were to occur at the oil collection tank, the smoke detectors in the area would activate and summon the fire brigade to extinguish the fire with portable fire-fighting equipment. However, although safe shutdown systems could be damaged, the loss of these systems would not impair the ability to achieve and maintain safe shutdown.

Additional modifications to safisfy the requirements of Appendix R would not significantly enhance the level of fire safety.

Conclusion

Based on its evaluation, the staff concludes that the licensee's fire protection configuration will achieve an acceptable level of fire protection equivalent to that provided by Section III.O. Therefore, the licensee's request for a deviation for the RCP oil collection system holding tanks is approved.

9.6.1.20 Summary

Based on its evaluation, the staff finds that the level of fire safety in the areas listed below is equivalent to that achieved by compliance with the technical requirements of Appendix R and, therefore, the licensee's requests for approved deviations in these areas are granted:

(1) RHR pump 1-1 and heat exchanger room (fire area 3-B-1)
(2) RHR pump 1-2 and heat exchanger room (fire area 3-B-2)
(3) centrifugal charging pumps room (fire area 3-H-1)
(4) reciprocal charging pump room (fire area 3-H-2)
(5) turbine-driven auxiliary feed pump (fire area 3-Q-1)
(6) 4.16-kV switchgear fan room (fire area 13-E)
(7) chemical laboratory and offices (fire area 4-A)
(8) G bus compartment (fire area 4-A-1)
(9) H bus compartment (fire area 4-A-2)
(10) shower, locker, and access control (fire area 4-B)
(11) hot shutdown panel and nonvital switchgear room (fire area 5-A-4)
(12) control room complex (fire area CR-1)
(13) electrical area west of the battery room (fire area 6-A-5)
(14) corridor outside the diesel generator room (fire area 11-D)
(15) component cooling water heat exchanger (fire area 14-E)
(16) auxiliary saltwater pump rooms 1-1 and 1-2 (fire areas 30-A-1 and 30-A-2)
(17) diesel fuel oil transfer pump vaults (fire areas 35-A and 35-B)
(18) auxiliary building and fuel handling building (fire area AB-1)*
(19) diesel generator rooms (fire areas TB-1, TB-2, and TB-3)
(20) steel hatches (fire areas 4-B, 6-A-5, 5-A-4, 7-A)
(21) containment (fire area 1)
(22) penetration area (fire area 3-BB)
(23) unlabeled fire doors
(24) RCP oil collection system (containment zone 1-B)

*Two exemptions

(25) emergency lighting (fire areas/zones CR-1, 3-R, 1, 6-A-1, 6-A-2, 6-A-3, 7-A, 5-A-4, elevation 104, TB-4, TB-5, TB-6, 3-Q-1, 3-Q-2, TB-1, TB-2, TB-3, 3-BB, elevation 100, 5-A-1, 5-A-2, 5-A-3)

The staff will require that all of the above modifications be completed before 5% of rated power is exceeded.

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14 ABSTRACT (200 words or less)

Supplement No. 23 to the Safety Evaluation Report for Pacific Gas and Electric Company's application for licenses to operate the Diablo Canyon Nuclear Power Plants (Docket Nos. 50-275 and 50-323), located in San Luis Obispo County, California, has been prepared by the Office of Nuclear Reactor Regulation of the U.S. Nuclear Regulatory Commission. This supplement addresses the licensee's requests for deviations from Section III.G in Appendix R (related to fire protection) of Title 10 of the Code of Federal Regulations Part 50, presents the staff's evaluation and conclusion regarding each request, and summarizes the staff's review of the licensee's requests.

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Safety Evaluation Report

related to the operation of
Diablo Canyon Nuclear Power Plant,
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Docket Nos. 50-275 and 50-323

Pacific Gas and Electric Company

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

July 1984

ABSTRACT

Supplement 24 to the Safety Evaluation Report for Pacific Gas and Electric Company's application for licenses to operate Diablo Canyon Nuclear Power Plant, Unit 1 and Unit 2 (Docket Nos. 50-275 and 50-323), has been prepared by the Office of Nuclear Reactor Regulation of the U.S. Nuclear Regulatory Commission. This supplement reports on the independent design verification program (IDVP) for Diable Canyon Unit 1 that was performed between November 1981 and May 1984 in response to Commission Order CLI-81-30 and an NRC letter to the licensee of November 19, 1981 and its application by PG&E in the Internal Technical Program (ITP). Specifically, Supplement 25 presents the final resolution of the remaining issues and other matters identified in Supplements 18, 19 and 20. This SER Supplement applies only to Diablo Canyon Unit 1.

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ABBREVIATIONS

ACRS	Advisory Committee on Reactor Safeguards
AFW	auxiliary feedwater
AFWS	auxiliary feedwater system
ASLAB	Atomic Safety and Licensing Appeal Board
ASLB	Atomic Safety Licensing Board
BNL	Brookhaven National Laboratory
CCW	component cooling water
CCWS	component cooling water system
DCNPP	Diablo Canyon Nuclear Power Plant
DCP	Diablo Canyon Project
E/H	electro-hydraulic
EQ	Equipment Qualification
FI	Follow-Up Item
FSAR	Final Safety Analysis Report
HLA	Harding Lawson Associates
IDVP	Independent Design Verification Program
IE	Office of Inspection and Enforcement (NRC)
ITP	Internal Technical Program
ITR	Interim Technical Report
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NSC	Nuclear Service Corporation
OI	Open Item
PG&E	Pacific Gas and Electric Company
QA	quality assurance
RLCA	Robert L. Cloud and Associates
SER	Safety Evaluation Report
W	Westinghouse

1 INTRODUCTION AND BACKGROUND

The staff of the U.S. Nuclear Regulatory Commission (NRC) issued on October 16, 1974, its Safety Evaluation Report (SER) in matters of the application of the Pacific Gas and Electric Company (PG&E) to operate the Diablo Canoyon Nuclear Power Plant, Unit 1 and Unit 2. The SER has since been supplemented by Supplements No. 1 through No. 23. SER Supplement No. 18 (SSER 18) presented the staff's safety evaluation on matters related to the verification effort for Diablo Canyon Unit 1 that was the result of Commission Order CLI-81-30 and an NRC letter to PG&E of November 19, 1981. The Commission Order suspended the authorization to load fuel and perform low power testing originally granted by the Diablo Canyon Unit 1 Generating License No. DPR-76. This verification effort relates only to Unit 1 of the Diablo Canyon Nuclear Power Plant.

SSER 18 contained a number of open items (OI - Table 1) that required resolution and a number of followup items (FI - Table 2) that required some additional action by PG&E and the staff. SSER 19 presented the staff's safety evaluation of those unresolved matters which must be satisfactorily resolved prior to commencement of fuel loading operations at Diablo Canyon Unit 1 (Step 1 of the Diablo Canyon Unit 1 licensing process). SSER 20 presented the staff's safety evaluation of those matters that must be satisfactorily resolved prior to Unit 1 achieving criticality and operating at power levels up to 5 percent of rated full power (Step 2).

The Commission reinstated the authority to load fuel and perform cold system testing (Step 1) on November 8, 1983. PG&E commenced fuel load operations on November 15, 1983 and completed that operation on November 20, 1983. The Commission authorized hot functional testing on January 25, 1984. At a Commission meeting on March 26 and 27, 1984 the staff briefed the Commission on the overall status of the Diablo Canyon plant readiness and licensing efforts with respect to criticality and lower power operation.

The briefing included an updating of five items of the design verification program that had been identified in SSER 20 as requiring a final resolution prior to criticality and the status of those items which require resolution prior to full power operation. On April 13, 1984 the Commission authorized criticality and low power operation. Diablo Canyon Unit 1 went critical on April 29, 1984 and zero physics and low power testing was successfully completed on May 23, 1984. According to the licensee, the plant has been ready for power ascension since late June 1984.

In December 1983, the staff issued SSER 20 for the Diablo Canyon Nuclear Power Plant. That supplement reported on the status of resolution of items that had resulted from the Independent Design Verification Program (IDVP) and the actions taken by the Diablo Canyon Project (DCP) of PG&E under its Internal Technical Program (ITP). The items included Open Items (OI) which required further information, confirmation of data, additional justification or bases for an analysis, or additional analyses or modifications and Followup Items (FI), which required further documentation or verification. SSER 20 identified the following items as requiring further action:

Table 1
IDVP/ITP OPEN ITEMS

OI 2	20 Hertz Cutoff Frequency
OI 11	Roof Truss Model for the Turbine Building
OI 18	Additional Large Bore Piping Analyses
OI 20	Equipment Qualification
OI 25	Intake Structure Lateral Force
OI 29	Jet Impignement Loads Inside Containment
OI 30	Rupture Restraints Inside and Outside Containment

Table 2
IDVP/ITP FOLLOW UP ITEMS

FI 1	AFWS Runout Control System Test
FI 5	Qualification Analysis for Motor Capacitor
FI 9	Modifications to AFWS
FI 11	Modifications from Pressure/Temperature Reanalyses
FI 12	Confirmation of EQ Documentation
FI 14	EQ of Cables for a Moderate Energy Line Break

As stated in SSER 20, all of the above items except four (OI 2, OI 11, OI 18, and OI 29) were required to be resolved before Unit 1 criticality and low-power operation (i.e., less than 5 percent). Since the issuance of SSER 20, PG&E has taken actions to resolve these issues and has provided the staff with the requested information. The staff has reviewed that information and an evaluation of each of the issues is presented in Sections 2 and 3 of this report. As stated by the staff at the Commission Meeting on March 26-27, 1984, those items had been satisfactorily resolved at that time. The remaining four items have since been resolved, as discussed in Sections 2 and 3.

2 RESOLUTION OF OPEN ITEMS

Open Item 2: 20 Hertz Cutoff Frequency

Reference: SSER 20 Section 3.2.1.

The staff stated in SSER 18 that the use of the 20 Hertz cutoff frequency for the generation of floor response spectra should be verified and/or justified. In SSER 20 the staff requested an additional analysis for a piping system in the high amplification region of the annulus structure since the spectra for these locations show acceleration peaks in the 20 to 33 Hertz region. The licensee provided an outline for the analysis which the staff reviewed and found acceptable. By letter of March 16, 1984, the licensee provided a report entitled "Effects of Horizontal Flexibility of the Annulus Structure on the Seismic Qualification of Attached Piping and Supports." The staff has reviewed this report and determined that the full design margins are assured for loadings associated with the Hosgri event. Therefore, the staff concludes this item is satisfactorily resolved.

Open Item 11: Turbine Building Roof Truss Modeling

Reference: SSER 20 Section 3.2.8

In SSER 18 the staff raised a concern regarding the modeling of the turbine building roof trusses. As stated in SSER 20, the staff had essentially completed its review but required that PG&E document its efforts. By letter of February 10, 1984, PG&E provided a study documenting the validity of using generalized uniaxial members to obtain individual truss member responses for the turbine building roof. The staff has reviewed this information and finds it acceptable. Therefore, this open item is resolved.

Open Item 18: Additional Piping Analyses

Reference: SSER 20 Section 3.3.1

The staff stated in SSER 18 that calculations for selected piping systems previously analyzed and reported in ITR-12 and ITR-17 should be repeated with revised support configurations and current loadings to verify that piping and supports satisfy the applicable design criteria. As stated in SSER 20, the IDVP conducted an additional, independent reevaluation of two piping systems selected by the staff. The staff concluded at that time that this open item was resolved with respect to low-power operation (Mode 2) only and final resolution was required prior to full-power operation (Mode 1).

By letter of February 3, 1984, PG&E provided the results of the confirmatory piping analysis of two piping systems selected by the staff (Analysis 8-102 and 8-111), as presented in a report by R. L. Cloud and Associates (RLCA), "Stress Analysis of Two Piping System and Supports, Diablo Canyon Nuclear Power Plant,

Unit 1, Revision 0." Based on the review of the information in that report, the staff concludes that these analyses are acceptable and, therefore, this open item is resolved.

While this resolves the specific issue stated in SSER 18, and subsequently addressed in SSER 19 and SSER 20, additional concerns regarding piping and piping supports were raised in various allegations as described in SSER 21 and SSER 22. The staff initiated a special review and evaluation effort for this matter which resulted in requirements for additional evaluations by PG&E and which were established as license conditions in the NRR Order Modifying License of April 18, 1984. These license conditions must be met prior to full-power operation. PG&E provided responses to these conditions in a number of submittals. The staff and PG&E have pursued resolution of these issues through frequent meetings, documentation, audits at the PG&E offices, and plant walkdowns. The result of this broad effort is, therefore, reported in a separate SER supplement.

Open Item 20: Equipment Qualification

Reference: SSER 20 Section 3.4.1

The staff stated in SSER 18 seismic qualification should be verified for all equipment listed in the Diablo Canyon Project Final Report. SSER 20 stated that PG&E will inform the staff upon completion of the qualification of Class I mechanical equipment for current nozzle loads and response spectra and that this issue must be resolved prior to Mode 2. In a letter of February 15, 1984, PG&E advised the staff that this effort had been completed. Equipment qualification has been documented in the PG&E files. Some modifications to mechanical equipment supports and foundations were made as a result of this effort. The staff finds this acceptable and considers this item resolved.

Open Item 25: Intake Structure Lateral Forces

Reference: SSER 20 Section 3.5

The staff stated in SSER 18 that the total lateral forces, the total resistance to sliding, and the factor of safety against sliding of the intake structure should be fully evaluated. The IDVP presented the results in ITR-68, "Verification of HLA Soils Work," Revision 0 and Revision 1. As stated in SSER 20, the staff requested that, as a result of its review of ITR 68 Revision 1 and its audit in October 1983, R. L. Cloud Associates (RLCA) provide certain confirmatory information regarding ITR-68. By letter dated December 29, 1983, RLCA provided the requested information to the staff. Based on the review, the staff concludes that the information is satisfactory and this open item is resolved.

Open Item 29: Jet Impingement Loads on Piping Inside Containment

Reference: SSER 20 Section 4.3.5

The staff stated in SSER 18 that the review of jet impingement effects had not been completed, at the time, and that consideration of jet impingement loads in the design and qualification of all safety-related piping and equipment should

be clearly demonstrated. SSER 20 stated that PG&E and Westinghouse were conducting an evaluation of jet impingement loads on piping and supports, mechanical and electrical equipment and conduits. PG&E submitted a report on this effort by letter of February 6, 1984.

In addition, the Atomic Safety and Licenisng Appeal Board in its decision of March 20, 1984 (ALAB-763) requested that PG&E perform a jet impingement evaluation for those lines inside containment that were not included within the scope of the pressure/temperature criteria. PG&E applied those criteria to identify the lines for analysis and provided its response to this requirement in a letter of April 9, 1984. The staff has reviewed this information and finds it acceptable. Therefore, this open item is resolved.

Open Item 30: Rupture Restraints Inside and Outside Containment

Reference: SSER 20 Section 4.3.6

The staff stated in SSER 18 that the design and installation of rupture restraints inside and outside containment should be verified. As a result of an audit in October 1983, the staff had raised a concern regarding the acceptance criteria for compression members of the frame-type rupture restraints which contain crushable bumpers. At a meeting on December 6, 1983, PG&E provided extensive supplementary information which demonstrated that the criteria used conform to accepted industry practices for the design of rupture restraints. In a letter of January 20, 1984, PG&E identified this information in a report by K. P. Buchert, titled "Review of Criteria Used to Verify the Beams/Colums Used on the Inside and Outside Containment Pipe Whip Restraints on the Diablo Project." The staff has reviewed this report and concludes that the information is applicable and acceptable for the Diablo Canyon Plant. On this basis, the staff concludes this item is resolved.

3 RESOLUTION OF FOLLOW-UP ITEMS

Follow-Up Item 1: AFWS Runout Control System Test

Reference: SSER 20 Section 4.2.1

As stated in SSER 18, PG&E, as a result of an IDVP analysis of the auxiliary feedwater system (AFWS) runout control system, changed the low pump discharge pressure setpoints and committed to perform a test of the runout control system to confirm dynamic stability and component operability. As stated in SSER 20, this test would be performed at hot standby conditions (Mode 3). PG&E described the proposed test in a letter of December 6, 1983. The NRC Region V staff noted during an audit that the proposed test would not confirm the dynamic stability of the AFWS during runout conditions; the licensee stated that Start-Up Test 37.12, Addendum 3 will confirm operability and stability of the AFWS level control valve actuators and will demonstrate that the system will maintain steam generator water level. By letter of March 19, 1984, PG&E informed the staff that this test has been successfully completed and confirmed that the control system exhibits stable operation. The staff concludes that the successful completion of that test resolves this item.

Follow-Up Item 5: Motor Capacitor Qualification Analysis

Reference: SSER 20 Section 4.2.3

In SSER 18 the staff stated that PG&E will conduct an analysis to determine the qualified life of the motor capacitor of the motor-operated auxiliary feedwater valves for steam generator level control. As stated in SER 20, PG&E subsequently provided documentation regarding the qualified life of the capacitor. The staff reviewed that information and found it acceptable with respect to low-power operation. The staff also stated in SSER 20 that additional information would be necessary for the final resolution prior to full-power operation.

PG&E, by letters of January 20 and January 30, 1984, provided additional information on the environmental qualification of the motor capacitor in the electro-hydraulic (E/H) actuator of the motor-operated auxiliary feedwater valves for steam generator level control. The staff reviewed this information, but was not able to conclude that environmental qualification this equipment had been satisfactorily demonstrated for the postulated high energy line break environment.

PG&E, by letter of February 15, 1984, provided additional information, including a reference to SSER 9 (June 13, 1980), page 7-1, stating that the auxilary feedwater level control valves are not required to be qualified for the severe environment. This information is contained in Amendment 69 (September 1978) to the FSAR, Notes to Table 3.11-1A. The staff reviewed that information and concludes that no more than two E/H valve actuators would be affected by any single high energy line break environment. Therefore, a concurrent single active failure will not prevent the delivery of sufficient auxiliary feedwater by the turbine-driven AFW pump or the unaffected motor-driven pump to at least two intact steam generators, and thus a safe shutdown can be achieved. In addition,

by letter of March 23, 1984, PG&E confirmed that failure of the valve actuators will not affect other safety-related systems and will not mislead the plant operators into taking an inappropriate action. The staff has reviewed this additional information and concludes that the E/H valve actuators need not be qualified to the high energy line break environment. Thus, the original staff evaluation on the subject, as contained in SSER 9, remains acceptable and this issue is considered resolved.

Follow-Up Item 9: Modifications to AFWS

Reference: SSER 20 Section 4.3.2

As stated in SSER 18, the staff will confirm that any modifications required in safety-related systems to satisfy pressure/temperature rating and power-operated valve operability under appropriate differential pressure conditions are implemented. The Region V staff audited documentation for selected modifications that had been completed. As stated in SSER 20, modifications to the AFWS resulting from the revised pressure and temperature ratings had been completed, except for the AFWS pump turbine overspeed setpoint change. This change was to be conducted during hot shutdown (Mode 4) when steam is available from reactor coolant pump heat. The licensee informed the staff by letter of March 19, 1984 that the overspeed trip setpoint change for the AFWS pump turbine was completed during Mode 4. The staff concludes that, within this action, this item is resolved.

Follow-Up Item 11: Pressure/Temperature Reanalysis Modifications and Documentation

Reference: SSER 20 Section 4.3.3

As stated in SSER 18, as a result of the PG&E pressure/temperature reanalyses for environments resulting from high energy pipe breaks outside containment, modifications were required. The staff required, as stated in SSER 20, that the modifications be completed prior to criticality (Mode 2). In a letter of December 6, 1983, PG&E identified the specific modifications required and, in its letter of February 15, 1984, stated that all modifications had been completed. The staff considers this item resolved.

Follow-Up Item 12: Confirmation of Environmental Qualification Documentation

Reference: SSER 20 Section 4.3.3

In SSER 18 the staff stated that it will evaluate the results of the PG&E analysis with respect to assuring environmental qualification of equipment. As stated in SSER 20, the staff conducted an audit of the PG&E qualification files in late 1983. The staff determined that the equipment is qualified for the reanalyzed environments. However, specific documentation was not available in the files. This aspect was discussed in further detail in a letter dated January 31, 1984 from T. Bishop, NRC Region V, to J. Schuyler, PG&E. PG&E responded in a letter of March 1, 1984 and stated that the files have now been updated. A PG&E interoffice memorandum was issued which requires that these records be treated as quality records. The staff concludes that these actions resolve this item.

Follow-Up Item 14: Environmental Qualification of Cables and Wires

Reference: SSER 20 Section 4.2.5

As stated in SSER 18, the IDVP review of high energy pipe cracks indicated that certain cables and wires, other than those previously identified as environmentally qualified for use in the AFWS, were utilized and were subject to severe environments due to high temperature jet impingement. The staff audited the documentation for certain wires and cables and the results were documented in SSER 20. The licensee provided additional information by letters of December 12 and 21, 1983. Based on the audit and on the review of the additional information submitted, the staff finds the information acceptable and concludes that this item is resolved.

4 SUMMARY AND CONCLUSIONS

In Supplements 18, 19 and 20 to the Safety Evaluation Report related to the operation of the Diablo Canyon Nuclear Power plant (NUREG-0675), specifically for Unit 1, the staff identified a number of open items (OI) and followup items (FI) which required resolution. These items evolved from the staff's review of the Independent Design Verification Program (IDVP) for Unit 1 and its application by PG&E in the Internal Technical Program (ITP).

For all of the items identified, PG&E submitted additional information, analyses and/or justification for the corrective actions resulting from their ITP. The staff has reviewed those submittals and concludes that all of IDVP items have been satisfactorily resolved for Unit 1.

5 REFERENCES

U.S. Nuclear Regulatory Commission, Commission Memorandum and Order CLI-81-30, "Order Suspending License," November 19, 1981.

---, ALAB-763, March 20, 1984, Atomic Safety Licensing Appeal Board Decision.

---, NUREG-0675, "Safety Evaluation Report Related to Operation of Diablo Canyon Nuclear Power Plant Units 1 and 2," October 12, 1984; Suppl. 9, June 30, 1980; Suppl. 18, August 31, 1983; Suppl. 19, October 31, 1983; Suppl. 20, December 31, 1983.

Pacific Gas & Electric Company, "Final Safety Analysis Report," Docket Nos. 50-275 and 50-323.

---, November 19, 1981, from H. Denton (NRC) to M. Furbush (PG&E), Subject: Diablo Canyon Unit 1 Independent Design Verification Programs.

---, December 6, 1983, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: Response to Items in Board Notification 83-179.

---, December 6, 1983, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: SSER 19 Followup Items.

---, December 21, 1983, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: Board Notification 83-179 Followup Item 14.

---, December 21, 1983, from E. Denison (RLCA) to H. Denton (NRC) and others, Subject: Verification of HLA Soils Work.

---, January 20, 1984, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: SSER 20 Followup Item 5 - Additional Information (DCL 84-020, and DCL 84-032).

---, January 20, 1984, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: SSER 20 Open Item 20 (DLC 84-018).

---, January 31, 1984, from T. Bishop (NRC-RV) to J. Schuyler (PG&E), Subject: NRC Inspection of Diablo Canyon Units 1 and 2 (IR 83-40).

---, February 3, 1984, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: SSER Open Item 18, Piping Analysis Report (DCL 84-037).

---, February 6, 1984, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: SSER 20 Followup Item 29 and SSER Allegation 12, Jet Impingement Loads (DCL 84-041).

---, February 10, 1984, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: SSER 20 Open Item 11, Turbine Building Roof Truss Modeling (DCL 84-052).

---, February 15, 1984, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: Status of SSER 20 Items (DCl 84-062).

---, March 1, 1984, from J. Schuyler (PG&E) to J. Martin (NRC-RV), Subject: IE Inspection Report 83-40 - Notice of Violation (DCL 84-088).

---, March 16, 1984, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: Closeout of SSER 20 Open Item 2-20 Hertz Cutoff Frequency (DCL 84-101).

---, March 19, 1984, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: Closeout of SSER 20 Items (DCL 84-102).

---, March 23, 1984, from J. Schuyler (PG&E) to G. Knighton (NRC), Subject: SSER 20 Followup Item 5 - Additional Information, Motor Capacitor Qualification (DCL 84-116).

---, April 9, 1984, from J. Schuyler (PG&E) to H. Denton (NRC), Subject: Jet Impingement Evaluations (DCL 84-137).

---, April 18, 1984, from D. Eisenhut (NRC) to J. Schuyler (PG&E), Subject: Order Modifying License DPR-76.

R. L. Cloud and Assoc., "Stress Analysis of Two Piping Systems and Supports, Diablo Canyon Nuclear Power Plant, Unit 1, Rev. 0."

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Supplement 24 to the Safety Evaluation Report for Pacific Gas and Electric Company's application for licenses to operate Diablo Canyon Nuclear Power Plant, Units 1 and 2 (Docket Nos. 50-275 and 50-323), has been prepared by the Office of Nuclear Reactor Regulation of the U.S. Nuclear Regulatory Commission. This supplement reports on the independent design verification program (IDVP) for Diablo Canyon Unit 1 that was performed between November 1981 and May 1984 in response to Commission Order CLI-81-30 and an NRC letter and its application by PG&E in the Internal Technical Program (ITP). Specifically, Supplement 25 presents the final resolution of the remaining issues and other matters identified in Supplements 18, 19 and 20. This SER Supplement applies only to Diablo Canyon Unit 1.

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