



444 South 16th Street Mall  
Omaha NE 68102-2247

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LIC-02-0012

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555

- References:
1. Docket No. 50-285
  2. Letter from OPPD (R. L. Andrews) to NRC (J. R. Miller) dated January 9, 1985 (LIC-84-0338)
  3. Letter from NRC (E. J. Butcher) to OPPD (R. L. Andrews) dated July 3, 1985 (NRC-85-0200)
  4. Letter from NRC (D. A. Powers) to OPPD (S. K. Gambhir) dated May 9, 2000 (NRC-00-0054)
  5. Letter from OPPD (S. K. Gambhir) to NRC (D. A. Powers) dated June 8, 2000 (LIC-00-0053)
  6. Letter from NRC (A. T. Howell) to OPPD (S. K. Gambhir) dated January 31, 2001 (NRC-01-008)

**SUBJECT: Request for Clarification of Exemption from the Requirements of 10 CFR 50, Appendix R, Fire Protection Program for Nuclear Power Facilities**

This letter is being submitted to provide a clarification to the Reference 3 exemption and Safety Evaluation Report (SER) issued to Fort Calhoun Station (FCS). The documentation submitted by Omaha Public Power District (OPPD) in Reference 2 and the SER OPPD received in Reference 3 do not meet current industry expectations regarding depth of information and clarity. OPPD believes that this is the underlying cause of the non-cited violation (NCV). The results of the attached review by OPPD clearly define the configuration of Fire Area 32. OPPD respectfully requests that the NRC supplement the Reference 3 SER. This supplement should reflect a sufficient level of detail such that a future review of this fire area would be less complicated for both the NRC inspectors and for future OPPD audit teams.

In Reference 2, OPPD requested exemption from the requirements of 10 CFR 50, Appendix R, Section III, for Fire Area 32 at the FCS. In Reference 3, the NRC granted an exemption for Fire Area 32 that was requested by OPPD in Reference 2 and provided discussion in an SER. Following a January 2000 Triennial Fire Protection Inspection of FCS, in Reference 4 the NRC issued an NCV (green finding) regarding the configuration in Fire Area 32 at FCS. In Reference 5, OPPD denied the NCV (green finding) levied in Reference 4. In Reference 6, the NRC reinstated the NCV (green finding).

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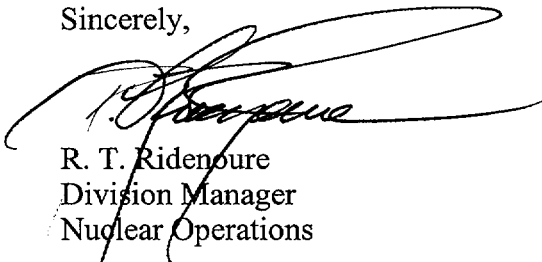
As a result of the NCV, OPPD completed an extensive review of Fire Area 32 to fully illustrate the exemption granted in Reference 3 and its corresponding SER. An OPPD goal was also to capture insight into the FCS staff thought process as the Reference 2 exemption request was written. This letter documents the results of the OPPD review, provides clarifying information where necessary, and demonstrates OPPD's compliance with the Reference 3 exemption where appropriate. This letter also provides discussion where an exemption from 10 CFR 50, Appendix R, Section III.G.2 was not necessary. The letter provides further discussion where some cables in Fire Area 32 were actually covered under 10 CFR 50, Appendix R, Section III.G.1 and provides discussion noting that there were no previous docketed information exchanges of this issue with the NRC. Finally, this letter identifies a number of enhancements, noted in the review, that OPPD is making to increase the defense-in-depth features of Fire Area 32.

Much of the historical correspondence associated with this issue is documented in Reference 5, which was previously submitted to the NRC. This letter provides clarification to docketed information regarding these issues for future inspections and reviews.

Based on NRC review of this documentation, OPPD respectfully requests that the NRC supplement the SER in Reference 3. The documentation submitted by OPPD in Reference 2 and the SER OPPD received in Reference 3 do not meet OPPD's expectations of a clear information exchange that would occur if the exchange were being done meeting today's standards. The results of the attached review clearly define the configuration of Fire Area 32. OPPD requests that the supplemented SER reflect a sufficient level of detail such that a future review of this fire area would be less complicated for both the NRC inspectors and for future OPPD audit teams.

If you should have further questions, please contact me at (402) 533-7426.

Sincerely,



R. T. Ridenoure  
Division Manager  
Nuclear Operations

Attachment

RTR/GRC/grc

c: E. W. Merschoff, NRC Regional Administrator, Region IV  
A. B. Wang, NRC Project Manager  
W. C. Walker, NRC Senior Resident Inspector  
Winston & Strawn

## **Attachment to LIC-02-0012**

Figure 1 and Figure 2 are included at the end of this attachment and are referenced where appropriate within the text of this attachment.

Figure 1: Fire Area 32 Appendix R Cable Locations

Figure 2: Isometric Drawing, Fire Area 32 Evaluation Zones

### **Executive Summary**

In January 1985, Omaha Public Power District (OPPD) requested exemption from the requirements of 10 CFR 50, Appendix R, Section III for Fire Area 32 at the Fort Calhoun Station (FCS). In July 1985, the NRC granted an exemption for Fire Area 32 that was requested in January 1985 and provided discussion in a Safety Evaluation Report (SER). Following a January 2000 Triennial Fire Protection Inspection at FCS, in May 2000 the NRC issued a non-cited violation (NCV) (green finding) regarding the configuration in Fire Area 32 at FCS. In June 2000, OPPD denied the NCV (green finding) levied in May 2000. In January 2001, the NRC reinstated the NCV (green finding). As a result of the green finding, OPPD conducted an exhaustive evaluation of Fire Area 32 (auxiliary building room 19). The results of the evaluation are documented in this attachment.

In January 2000, the NRC conducted a Triennial Fire Protection Baseline Inspection at FCS. As noted above, the NRC identified a violation to an exemption granted to 10 CFR 50, Appendix R, for the air compressor room (Fire Area 32, auxiliary building room 19). The violation, as identified by the NRC in the May 9, 2000 Inspection Report No. 50-285/00-01, concerned the following issues:

- In Fire Area 32, redundant power cables were found to be closer than 10 feet, contrary to discussion in the exemption request for the area.
- In Fire Area 32, redundant control cables were found to be closer than 20 feet. Control cables and their separation within the fire area were not discussed in the exemption request or approved exemption.

In the May 9, 2000 inspection report, the NRC further characterized these concerns as follows:

Specifically, the installed configuration of power cables in Fire Area 32 (the air compressor room) conflicts with the description of the area provided to the NRC in your exemption request of January 9, 1985. The NRC used this information as a basis for issuing an exemption from 10 CFR 50, Appendix R, Section III.G.2 for power cables in Fire Area 32. The other example concerns the failure of the installed configuration of control cables in Fire Area 32 to meet the requirements of 10 CFR Part 50, Appendix R, Section III.G.2 for ensuring that redundant trains of safe shutdown equipment remain free of fire damage.

OPPD completed an exhaustive evaluation to address the issues identified by the NRC in the May 2000 inspection report and to assess and document the design and licensing basis for Fire Area 32. This was completed to determine:

1. If FCS was within the bounds of the exemption granted in July 1985, and
2. Why the cables, cited as an NCV in the May 2000 inspection report, were not addressed in the January 1985 OPPD exemption request.

The purpose of this attachment is to summarize the evaluation and to provide the NRC additional information and clarification to previous OPPD submittals that were made prior to/as a part of the January 1985 exemption request.

The results of the FCS evaluation are:

- The cables, noted as an NCV in the May 2000 inspection report, were intentionally not included in the January 1985 exemption request because the cables (both power and control) were not redundant hot shutdown cables requiring separation or protection per the requirements of Section III.G.2 of 10 CFR 50, Appendix R,
- The cables, noted as an NCV in the May 2000 inspection report, fall under Section III.G.1 of 10 CFR 50, Appendix R and do not require exemption relief,
- The results of the significant determination process (SDP), which concluded the issues were green findings, demonstrate that a fire in Fire Area 32 would result in low safety significance, thereby supporting the July 1985 exemption that was granted, and
- This clarification submittal supports the conclusions made in the exemption granted by the NRC in the July 1985 SER.

## **Background**

The air compressor room (Fire Area 32, room 19) is located along the entire eastern edge of the auxiliary building at the basement level. It is bordered on the north and south by exterior walls, on the east by the turbine building, and on the west by the component cooling heat exchanger area (Fire Area 33), electrical penetration area (Fire Area 34A), and basement level general area (Fire Area 6). The compressor area lies under the battery areas (Fire Areas 37 and 38) and switchgear area (Fire Areas 36A and 36B). Fire Area 32 includes a small corridor and open stairwell (room 53) running alongside the battery rooms and Fire Area 19 on the auxiliary building ground floor. Fire Area 33 partially protrudes into Fire Area 32 at the basement level.

Walls and floors between this area and other fire areas are typically 3-hour fire rated barriers, with the exception of barrier elements that contain nonfire-rated penetration configurations that have been evaluated as adequate to withstand the fire hazard present.

The most prevalent combustibles for this fire area are cable insulation and the transient combustibles that are allowed in the area in accordance with FCS standing order SO-G-91, "Control and Transportation of Combustible Materials." The combustible loading for this area is classified as "low". "Low", as defined in the Updated Fire Hazards Analysis, is less than 80,000 BTU/ft<sup>2</sup>, which is less than a one-hour loading.

The Fire Area 32 fire detection system consists of ionization detectors at the basement level only. There are also ionization detectors installed at the ceiling above the 1011-foot elevation in the vicinity of the stairway to the air compressor area. The ionization detectors in the basement level activate a pre-action sprinkler system. The available hose stream, in addition to the automatic suppression demand, has been evaluated and determined to be adequate. A second suppression system consists of two wet-pipe pendant sprinklers located immediately above the cage for auxiliary feedwater pump FW-10. This is to prevent fire exposure to redundant auxiliary feedwater pump FW-6.

An adequate number of portable fire extinguishers are distributed throughout Fire Area 32, and other fire extinguishers are available from adjacent areas. There are also four fire hose cabinets in Fire Area 32.

Fire Area 32 contains the turbine- and motor-driven auxiliary feedwater pumps (i.e., FW-10 and FW-6, respectively). In addition, Fire Area 32 contains power distribution cables for both electrical divisions; control and power cables for both low pressure safety injection (LPSI) pumps, two of the three charging pumps, and two of the three high pressure safety injection (HPSI) pumps; and cables for other miscellaneous components.

### **Appendix R Exemption**

Several years of communication between OPPD and the NRC regarding Fire Area 32 resulted in an SER from the NRC Staff on July 3, 1985. Excerpts from the July 3, 1985 SER, Section IV, regarding Fire Area 32 are as follows:

#### "Air Compressor Room (Fire Area 32)

The licensee requested an exemption from Section III.G.2 to the extent that it requires that systems associated with redundant shutdown divisions be completely separated by a continuous 1-hour fire-rated barrier and the fire area containing these systems be protected by an area-wide automatic fire suppression system.

The technical requirements of Section III.G.2 [of 10CFR50, Appendix R] are not met in this area because cables and components of redundant shutdown divisions are not completely separated by a continuous 1-hour fire barrier. The licensee's exemption request originally encompassed the need for an automatic fire suppression system. However, the licensee subsequently committed to install an area-wide automatic sprinkler system in the room.

The staff's concern was that a fire of significant magnitude would damage redundant shutdown cables and/or the auxiliary feedwater pumps. However, the area is equipped with a complete fire detection system designed and installed in accordance with National Fire Protection Association (NFPA) Standard 72E. This system provides the staff with reasonable assurance that any potential fire would be detected in its incipient stages, before significant flame propagation or temperature rise occurred. The fire brigade would then be dispatched and would extinguish the fire using portable fire extinguishers or manual hose stations.

If rapid fire spread occurred prior to arrival of the brigade, the automatic sprinkler system would actuate to suppress the fire, reduce room temperatures, and protect shutdown systems. Until actuation of the suppression system, the fire barriers would provide a degree of passive protection by shielding the systems from direct impingement and the effects of radiant energy from a fire.

Based on the above evaluation, the staff concludes that the existing fire protection with the proposed modifications provides an equivalent level of safety to that achieved by compliance with Section III.G. Therefore, the licensee's request for exemption for a 1-hour fire barrier in the Air Compressor Room is granted. The exemption request for an automatic fire suppression system is not needed."

Reference 5 (previously submitted to the NRC), contains a copy of licensing submittals, the July 1985 exemption, July 1985 SER, and supporting documentation.

## **10 CFR 50 Appendix R Requirements and Guidance**

The following requirements from 10 CFR 50 Appendix R are used as a basis for this evaluation. Section III.G.1 of Appendix R states the following:

Fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage so that:

- a. One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage; and
- b. Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.

When redundant equipment/cables necessary to achieve and maintain hot shutdown are located within the same fire area, the separation/protection requirements of Section III.G.2 or III.G.3 (Alternative or Dedicated Shutdown Capability) are applicable. Since alternative shutdown capability was not provided for Fire Area 32, the separation/protection criteria of Section III.G.2 of Appendix R are applicable for those redundant hot shutdown equipment/cables located within the area. Since the separation/protection criteria of Section III.G.2 of Appendix R could not be met for the area, OPPD submitted an exemption request in January 1985 and it was subsequently approved by the NRC in July 1985 for the configuration in the room. Please note that Fire Area 32 remains largely the same today as it was in 1985.

Further, note that the separation criteria of Section III.G.2 of Appendix R is not applicable to systems required to achieve and maintain cold shutdown. Compliance with Section III.G.1.b of Appendix R only requires the ability to repair these systems within 72 hours. Therefore, an exemption from Section III.G.2 of Appendix R is not required to ensure post-fire availability of cold shutdown equipment.

Local manual operation of hot shutdown equipment is considered an acceptable means of ensuring that one train of systems necessary to achieve and maintain hot shutdown from an emergency control station is free of fire damage. Documented capability to manually operate these Safe Shutdown Components (post fire) demonstrates compliance with Section III.G.1.a of Appendix R. If safe shutdown equipment within an area is in compliance with Section III.G.1.a of Appendix R, the separation/protection requirements of Section III.G.2 are not applicable for that particular equipment/function. Therefore, an exemption from Section III.G.2 of Appendix R is not required when hot shutdown equipment is free of fire damage such that it can be operated from an emergency control station in accordance with Section III.G.1.a. The use of manual operator actions must be considered acceptable (i.e., within time constraints, accessible, emergency lighting provided, communications acceptable, etc.) for use as a compliance strategy. The use of manual actions as a means of ensuring that hot shutdown equipment is free of fire damage from an emergency control station is documented by the NRC in:

- 1) Regulatory Guide 1.189, "Fire Protection for Operating Nuclear Power Plants" (Section 5.3),
- 2) NRC Internal Memorandum, dated July 2, 1982, Vollmer to Mattson, Re: Position Statement on Allowable Repairs for Alternative Shutdown and on the Appendix R Requirement for Time Required to Achieve Cold Shutdown (Page 1),
- 3) SECY 83-269, dated July 3, 1983, Fire Protection Rule for Future Plants (Attachment C to Enclosure to SECY 83-269, page C-2).

The acceptability of manual actions is addressed in Regulatory Guide 1.189 as follows:

One success path necessary to achieve hot standby (PWR) or Hot Shutdown (BWR) from either the control room or emergency control stations should be maintained free of fire damage by a single fire, including an exposure fire. Manual operation of valves, switches, and circuit breakers is allowed to operate equipment and isolate systems and is not considered a repair.

## Analysis

Fire Area 32 contains redundant auxiliary feedwater pumps, as well as redundant cables for redundant power distribution and other safe shutdown equipment. The fire area has an extensive licensing history due to its unique configuration. In order to clearly address NRC concerns, a review of safe shutdown equipment and cables within the area was performed. This included a review of the physical locations of the cables and equipment of redundant hot shutdown functions within the areas applicable to the requirements of Section III.G.2 that may have required protection or an exemption from the requirements of Section III.G.2 of Appendix R. Evaluation Zones within the area were identified for detailed assessment based upon the licensing basis for the area and worst-case fire damage, given equipment and cable configuration in Fire Area 32.

Based on the routing of cables in Fire Area 32 (Figure 1), zones within the area were selected for detailed assessment. These zones were selected from those locations within the fire area that contain multiple train and redundant cables. These zones were selected independent of the cable type (power, control, or instrument) or the amount of separation that may exist. The zones were selected based upon:

- Areas with the potential to damage multiple trains of safe shutdown equipment (not necessarily redundant hot shutdown equipment requiring protection per Section III.G.2 of Appendix R),
- Separation or protection of redundant trains documented in the Fire Area 32 licensing basis,
- Areas of interest from the May 2000 NRC inspection report,
- The selection of these zones allowed for a systematic analytical approach to determine if Fire Area 32 was within the basis for the approved exemption. The following zones were identified for detailed evaluation:

<b>Zone A</b>	Train A power and switchgear control cables (east side of room 19)
<b>Zone B</b>	Train B power and switchgear control cables (west side of room 19)
<b>Zone C</b>	Cable tray systems containing both Train A and Train B control cables
<b>Zone D</b>	Cable tray systems containing both Train A and Train B power cables
<b>Zone E</b>	Auxiliary feedwater pumps (FW-6, FW-10) location
<b>Zone F</b>	Cable tray systems containing both Train A and Train B power cables
<b>Zone G</b>	Cable tray systems containing Train A power cables and Train B control cables. This includes cables for pressurizer power operated relief valve (PORV) PCV-102-2 and power for its redundant block valve.



As part of the analytical approach, various zones were combined to demonstrate that loss of both trains of cabling would not prevent safe shutdown. As such, these zones were combined as necessary to provide a conservative analytical method of addressing impacts of fire in various locations within the fire area and to address specific concerns identified by the NRC in the May 2000 inspection report. Specifically, Zones A and C (Evaluation Zone AC) and Zones B and C (Evaluation Zone BC) were combined for analysis. The combination evaluation of AC and BC was of particular interest to the January 2000 NRC inspection team. A post-fire safe shutdown evaluation was performed for each evaluation zone. The evaluation encompassed all of the zones identified within Fire Area 32. The following are the evaluation zones that were assessed (Figure 2):

<b><i>Evaluation Zone AC</i></b>	Train A power and control cables in Zone A and Train A and B control cables in Zone C
<b><i>Evaluation Zone BC</i></b>	Train B power and control cables in Zone B and Train A and Train B control cables in Zone C
<b><i>Evaluation Zone D</i></b>	Cable tray systems containing both Train A and Train B power cables
<b><i>Evaluation Zone E</i></b>	Auxiliary feedwater pumps (FW-6, FW-10) location
<b><i>Evaluation Zone F</i></b>	Cable tray systems containing both Train A and Train B power cables
<b><i>Evaluation Zone G</i></b>	Cable tray systems containing control cables for pressurizer PORV PCV-102-2 and power for its redundant block valve.

The evaluation considered the following for each evaluation zone:

- General discussion of the zone
- Fire protection features and hazards
- Safe shutdown analysis
- Conclusions

A summary of the results of the evaluation of each zone is as follows:

#### **Evaluation Zone AC** (Figure 2)

##### ***General Description***

Zone AC is a combination of Zone A and Zone C. Zone A runs north to south from approximately column lines 1a to 7a (Figure 1). The power and switchgear control cables routed in Zone A are primarily associated with the Train A switchgear and power transformers located in the rooms directly above the cable trays. Zone C contains the two control cable tray systems that run north to south parallel to and between Zones A and B. These trays are located at the south end of the room approximately between column lines 1a and 4a and are above the station air compressors. The configuration of this

cable tray system has remained unchanged from the original construction of the plant.

### ***Fire Protection Features and Hazards***

Zone AC is monitored by detection and is protected with an area-wide suppression system and sprinkler heads in the cable trays. As stated in the original July 1985 exemption, this detection and suppression will ensure early detection of a fire and alert operators to dispatch the fire brigade to the area. The suppression system will operate to protect equipment located in the area and to suppress the fire until the fire brigade arrives to fully extinguish the fire. The primary combustible load in this zone is cable. In addition, a small portion of Zone A is located over the auxiliary feedwater pumps (FW-6 and FW-10). The turbine-driven pump (FW-10) contains 5.5 gallons of lube oil and the motor-driven pump (FW-6) contains 2 gallons of lube oil. At the south end of room 19, the Train A power cables are routed above the three station air compressors. The compressors represent fixed combustibles with a total of 21 gallons of lube oil. Based on the robust design of the suppression system and the limited combustibles, any fire in the area would be contained to the area of origin with minimum damage.

### ***Safe Shutdown Analysis***

Zone A contains Train A power cables. These cables provide power from the 4kV buses to the 480V switchgear and from the 480V switchgear to the 480V motor control centers (MCCs). **These cables are separated by ten feet from their redundant Train B cables and are explicitly addressed by the July 1985 exemption for the area.**

Additionally, the 125 VDC cables for control of the Train A 4kV and 480V switchgear are routed in Zone A. These cables are associated with the same busses as the power cables (i.e., control cables associated with the switchgear whose power cables are routed through the zone). Therefore, a loss of these control cables would have the same impact as a loss of the power cables for the switchgear that are explicitly addressed by the July 1985 exemption. **These control cables are separated from their redundant components in Zone B by the same 10-foot distance as the power cables addressed by the July 1985 exemption.**

Zone C contains redundant control cables for LPSI pumps SI-1A and SI-1B. Loss of the cables would require manual operation of the breakers at the switchgear as needed to support cold shutdown. The other cables routed in these trays are either not redundant or are not required for safe shutdown.

The loss of the LPSI pump control cables will not impact the ability to achieve and maintain hot shutdown as the LPSI pumps are needed to support cold shutdown only. If these control cables were lost during a fire event, it would be necessary to manually operate the LPSI pump breakers in order to initiate shutdown cooling. Manual operation of these breakers would occur outside of Fire Area 32. Manual operation of the breakers is within the capability of the plant operators without special training or instruction.

## ***Conclusions***

Train A power cables within Evaluation Zone AC are separated from redundant Train B power cables in Zone B by greater than 10 feet and are adequately addressed by the approved July 1985 Appendix R exemption. Switchgear control cables routed in Zone A are associated with the same components as the power cables (i.e., control cables for the switchgear whose power cables are routed through the zone). Therefore, a loss of switchgear control cables would have the same impact as a loss of the power cables for the switchgear itself, which is explicitly addressed by the July 1985 exemption. These control cables are separated from their redundant components in Zone B by the same 10-foot distance as the power cables addressed by the July 1985 exemption.

Review of this configuration determined that the control cables within Evaluation Zone AC (LPSI pump control cables in zone C) were not redundant hot shutdown cables requiring protection per Section III.G.2 of Appendix R. Therefore, the July 1985 exemption from Section III.G.2 of Appendix R is not applicable to the cold shutdown control cables routed in Zone C.

## **Evaluation Zone BC** (Figure 2)

### ***General Description***

Zone BC is a combination of Zone B and Zone C. Zone B runs north to south from approximately column lines 1a to 7a (Figure 1). The cables routed in Zone B are primarily associated with the Train B switchgear and power transformers located in the rooms directly above the cable trays. Zone C contains the two control cable tray systems that run north to south parallel to and between zones A and B. These trays are located at the south end of the room approximately between column lines 1a and 4a and are above the station air compressors. The configuration of this cable tray system has remained unchanged from the original construction of the plant.

### ***Fire Protection Features and Hazards***

Zone BC is monitored by detection and is protected with an area-wide suppression system and sprinkler heads in the cable trays. As was stated in the original July 1985 exemption, this detection and suppression will ensure early detection of a fire and alert operators to dispatch the fire brigade to the area. The suppression system will operate to protect equipment located in the area and to suppress the fire until the fire brigade arrives to fully extinguish the fire. The primary combustible load in this zone is cable. At the south end of room 19, the Train B power cables are routed above the three station air compressors. The compressors represent fixed combustibles with a total of 21 gallons of lube oil. Based on the robust design of the suppression system and the limited combustibles, any fire in the area would be contained to the area of origin with minimum damage.

### ***Safe Shutdown Analysis***

Zone B contains Train B power cables. These cables provide power from the 4kV buses to the 480V switchgear and from the 480V switchgear to the 480V MCCs. **These cables are separated by ten feet from the redundant Train A cables and are explicitly addressed by the July 1985 exemption for the area.**

Additionally, the 125 VDC cables for control of the Train B 4kV and 480V switchgear are routed in Zone B. These cables are associated with the same busses as the power cables (i.e., control cables associated with the switchgear whose power cables are routed through the zone). Therefore, a loss of these control cables would have the same impact as a loss of the power cables for the switchgear that are explicitly addressed by the July 1985 exemption. **These control cables are separated from their redundant components in Zone A by the same 10-foot distance as the power cables addressed by the July 1985 exemption.**

Zone C contains redundant control cables for LPSI pumps SI-1A and SI-1B. Loss of the cables would require manual operation of the breakers at the switchgear as needed to support cold shutdown. The other cables routed in these trays are either not redundant or are not required for safe shutdown.

The loss of the 125 VDC cables for control of the Train B 4kV and 480V switchgear or the control cables for LPSI pumps SI-1A and SI-1B will not impact the ability to achieve and maintain hot shutdown. If these control cables were lost during a fire event, it would be necessary to manually operate the LPSI pump breakers. This action would be necessary to initiate shutdown cooling when in cold shutdown. Manual operation of these breakers would occur outside of Fire Area 32. Manual operation of the breakers is within the capability of the plant operators without special training or instruction.

### ***Conclusions***

Train B power cables within Evaluation Zone BC are separated from redundant Train A power cables in Zone A by greater than 10 feet and are adequately addressed by the approved July 1985 Appendix R exemption. Switchgear control cables routed in Zone B are associated with the same components as the power cables (i.e., control cables for the switchgear whose power cables are routed through the zone). Therefore, a loss of switchgear control cables would have the same impact as a loss of the power cables for the switchgear itself, which is explicitly addressed by the July 1985 exemption. These control cables are separated from their redundant components in Zone A by the same 10-foot distance as the power cables addressed by the July 1985 exemption.

Review of this configuration determined that the control cables within Evaluation Zone BC (LPSI pump control cables in zone C) were not redundant hot shutdown cables requiring protection per Section III.G.2 of Appendix R. Therefore, the July 1985 exemption from Section III.G.2 of Appendix R is not applicable to the cold shutdown control cables routed in Zone C.

## **Evaluation Zone D (Figure 2)**

### ***General Description***

Evaluation Zone D is located toward the north end of auxiliary building room 19 along the west wall. In this zone, power cables of Trains A and B are routed within 3 feet of each other. Evaluation Zone D is described in the May 2000 NRC inspection report as being the zone where, "The licensee failed to maintain 10 feet of horizontal separation between power cables associated with redundant equipment necessary for achieving and maintaining hot shutdown conditions." Specifically the team identified cable trays in Fire Area 32 that contained power cables associated with redundant safe shutdown equipment that were separated by 3 feet, 3 inches. This configuration is part of the original plant design and was in place at the time the July 1985 exemption was granted.

### ***Fire Protection Features and Hazards***

The only fixed hazard in Zone D is the cable tray system in question. There are no fixed combustibles located below these trays. The zone is protected by area detection and suppression. Additionally, the cable trays are protected by sprinklers located in the trays.

### ***Safe Shutdown Analysis***

Zone D contains redundant power cables for the following pumps:

<b><u>Equipment Lost</u></b>	<b><u>Credited Equipment</u></b>	<b><u>Function</u></b>
CH-1A, CH-1B	CH-1C	Charging Pumps
SI-2A, SI-2B	SI-2C	HPSI Pumps
SI-1A, SI-1B	Cold Shutdown Repair	LPSI Pumps

Redundant pumps CH-1C and SI-2C are available for back-up to CH-1A and CH-1B, and SI-2A and SI-2B, respectively. Cables for CH-1C and SI-2C are routed outside of Fire Area 32 and would be available in case of a fire in Fire Area 32. Loss of power cables to both LPSI pumps would require a cold shutdown repair activity to restore power to the pumps.

In addition, Zone D contains power cables for Train A MCCs 3A2 and 3C2 and Train B MCCs 4A2 and 4C2. A detailed review of the function of these MCCs determined that loss of power to these MCCs would not adversely affect the ability to achieve and maintain hot shutdown from an emergency control station. Although power may be lost to valves used to align charging system suction to either the safety injection and refueling water tank (SIRWT) or the boric acid storage tanks (BASTs), the ability to operate the valves locally would not be adversely affected. If a fire in this zone were to damage cables for the Train A MCCs 3A2 and 3C2 and Train B MCCs 4A2 and 4C2, local manual operation could be taken to position valves for alignment of the charging pumps to the SIRWT. This would require manual operation of volume control tank (VCT) outlet valve LCV-218-2 and SIRWT outlet valve LCV-218-3. Instead of aligning to the SIRWT, the charging pumps could be aligned to the BASTs by manual operation of gravity feed valves HCV-258 and HCV-265 and VCT outlet valve LCV-218-2. Also, operators have the option of using HPSI pump SI-2C for reactor coolant system (RCS) inventory control, which may require other manual operator actions (i.e., HCV-308).

These actions are not time critical as there are no failures in this zone that result in a challenge to RCS inventory (i.e., spurious operation of letdown, pressurizer PORVs, or reactor coolant gas vent system is not credible for a fire in this zone). Plant operators are familiar with these actions, and the steps to align the charging pump suction are identified in emergency operating procedures.

### ***Conclusions***

Zone D contains power cables for MCCs that power valves required for alignment of the charging system to the SIRWT or the BASTs. Local manual actions for aligning these valves are practical and feasible and demonstrate compliance with Section III.G.1.a of Appendix R. Alignment of the charging system suction is an integral part of the plant emergency operating procedures.

Zone D also contains power cables for both LPSI pumps. A cold shutdown repair used in corridor 4 can be modified to include Fire Area 32 as a compliance strategy in accordance with Section III.G.1.b of Appendix R. Abnormal operating procedure AOP-6, "Fire Emergency," provides guidance to perform the repair.

In summary, review of this configuration determined that the cables within Evaluation Zone D were not redundant hot shutdown cables requiring protection per Section III.G.2 of Appendix R. Therefore, the July 1985 exemption from Section III.G.2 of Appendix R is not applicable for this evaluation zone.

## **Evaluation Zone E (Figure 2)**

### ***General Description***

Zone E contains redundant auxiliary feedwater pumps FW-6 and FW-10. Additionally, there is a Train A cable tray system routed above the area, which is protected from an FW-10 fire by a local radiant energy barrier.

### ***Fire Protection Features and Hazards***

Zone E is monitored by detection and is protected with an area-wide suppression system and sprinkler heads in the cable trays. As was stated in the July 1985 exemption, this detection and suppression will ensure early detection of a fire and alert operators to dispatch the fire brigade to the area. The suppression system will operate to protect cables located in the area and to suppress the fire until the fire brigade arrives to fully extinguish the fire. The primary combustible load in this area is FW-6 and FW-10 lube oil and cables. In addition to the suppression systems protecting the area, FW-10 is protected by a dedicated wet-pipe system located directly above the turbine/pump. This system will ensure that any fire originating at FW-10 will be contained within the fixed barriers surrounding the pumps.

### ***Safe Shutdown Analysis***

Zone E contains redundant cables for FW-6 and FW-10. A fire in this area is mitigated by a dedicated wet-pipe suppression system installed above FW-10, a barrier installed between FW-6 and FW-10, and a suppression system installed to protect the cables above the pumps. This configuration is addressed in the licensing correspondence from 1978 through 1985. The fire protection features ensure that either FW-6 or FW-10 would be available for safe shutdown.

**However, as a defense-in-depth strategy, diesel-driven auxiliary feedwater pump FW-54 can be credited for a fire in this zone. FW-54, and its associated support equipment, is independent of Fire Area 32 and would be available to support safe shutdown following a fire in this area.**

### ***Conclusions***

Evaluation Zone E contains redundant auxiliary feedwater pumps and Train A power cables. There are no specific coping actions for this area based upon the protection provided by the passive fire barriers and suppression system. This ensures that either FW-6 or FW-10 would be available for safe shutdown. This configuration and its acceptability is clearly documented in the July 1985 Appendix R exemption and its associated SER.

**However, as a defense-in-depth strategy, auxiliary feedwater pump FW-54 can be credited for a fire in this zone. FW-54, and its associated support equipment, is independent of Fire Area 32 and would be available to support safe shutdown following a fire in this area.**

#### **Evaluation Zone F** (Figure 2)

##### ***General Description***

Zone F is located in the center of Fire Area 32 along the west wall. In this zone, Train A cable trays cross above the Train B cable trays. A radiant shield separates the redundant trains where the trays cross.

##### ***Fire Protection Features and Hazards***

Zone F is monitored by detection and is protected with an area-wide suppression system and sprinkler heads at the cable trays. The cable trays are separated by a radiant energy shield. As was stated in the July 1985 exemption, the detection and suppression will ensure early detection of a fire and alert operators to dispatch the fire brigade to the area. The suppression system will operate to protect cables located in the area and to suppress the fire until the fire brigade arrives to fully extinguish the fire. The only combustible load in this area is the cable.

##### ***Safe Shutdown Analysis***

Zone F is considered acceptable based on the fact that it was specifically discussed in the July 1985 exemption. No further analysis was conducted based on previous approval and the adequacy on the suppression system to protect redundant cables.

##### ***Conclusions***

Evaluation Zone F contains redundant power cables for MCCs 3A1, 3B1, 3C1, 4A1, 4B1, and 4C1 located in the upper electrical penetration area. These cables are separated by a radiant energy shield and protected by an area-wide suppression system and dedicated sprinkler heads at the cable trays. **Because this area was explicitly addressed in the July 1985 exemption in Section 5.0, no further considerations were applied.**



## **Evaluation Zone G** (Figure 2)

### ***General Description***

Zone G is located in the middle section of Fire Area 32 along the east wall. This zone contains tray section 22S (Figure 1) which contains Train B control cables. There is a Train A cable tray system routed above and at a right angle to 22S. The Train A and Train B cable trays are separated by a radiant shield and protected with automatic suppression. Tray section 22S contains control cables for pressurizer PORV PCV-102-2. The power cables for MCC 3B1, which powers the redundant block valve HCV-150, are routed approximately 25 feet from where the control cables are located. **This separation distance is greater than the minimum 10-foot distance specified in the July 1985 exemption.** There are other Appendix R cables in tray section 22S; however, those cables are not credited for a Fire Area 32 fire. The only intervening combustibles are the cables routed in the trays in Zone G.

### ***Fire Protection Features and Hazards***

Zone G is monitored by detection and is protected with an area-wide suppression system and sprinkler heads in the cable trays. As was stated in the July 1985 exemption, this detection and suppression system will ensure early detection of a fire and alert operators to dispatch the fire brigade to the area. The suppression system will operate to protect cables located in the area and to suppress the fire until the fire brigade arrives to fully extinguish the fire. Cable represents the combustible load in the zone.

### ***Safe Shutdown Analysis***

As previously stated, Zone G contains control cable for PORV PCV-102-2 and power for its associated block valve (HCV-150). These cables are separated by approximately 25 feet. The circuit failure mode is assumed to be a hot short that results in spurious opening of the PORV. If such a failure were to occur, manual action would be required to remove power from the pressurizer PORV. This action would be performed outside of Fire Area 32. The PORV is powered from MCC 4B1, and removal of power at the MCC will cause the PORV to fail closed. Local manual operation of the PORV breaker at the MCC ensures compliance with Section III.G.1.a of Appendix R. Therefore, safe shutdown equipment necessary to achieve and maintain hot shutdown remains available from an emergency control station. Action to ensure PORV and/or PORV block valve closure is an integral part of plant emergency operating procedures (including breaker operations to fail a PORV closed in the event of fire induced damage).

### ***Conclusions***

Evaluation Zone G contains cables that could impact a PORV and its redundant block valve. **Cables are separated by 25 feet, which is greater than the 10-foot separation specified in the July 1985 exemption.** Local manual operation of PORV PCV-102-2 breaker at MCC 4B1 ensures compliance with Section III.G.1.a of Appendix R. Therefore, safe shutdown equipment necessary to achieve and maintain hot shutdown remains available from an emergency control station.

### **Final Evaluation Results and Conclusions**

The evaluation concluded that while there are a large number of cables routed in Fire Area 32, the number of cables providing redundant hot shutdown functions and requiring protection per Section III.G.2 of Appendix R (or an exemption from the requirements) is limited and adequately addressed by the current licensing basis and detailed in the FCS engineering analysis. The fire modeling and risk evaluations that were performed in support of this evaluation also confirmed that postulated fires in Fire Area 32 are limited to local damage and are not risk significant based on low combustibles and the installed suppression system. This is consistent with the conclusions reached in the July 3, 1985 exemption and associated SER that stated, "If rapid fire spread occurred prior to the arrival of the brigade, the automatic sprinkler system would actuate to suppress the fire, reduce room temperatures and protect shutdown systems."

The detailed evaluation determined that the configuration within Fire Area 32 is within the basis for the approved exemption dated July 3, 1985. The basis for the approved exemption includes:

1. Low combustible loading within the room
2. Area-wide fire detection system
3. Area-wide and dedicated cable tray automatic suppression system
4. Response by the fire brigade
5. Installed passive barriers
6. Physical configuration of redundant safe shutdown equipment/cables

With respect to the two issues identified by the NRC in the May 2000 inspection report, the following conclusions were reached:

***Redundant power cables were found to be closer than 10 feet.*** The detailed evaluations determined that while power cables of opposite divisions were routed within 10 feet of each other, **the specific power cables of concern were found to be either:**

- a) **Explicitly discussed within the July 1985 Appendix R exemption and pre-January 1985 fire protection related submittals (Evaluation Zone F), or**
- b) **Not associated with redundant hot shutdown equipment requiring separation/protection per Section III.G.2 of Appendix R (Evaluation Zone D).**

***Control cables were found to be closer than 20 feet.*** The detailed evaluations determined that control cables within Fire Area 32 were either:

- a) Not redundant hot shutdown cables requiring separation/protection per Section III.G.2 of Appendix R (Evaluation Zones AC, BC, and G), or
- b) Were directly associated with components whose power cables are routed in the same location **(and are explicitly discussed within the July 1985 exemption and pre-January 1985 fire protection relate submittals)** and whose separation from redundant cables is clearly enveloped by the July 1985 exemption (Evaluation Zones AC and BC).

This detailed technical review was performed in a deterministic manner and assumed cable failures that are beyond the original basis for the July 1985 Appendix R exemption. This was performed to provide a defense-in-depth approach that exceeded the level of detail associated with the 1985 submittals and approvals. From this review, OPPD has identified four enhancements to provide additional conservatism:

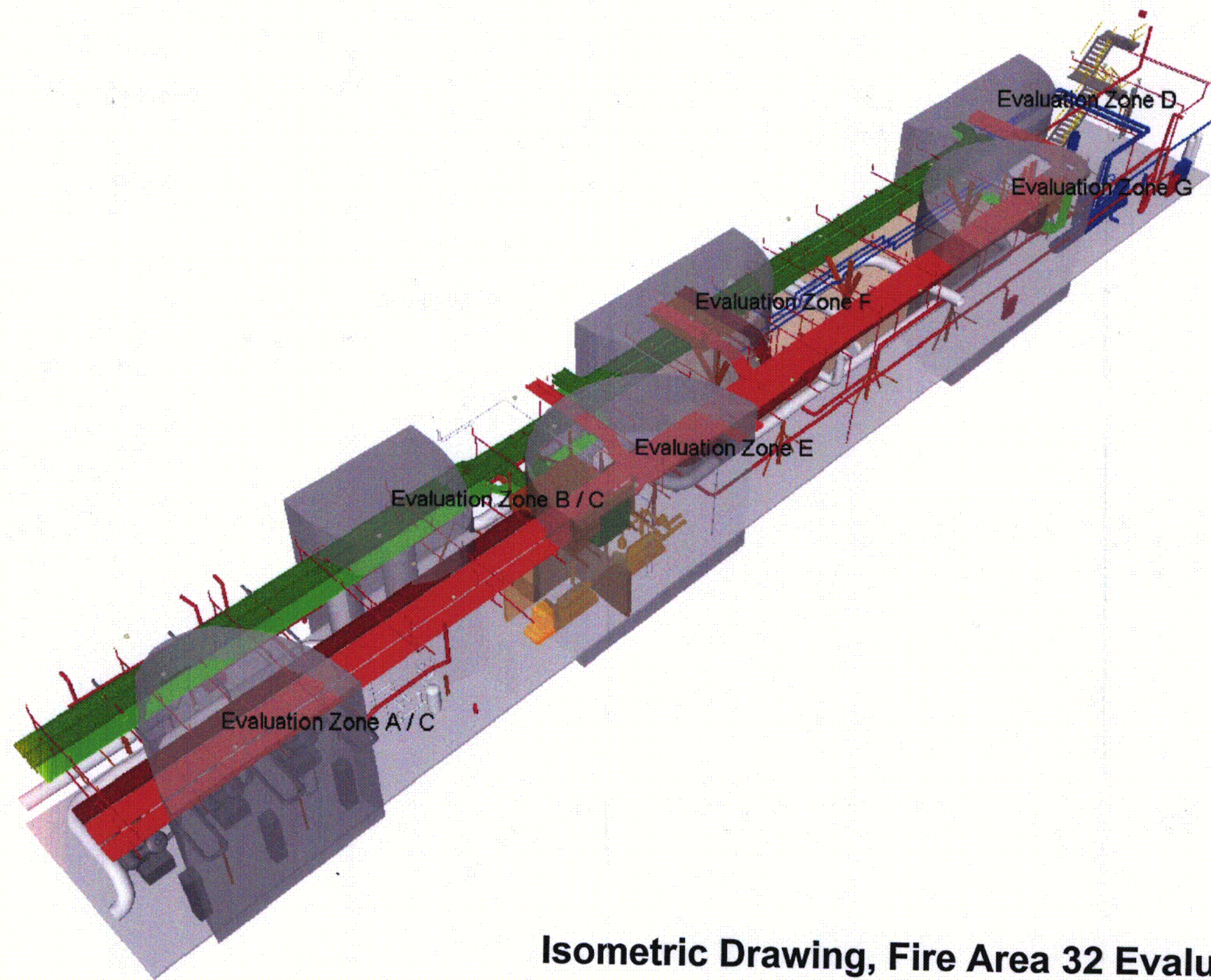
1. Procedural guidance to operators in FCS standing order SO-G-28, "Station Fire Plan," for Fire Area 32 (to supplement existing guidance) on the potential need for manual alignment of charging pump suction and isolation of a pressurizer PORV at the MCC;
2. Extension of a current cold shutdown LPSI pump power cable repair activity to include Fire Area 32;
3. Administrative restriction of transient combustibles within Fire Area 32 via FCS standing order SO-G-91, "Control and Transportation of Combustible Materials;"
4. Addition of auxiliary feedwater pump FW-54 to post-fire safe shutdown analysis and credit of its use in the event of fire in Fire Area 32 (in the unlikely event of a loss of FW-6 and FW-10). Although the protection of auxiliary feedwater pumps FW-6 and FW-10 is clearly described and documented in the Fire Area 32 licensing basis, addition of FW-54 to the post-fire safe shutdown program provides additional defense-in-depth, flexibility, and risk reduction.

These enhancements are currently being planned and will be completed in the future.

In conclusion, this analysis demonstrates that the configuration of Fire Area 32 is consistent with the approved July 1985 exemption for the area. The cables in question fall under either Sections III.G.1.a or III.G.1.b of 10 CFR 50, Appendix R and, therefore, do not require an exemption. Because no exemption is required, these cables were not discussed in the July 1985 exemption. Because these cables required no exemption, they were not discussed in any of the OPPD submittals made for the July 1985 exemption.

This submittal supports the conclusions of the July 1985 exemption granted by the NRC, clarifies the results of the January 2000 Triennial Fire Protection Inspection, and concurs with the SDP that a fire in Fire Area 32 has low safety significance and demonstrates that this area is in compliance with the July 1985 exemption.





C01  
**Figure 2**  
**Isometric Drawing, Fire Area 32 Evaluation Zones**

**THIS PAGE IS AN  
OVERSIZED DRAWING OR  
FIGURE,  
THAT CAN BE VIEWED AT THE  
RECORD TITLED:  
"FIRE AREA 32  
APPENDIX R CABLE  
LOCATIONS",  
FIGURE 1**

**WITHIN THIS PACKAGE**

**NOTE:** Because of these page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.

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