

September 11, 2001

EA 01-223

Mr. Douglas E. Cooper  
Site Vice President  
Palisades Nuclear Plant  
Nuclear Management Company, LLC  
27780 Blue Star Memorial Highway  
Covert, MI 49043-9530

SUBJECT: PALISADES TRIENNIAL FIRE PROTECTION BASELINE INSPECTION - NRC  
INSPECTION REPORT 50-255/01-08(DRS) AND PRELIMINARY WHITE  
FINDING

Dear Mr. Cooper:

On July 27, 2001, the NRC discussed with you and members of your staff the preliminary results of a fire protection triennial baseline inspection at the Palisades Nuclear Plant. The inspection was completed when the final results were subsequently discussed by telephone with members of your staff on August 17, 2001. The enclosed report presents the results of that inspection.

The inspection examined the effectiveness of activities conducted under your license as they related to implementation of your NRC approved Fire Protection Program. The inspection consisted of a selected examination of design drawings, calculations, analyses, procedures, audits, field walkdowns, and interviews with personnel.

This report discusses an issue that appears to have low to moderate safety significance. As described in Section 1R05.10.b(1) of this report, smoke detectors in the northwest portion of the cable spreading room were not located and installed in accordance with the applicable National Fire Protection Association code. This issue was assessed using the applicable SDP as a potentially safety significant finding that was preliminarily determined to be White, an issue with low to moderate safety significance that may result in additional NRC inspection. This issue is of apparent low to moderate safety significance because detection of a fire in the northwest portion of the cable spreading room may be delayed. As a result, sufficient damage to cabling could occur before the fire would be extinguished. The affiliated damage could require a shutdown of the plant from outside the control room, significantly increasing the complexity of manual actions required to achieve safe shutdown.

This smoke detector issue is an apparent violation of NRC requirements and is being considered for escalated enforcement action in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions" (Enforcement Policy), NUREG-1600. The current Enforcement Policy is included on the NRC's website at [www.nrc.gov/OE](http://www.nrc.gov/OE).

Before the NRC makes a final decision on this matter, we are providing you an opportunity to request a Regulatory Conference where you would be able to provide your perspectives on the significance of the finding, the bases for your position, and whether you agree with the apparent violation. If you choose to request a Regulatory Conference, we encourage you to submit your evaluation and any differences with the NRC evaluation at least one week prior to the conference in an effort to make the conference more efficient and effective. If a conference is held, it will be open for public observation. The NRC will also issue a press release to announce the conference.

Please contact Mr. Ronald N. Gardner at (630) 829-9751 within seven days of the date of this letter to notify the NRC of your intentions. If we have not heard from you within ten days, we will continue with our significance determination and enforcement decision and you will be advised by separate correspondence of the results of our deliberations on this matter.

Since the NRC has not made a final determination in this matter, no Notice of Violation is being issued for this inspection finding at this time. In addition, please be advised that the number and characterization of apparent violations described in the enclosed inspection report may change as a result of further NRC review.

Additionally, based on the results of this inspection, the inspectors identified two issues of very low safety significance (Green). Both issues were determined to involve violations of NRC requirements. However, because of their very low safety significance and because they have been entered into your corrective action program, the NRC is treating these issues as Non-Cited Violations, in accordance with Section VI.A.1 of the NRC's Enforcement Policy. If you deny these Non-Cited Violations, you should provide a response with the basis for your denial, within 30 days of the date of this inspection report to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Palisades Nuclear Plant.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your responses will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/NRC/ADAMS/index.html> (the Public Electronic Reading Room).

Sincerely,

*/RA/*

John A. Grobe, Director  
Division of Reactor Safety

Docket No. 50-255  
License No. DPR-20

Enclosure: Inspection Report 50-255/01-08(DRS)

cc w/encl: R. Fenech, Senior Vice President, Nuclear  
Fossil and Hydro Operations  
N. Haskell, Director, Licensing and Performance Assessment  
R. Anderson, Chief Nuclear Officer, NMC  
A. Udrys, Esquire, Consumers Energy Company  
S. Wawro, Nuclear Asset Director, Consumers Energy Company  
W. Rendell, Supervisor, Covert Township  
Office of the Governor  
Michigan Department of Environmental Quality  
Department of Attorney General (MI)

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**/RA/**  
 John A. Grobe, Director  
 Division of Reactor Safety

Docket No. 50-255  
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U.S. NUCLEAR REGULATORY COMMISSION  
REGION III

Docket No: 50-255  
License No: DPR-20  
Report No: 50-255/01-08(DRS)

Licensee: Nuclear Management Company, LLC

Facility: Palisades Nuclear Plant

Location: 27780 Blue Star Memorial Highway  
Covert, MI 49043-9530

Dates: July 9 to 13, 2001 on-site  
July 23 to 27, 2001 on-site  
August 17, 2001 completed

Lead Inspector: R. Langstaff, Senior Reactor Inspector  
Mechanical Engineering Branch

Inspectors: D. Chyu, Reactor Inspector  
Electrical Engineering Branch  
  
R. Daley, Reactor Inspector  
Electrical Engineering Branch

Approved By: Ronald N. Gardner, Chief  
Electrical Engineering Branch  
Division of Reactor Safety

## SUMMARY OF FINDINGS

IR 05000255-01-08(DRS), on 07/09-08/17/2001, Nuclear Management Company, LLC, Palisades Nuclear Plant. Fire Protection Triennial.

The inspection was conducted by a team of three Region III inspectors. The inspection identified one issue preliminarily determined to be of low to moderate safety significance (White) which was an apparent violation and two Non-Cited Violations (NCVs). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609 "Significance Determination Process" (SDP). The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described at its Reactor Oversight Process website at <http://www.nrc.gov/NRR/OVERSIGHT/index.html>.

### A. Inspector-Identified Findings

#### **Cornerstone: Mitigating Systems**

- TBD. The inspectors identified that smoke detectors in the northwest portion of the cable spreading room were not located and installed in accordance with the applicable National Fire Protection Association (NFPA) code. The smoke detector located in that area was not adequately evaluated to consider the effects of installed ventilation on the detector's performance and would not be able to quickly detect a fire, as required. The failure to have adequate detector placement in the area is an apparent violation of the Palisades operating license.

This issue has been preliminarily determined to have low to moderate safety significance (White). As a result of the inadequate detector placement, detection of a fire in the northwest portion of the cable spreading room could be delayed and sufficient cable damage could occur which would require a shutdown of the plant from outside the control room, significantly increasing the complexity of manual actions required to achieve safe shutdown (Section 1R05.10.b.1).

- Green. The inspectors identified that the placement of smoke detectors for the beam pocket areas in the southern portions of the cable spreading room was not in accordance with the NFPA code. Specifically, no detector existed for the southeast beam pocket area and the detector for the southwest beam pocket area was inappropriately located in a "dead air space." The failure to have adequate detector placement in this area is a violation of the Palisades operating license.

The finding was greater than minor because it affected the detection and suppression capability defense-in-depth element. As a result of the inadequate detector placement, detection of a fire in the south portion of the cable spreading room could be delayed. The finding was of very low safety significance because of the low ignition frequency. Because the finding is of very low safety significance, and the finding being captured in the licensee's corrective action system, this finding is being treated as a NCV, consistent with Section VI.A.I of the NRC Enforcement Policy (Section 1R05.10.b.2).

- Green. The inspectors identified that required area wide detection did not exist for the 1-D switchgear room. Specifically, no detectors existed in the high ceiling areas formed by vertical shaft above the cableway and the stairway. The failure to have area wide

detection is a violation of 10 CFR Part 50, Appendix R, Section III.G.3.

The finding was greater than minor because it affected the detection and suppression capability defense-in-depth element. As a result of the inadequate detector placement, detection of a fire in the 1-D Switchgear Room could be delayed. The finding was of very low safety significance because of the low ignition frequency and the mitigating equipment available which included, as a minimum, the power conversion system, make-up to the condensate storage tank, and recovery of auxiliary feedwater. Because the finding is of very low safety significance, and the finding being captured in the licensee's corrective action system, this finding is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (Section 1R05.10.b.3).

## Report Details

Summary of Plant Status: The unit was shut down during the inspection period.

### 1. REACTOR SAFETY

#### **Cornerstones: Initiating Events and Mitigating Systems**

##### 1R05 Fire Protection (71111.05)

The purpose of this inspection was to review the Palisades Nuclear Plant fire protection program for selected risk-significant fire areas. Emphasis was placed on verifying that the post-fire safe shutdown capability and the fire protection features were maintained free of fire damage to ensure that at least one post-fire safe shutdown success path was available. The inspection was performed in accordance with the NRC regulatory oversight process using a risk-informed approach for selecting the fire areas and attributes to be inspected. The lead inspector used the Palisades Individual Plant Examination for External Events (IPEEE) to choose several risk-significant areas for detailed inspection and review. The fire areas chosen for review during this inspection were:

- Fire Area 2 Cable Spreading Room
- Fire Area 3 1-D Switchgear Room
- Fire Area 23 Turbine Building

For each of these fire areas, the inspection was focused on the fire protection features, the systems and equipment necessary to achieve and maintain safe shutdown conditions, determination of license commitments, and changes to the fire protection program.

##### .1 Systems Required to Achieve and Maintain Post-Fire Safe Shutdown

10 CFR Part 50, Appendix R, Section III.G.1, required the licensee to provide fire protection features that were capable of limiting fire damage to structures, systems, and components important to safe shutdown. The structures, systems, and components that were necessary to achieve and maintain post-fire safe shutdown were required to be protected by fire protection features that were capable of limiting fire damage to the structures, systems, and components so that:

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

Specific design features for ensuring this capability were specified by 10 CFR Part 50, Appendix R, Section III.G.2.



a. Inspection Scope

The inspectors reviewed the plant systems required to achieve and maintain post-fire safe shutdown to determine if the licensee had properly identified the components and systems necessary to achieve and maintain safe shutdown conditions for each fire zone selected for review. Specifically, the review was performed to determine the adequacy of the systems selected for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring, and support system functions. This review included the fire protection safe shutdown analysis.

The inspectors also reviewed the operators' ability to perform the necessary manual actions for achieving safe shutdown including a review of procedures, accessibility of safe shutdown equipment, and the available time for performing the actions.

The inspectors reviewed the updated final safety analysis report and the licensee's engineering and/or licensing justifications (e.g., NRC guidance documents, license amendments, technical specifications, safety evaluation reports, exemptions, and deviations) to determine the licensing basis.

b. Findings

No findings of significance were identified.

.2 Fire Protection of Safe Shutdown Capability

10 CFR Part 50, Appendix R, Sections III.G.2, required separation of cables and equipment and associated circuits of redundant trains by a fire barrier having a three hour rating. If the requirements cannot be met, then alternative or dedicated shutdown capability and its associated circuits, independent of cables, systems or components in the area, room, or zone under consideration should be provided (Section III. G.3).

a. Inspection Scope

For each of the selected fire areas, the inspectors reviewed the licensee's safe shutdown analysis to ensure that at least one post-fire safe shutdown success path was available in the event of a fire. This included a review of manual actions required to achieve and maintain hot shutdown conditions and make the necessary repairs to reach cold shutdown within 72 hours. The inspectors also reviewed procedures to verify that adequate direction was provided to operators to perform these manual actions. Factors, such as timing, access to the equipment, and the availability of procedures, were considered in the review.

The inspectors also evaluated the adequacy of fire suppression and detection systems, fire area barriers, penetration seals, and fire doors to ensure that at least one train of safe shutdown equipment was free of fire damage. To do this, the inspectors observed the material condition and configuration of the installed fire detection and suppression systems, fire barriers, and construction details and supporting fire tests for the installed fire barriers. In addition, the inspectors reviewed license documentation, such as deviations, detector placement drawings, fire hose station drawings, carbon dioxide pre-operational test reports, smoke removal plans, fire hazard analysis reports, safe

shutdown analysis, and National Fire Protection Association (NFPA) codes to verify that the fire barrier installations met license commitments.

b. Findings

No findings of significance were identified.

.3 Post-fire Safe Shutdown Circuit Analysis

10 CFR Part 50, Appendix R, Section III.G.1, required that structures, systems, and components important to safe shutdown be provided with fire protection features capable of limiting fire damage to ensure that one train of systems necessary to achieve and maintain hot shutdown conditions remained free of fire damage. Options for providing this level of fire protection were delineated in 10 CFR Part 50, Appendix R, Section III.G.2. Where the protection of systems whose function was required for hot shutdown did not satisfy 10 CFR Part 50, Appendix R, Section III.G.2, an alternative or dedicated shutdown capability and its associated circuits, was required to be provided that was independent of the cables, systems, and components in the area. For such areas, 10 CFR Part 50, Appendix R, Section III.L.3, specifically required the alternative or dedicated shutdown capability to be physically and electrically independent of the specific fire areas and capable of accommodating post-fire conditions where offsite power was available and where offsite power was not available for 72 hours.

a. Inspection Scope

On a sample basis, the inspectors investigated the adequacy of separation provided for the power and control cabling of redundant trains of shutdown equipment. This investigation focused on the cabling of selected components in systems important for safe shutdown. The inspectors' review also included a sampling of components whose inadvertent operation due to fire may adversely affect post-fire safe shutdown capability. The purpose of this review was to determine if a single exposure fire, in one of the fire areas selected for this inspection, could prevent the proper operation of both safe shutdown trains. The inspectors performed this review for the following components:

72-01	Shunt trip push button
PRV 1042B & 1043B	Pressurizer power operated relief valves
MO 1042A	Pressurizer relief isolation valve
MO 2087	Volume control tank outlet valve
MO 2160	Safety injection refueling water tank to charging pump valve
MO 2140	Boric acid pumped feed valve
MO 2169 & 2170	Boric acid gravity feed valves
MO 3015	Shutdown cooling motor operated valve
CV 2117	Pressurizer auxiliary spray valve

b. Findings

No findings of significance were identified.

.4 Alternative Safe Shutdown Capability

10 CFR Part 50, Appendix R, Section III.G.1, required that structures, systems, and components important to safe shutdown be provided with fire protection features capable of limiting fire damage to ensure that one train of systems necessary to achieve and maintain hot shutdown conditions remained free of fire damage. Options for providing this level of fire protection were delineated in 10 CFR Part 50, Appendix R, Section III.G.2. Where the protection of systems whose function was required for hot shutdown did not satisfy 10 CFR Part 50, Appendix R, Section III.G.2, an alternative or dedicated shutdown capability independent of the area under consideration was required to be provided. Additionally, alternative or dedicated shutdown capability must be able to achieve and maintain hot standby conditions and achieve cold shutdown conditions within 72 hours and maintain cold shutdown conditions thereafter. During the post-fire safe shutdown, the reactor coolant process variables must remain within those predicted for a loss of normal alternating current (AC) power, and the fission product boundary integrity must not be affected (i.e., no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary).

a. Inspection Scope

The inspectors reviewed the licensee's systems required to achieve alternative safe shutdown to determine if the licensee had properly identified the components and systems necessary to achieve and maintain safe shutdown conditions. The inspectors also focused on the adequacy of the systems to perform reactor pressure control, reactivity control, reactor coolant makeup, decay heat removal, process monitoring, and support system functions.

b. Findings

No findings of significance were identified.

.5 Operational Implementation of Alternative Shutdown Capability

10 CFR Part 50, Appendix R, Section III.L.2.d, required that the process monitoring function should be capable of providing direct readings of the process variables necessary to perform and control the functions necessary to achieve reactivity control, reactor coolant makeup, and decay heat removal.

a. Inspection Scope

The inspectors performed a walkdown of a sample of the actions defined in procedure ONP-25.2, "Alternate Safe Shutdown Procedure," which was the procedure for performing a plant alternative shutdown from outside the control room. The inspectors verified that operators could reasonably be expected to perform the procedure actions within the identified applicable plant shutdown time requirements and that equipment labeling was consistent with the procedure.

The inspectors' reviews of the adequacy of communications and emergency lighting associated with these procedures are documented in Sections 1R05.6 and 1R05.7 of this report.

b. Findings

No findings of significance were identified.

.6 Communications

For a fire in an alternative shutdown fire area such as the cable spreading room, control room evacuation is required and a shutdown is performed from outside the control room. Radio communications are relied upon to coordinate the shutdown of both units and for fire fighting and security operations. 10 CFR Part 50, Appendix R, Section III.H., required that equipment provided for the fire brigade include emergency communications equipment.

a. Inspection Scope

The inspectors reviewed the adequacy of the communication system to support plant personnel in the performance of alternative safe shutdown functions and fire brigade duties.

b. Findings

No findings of significance were identified.

.7 Emergency Lighting

10 CFR Part 50, Appendix R, Section III.J., required that emergency lighting units with at least an eight-hour battery power supply be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

a. Inspection Scope

The inspectors performed a walkdown of a sample of the actions defined in Procedure ONP-25.2, "Alternate Safe Shutdown Procedure." As part of the walkdowns, the inspectors verified that sufficient emergency lighting existed for access and egress to areas and for performing necessary equipment operations. The inspectors verified that testing of emergency lighting for the remote shutdown panel and charging pump areas ensured a minimum of eight hours of emergency lighting.

b. Findings

No findings of significance were identified.

.8 Cold Shutdown Repairs

10 CFR Part 50, Appendix R, Section III.L.5, required that equipment and systems comprising the means to achieve and maintain cold shutdown conditions should not be damaged by fire; or the fire damage to such equipment and systems should be limited so that the systems can be made operable and cold shutdown achieved within 72 hours. Materials for such repairs shall be readily available onsite and procedures shall be in effect to implement such repairs.

a. Inspection Scope

The inspectors reviewed the licensee's procedures to determine if any repairs were required to achieve cold shutdown. The inspectors determined that the licensee did require repair of some equipment to reach cold shutdown based on the safe shutdown methods used. The inspectors reviewed the procedures for adequacy.

b. Findings

No findings of significance were identified.

.9 Fire Barriers and Fire Zone/Room Penetration Seals

10 CFR Part 50, Appendix R, Section III.M, required that penetration seal designs be qualified by tests that are comparable to tests used to rate fire barriers.

a. Inspection Scope

The inspectors reviewed the test reports for three-hour rated barriers installed in the plant and performed visual inspections of selected barriers to ensure that the barrier installations were consistent with tested configuration.

b. Findings

No findings of significance were identified.

.10 Fire Protection Systems, Features, and Equipment

a. Inspection Scope

The inspectors reviewed the material condition, operations lineup, operational effectiveness, and design of fire detection systems, fire suppression systems, manual fire fighting equipment, fire brigade capability, and passive fire protection features. The inspectors reviewed deviations, detector placement drawings, fire hose station drawings, carbon dioxide pre-operational test reports, and fire hazard analysis reports to ensure that selected fire detection systems, sprinkler systems, portable fire extinguishers, and hose stations were installed in accordance with their design, and that their design was adequate given the current equipment layout and plant configuration.

b. Findings

b.1 Smoke Detectors for Cable Spreading Room - Northwest Portion

A violation of the Palisades Nuclear Plant operating license was identified for inadequate placement of smoke detectors in the northwest portion of the cable spreading room. The inadequate placement of smoke detectors would result in delayed detection of a fire for certain equipment in the room. The finding was preliminarily determined to be of low to moderate safety significance (White) and is being tracked as an apparent violation (AV).

(a) Issue Description

The cable spreading room ceiling area was physically divided into a number of different areas by a 30 inch deep concrete beam and Marinite board partitions having an approximate four foot depth from the ceiling. One beam pocket with an approximate area of 575 square feet was formed in the northwest portion of the ceiling due to the concrete beam and installed Marinite board. For this beam pocket area, there was only one smoke detector, detector U236, which was located on the ceiling. The spacing and placement of the detector met nominal spacing requirements which applied for cases for which there was no air flow. However, there was a relatively high average air change out rate for the room of approximately one room volume every three minutes. In addition, detector U236 was located above the ventilation return intakes for the room. The ventilation return intakes had an approximate combined air intake of 10,000 cubic feet per minute and were located mid-way between the floor and ceiling of the room. As such, the nominal detector spacing requirements did not apply to the northwest portion of the cable spreading room.

The documented evaluation of this fire area's fire detection system (Palisades Engineering Analysis EA-APR-95-033) considered ventilation effects for the cable spreading room. The evaluation stated that "the detectors are located away from any direct airflow that could possibly dilute smoke before reaching the detectors." The inspectors agreed that airflow in the upper portion of the room (where the room smoke detectors were located) was minimal due to obstructions formed by cable trays and Marinite board partitions. However, there was considerable airflow in the lower portion of the room (where the majority of potential ignition sources were located) which would dilute smoke. Additionally, the ventilation return intakes were located approximately mid-way between the floor and ceiling which tend to draw in smoke from a fire located near or below the intakes. In a "Palisades Fire Protection Code Interpretation Summary," which the licensee provided to the inspectors during the inspection, the licensee stated that "The Palisades staff agree that detection in this area of the cable spreading room could be affected by the ventilation related airflows in the area."

The cable spreading room contained electrical cabinets and cables from both safety related divisions. The electrical cabinets contained transformers, inverters, battery chargers, breakers, or instrumentation. Two load centers, five motor control centers, and two 125 Vdc buses were located in the room. The cabling was located primarily in cable trays suspended above the electrical cabinets that were generally stacked three to four trays high. The majority of cable trays were of the ladder type construction without a solid top or bottom and were filled to capacity with electrical cables. The cable trays

were typically separated by six inches to a foot of vertical clearance between stacked trays. This overall tray arrangement was present throughout the room, and made it impossible to see the ceiling in all but a few areas of the room.

The northwest area of the room included two 480 volt motor control centers, two battery chargers, two inverters, and the control room instrument AC distribution panel in addition to other electrical cabinets. Detection of a fire by the single smoke detector in the northwest area of the cable spreading room would have been significantly delayed due to dilution of smoke (due to the high ventilation air change out rate) and intake of smoke into the ventilation return intakes located between the electrical cabinets (including battery chargers) and the ceiling (where the detector was located). The inspectors noted that the battery chargers and inverters had ventilation openings in the cabinets which would have allowed a fire to propagate beyond the individual cabinets. Additionally, a cable tray was located approximately one foot above the ventilation openings. Cables to and from the instrument AC distribution panel ran through the same cable tray. One of the two 480 volt motor control centers was also located near the instrument AC distribution panel.

The cable spreading room contained a wet pipe sprinkler system for automatic suppression. However, sprinkler heads were only installed near the ceiling above the cable trays. There were no sprinkler heads in the vertical clearances between cable trays nor were there any sprinkler heads below the cable trays and other obstructions in the room. Consequently, the sprinkler system would only be effective for extinguishing a fire in the upper cable trays. The inspectors noted that, due to density of cable trays, it was not possible to see the ceiling from standing on the floor in all but a few areas of the room. The safety evaluation report (SER) for amendment number 42 to the Palisades Plant Operating License, dated September 1, 1978, stated that the "lower levels of cable trays may be shielded from water extinguishant from the sprinkler system, allowing continuation of the fire." The SER also noted that "Manual suppression capability will be adequate to suppress fires in lower trays that may be shielded from sprinkler system water." The inspectors concluded that the NRC relied upon rapid detection of fire and fire brigade capability to compensate for the inadequacies associated with the sprinkler system.

(b) SDP Phase 1

The inspectors evaluated the finding using Inspection Manual Chapter (IMC) 0609, Appendix F, "Determining Potential Risk Significance of Fire Protection and Post-fire Safe Shutdown Inspection Findings," issued February 27, 2001. The finding affected the detection and manual suppression capability defense-in-depth element. Consequently, the finding met the criteria of step 1 of phase 1 (IMC 0609, Appendix F, Figure 4-1, "Screening Process Phase 1" (Step 1)). The cable spreading room was an alternate shutdown area having redundant trains of equipment within the area. Accordingly, IMC 0609, Appendix F, Figure 4-3, was deemed to apply. The finding met the screening criteria for Figure 4-3 because detection was affected.

(c) SDP Phase 2 - Fire Scenario

The inspectors postulated that a fire would occur near the ventilation return intakes in the cable spreading room. The fire would originate from either a battery charger (with

ventilation openings), a medium voltage electrical cabinet, an electrical cabinet with ventilation openings, or transient combustibles. Detection of the fire would be significantly delayed due to smoke from the fire being drawn into the ventilation return intakes or being diluted due to the relatively high ventilation air change out rate in the room. Due to the delayed detection, the fire could grow to sufficient magnitude to damage and ignite the cables in the overhead cable trays in the vicinity. Automatic suppression would not be effective in suppressing a fire in the lower cable trays. Due to the equipment and associated cabling in the area near the ventilation return intakes, the inspectors postulated that control room instrumentation and at least one direct current bus would be lost as a result of fire-induced damage. The loss of indication and control from the control room would require performing an alternative shutdown from outside the control room.

(d) SDP Phase 2 - Calculation of Ignition Frequency

The inspectors calculated ignition frequency based on the values the licensee used for their IPEEE. The inspectors prorated the licensee's values based on an evaluation of what was in the area near the ventilation return intakes. The inspectors estimated the area affected by the finding (i.e., the area of concern) to be approximately 1/8 of the cable spreading room area. Weighting factors for the area of concern were determined as follows:

- **Battery Chargers:** There were two battery chargers in the area of concern. There were a total of four battery chargers in the cable spreading room. The weighting factor for the battery chargers was 1/2.
- **Electrical Cabinets:** The area of concern was estimated to contain approximately 1/8 of the electrical cabinets in the cable spreading room. Within the area of concern, the inspectors estimated that a fire could propagate outside of 1/3 of the electrical cabinets due to medium or high voltage, or due to ventilation openings in the cabinets. ("Fire Scenario Considerations" statements "d" and "e" of IMC 0609 Appendix F Attachment 2, "Additional Guidance for the Assessment of Findings Using SDP Entry," provided the basis for determining what types of electrical cabinets would allow a fire to propagate outside of the cabinets.) Accordingly, the weighting factor for electrical cabinets was determined to be  $1/8 \times 1/3 = 1/24$ .
- **Transient Fires Caused by Welding and Cutting:** The area of concern was approximately 1/8 of the room area and the weighting factor was determined to be 1/8 accordingly.
- **Cable Fires Caused by Welding:** The area of concern was approximately 1/8 of the room area and the weighting factor was determined to be 1/8 accordingly.
- **Transient Combustibles:** The area of concern was approximately 1/8 of the room area and the weighting factor was determined to be 1/8 accordingly.

The licensee IPEEE ignition frequency values for the cable spreading room, the weighting factors applied by the inspectors, and the resulting ignition frequency for the area of concern for each ignition sources were as follows:



Ignition Source	Cable Spreading Room (ignition frequency per year) IPEEE value	Weighting Factor for Area of Concern	Area of Concern (ignition frequency per year)
Battery Chargers	$2.700 \times 10^{-3}$	1/2	$1.350 \times 10^{-3}$
Electrical Cabinets	$3.200 \times 10^{-3}$	1/24	$0.133 \times 10^{-3}$
Transient fires caused by welding and cutting	$0.775 \times 10^{-3}$	1/8	$0.097 \times 10^{-3}$
Cable fires caused by welding	$0.128 \times 10^{-3}$	1/8	$0.016 \times 10^{-3}$
Transient Combustibles	$0.130 \times 10^{-3}$	1/8	$0.016 \times 10^{-3}$
Total			$1.612 \times 10^{-3}$

The calculated ignition frequency (IF) for the area of concern was  $1.612 \times 10^{-3}$  per year.

(e) SDP Phase 2 - Calculation of Fire Mitigation Frequency

The inspectors calculated the fire mitigation frequency (FMF) as follows:

- Fire Barrier Effectiveness (FB): The cable spreading room was an alternate shutdown area and there were no fire barriers which protected redundant trains of safe shutdown equipment. Based on review of IMC 0609, Appendix F, Table 5.1, "Quantification of Degradation Ratings (DR) of the Individual DID Elements," the inspectors determined that  $FB = 0$ .
- Manual Fire Fighting Effectiveness (MS): Manual fire fighting effectiveness was determined to be moderately degraded due to inadequate detector placement and weaknesses associated with the pre-fire plan. Detector placement deficiencies, which would delay early detection of a fire thereby delaying fire brigade response, were discussed as part of the fire scenario. With regard to the fire brigade, the licensee regularly conducted drills and observed response times were well under 15 minutes upon notification of a fire. However, the pre-fire plan for the cable spreading room was less than comprehensive and did not establish minimum guidance to support fire fighting operations. The cable spreading room pre-fire plan provided information on general hazards in the room and location of nearby fire fighting equipment. However, the pre-fire plan did not identify fire suppression agents best suited for extinguishing the fires associated with the fire hazards in the area, information on ventilation systems for the area for smoke management, nor information on where the shutoff valve for the sprinkler system was located. With respect to ventilation systems, there were a number of strong ventilation paths in the cable spreading room which could impact fire fighting. During a fire drill conducted on August 1, 2001, fire brigade members used an emergency ventilation system for ventilating the room. However, neither the existence nor the operation of the emergency ventilation

system was described by the pre-fire plan. In addition, during the drill, fire brigade members simulated closing the sprinkler isolation valve to the 1D switchgear room instead of the cable spreading room as intended. The valve location was not shown on the pre-fire plan. Based on this finding and the guidance outlined in IMC 0609, Appendix F, Attachment 2, for fire drills and exercises, the inspectors determined that the defense-in-depth element for manual fire fighting effectiveness was moderately degraded. The inspectors determined that MS = -0.5 consistent with IMC 0609, Appendix F, Table 5.1.

- Automatic Fire Suppression Effectiveness (AS): Automatic suppression effectiveness was determined to be moderately degraded because the sprinkler heads were located only at the ceiling. The majority of sprinkler heads were obstructed by a heavy population of cable trays with no sprinkler heads located below the obstructions. The sprinkler system would not be fully effective for suppressing a fire in the lower cable trays. Based on review of IMC 0609, Appendix F, Table Table 5.1, the inspectors determined that AS = -0.75.
- Dependencies and Common Cause Contributions (CC): Based on review of IMC 0609, Appendix F, Tables 5.2 and 5.3, the inspectors did not identify any dependencies or common cause contributions. Accordingly, CC = 0.

The inspectors calculated the Fire Mitigation Frequency as follows:

$$\begin{aligned}
 \text{FMF} &= \log_{10}(\text{IF}) + \text{FB} + \text{MS} + \text{AS} + \text{CC} \\
 &= \log_{10}(1.612 \times 10^{-3}) + 0 + -0.5 + -0.75 + 0 \\
 &= -2.79 + 0 + -0.5 + -0.75 + 0 \\
 &= -4.04
 \end{aligned}$$

(f) SDP Phase 2 - Calculation of Estimated Likelihood Rating

Based on review of IMC 0609, Appendix F, Table 5.4, the inspectors determined that the fire mitigation frequency correlated to an approximate frequency of 1 per  $10^4$  to  $10^5$  years. The finding associated with the detectors had existed since the detectors had been installed in 1979. Based on review of IMC 0609, Appendix F, Table 5.5, the inspectors determined that the estimated likelihood rating was “E.”

(g) SDP Phase 2 - Calculation of Mitigation Credit and Preliminary Significance Determination

Based on review of the text associated with IMC 0609, Appendix F, Figure 4-3, and IMC 0609, Appendix F, Attachment 1, Example 1C, the inspectors determined that -1 point credit for post-fire safe shutdown operation was applicable. Based on review of IMC 0609, Appendix F, Table 5.6, “Risk Significance Estimation Matrix,” the inspectors preliminarily determined that the finding was characterized as having low to moderate safety significance (White).

(h) Regulatory Requirements and Potential Enforcement

Section 2.C(3) of the operating license for the Palisades Nuclear Plant, License DPR 20, required, in part, that the licensee implement and maintain in effect all provisions of the approved fire protection programs as described in the Final Safety Analysis Report (FSAR). FSAR Section 9.6.2, "Design Basis," stated, in part, that fire protection at the Palisades Nuclear Plant used a defense-in-depth concept of design to provide a high degree of safety. The plant fire protection program was designed to prevent fires, detect and suppress quickly any fire that did occur, limit the damage, and prevent safety-related functions and systems from being interrupted. FSAR Section 9.6.3.1, "System Description," stated, in part, that detectors were located and installed in accordance with the guidance of National Fire Protection Association (NFPA) code 72E-1974, "Automatic Fire Detectors." Section 4-4.1 of NFPA 72E-1974, stated that spacing of smoke detectors shall result from an evaluation based upon engineering judgment supplemented, if feasible, by field tests. In addition, ceiling shape and surfaces, ceiling height, configuration of contents, burning characteristics of the stored combustibles, and ventilation are some of the parameters that shall be considered.

Contrary to the above, the licensee failed to adequately evaluate detector placement in accordance with the design parameters identified in the NFPA code which resulted in inadequate smoke detector placement for the northwest area of the cable spreading room. The licensee had only installed one smoke detector in the northwest portion of the cable spreading room. The placement of only one detector in the northwest portion of the cable spreading room was inadequate to quickly detect a fire in the area due to ceiling height, configuration of cable trays in the area, the location of ventilation supply registers and return intakes, and the amount of forced air flow. This finding is an apparent violation of the Palisades Nuclear Plant operating license. The licensee initiated condition report CPAL0102369 to address this finding (AV 50-255/01-08-01).

b.2 Smoke Detectors for Cable Spreading Room - South Portion

A violation of the Palisades Nuclear Plant operating license was identified for inadequate placement of smoke detectors in the south portions of the cable spreading room. The inadequate placement of smoke detectors would result in delayed detection of a fire affecting certain equipment in the room. The violation was determined to be of very low safety significance (Green) because of the relatively low ignition frequency, and this violation is being treated as a NCV.

Due to Marinite board partitions which extended approximately four feet down from the ceiling, the southern portions of the cable spreading room ceiling were effectively segregated from the other portions of the cable spreading room ceiling. The southeast portion of the cable spreading room ceiling did not have a smoke detector. The southwest portion of the cable spreading room ceiling had one detector. However, the detector was located four inches from the side of a beam and, as such, was located in a dead air space. Smoke from a fire in the southern portions of the room would have to fill the volume formed by the Marinite board partitions before being sensed by a detector in another beam pocket area. Consequently, smoke from a fire in the southern portions of the cable spreading room would not be readily detected and manual suppression would be delayed.

This failure to meet the detector placement requirements of NFPA 72E-1974 had a credible impact upon safety because smoke from a fire could accumulate in these ceiling areas and delay detection of the fire. This delay in detection would also delay any subsequent manual suppression. However, the only combustible material located below these beam pockets was electrical cabling. Smoke from any postulated electrical cabinet fires would spill into other beam pockets and activate the detectors in those pockets.

The inspectors evaluated the finding using IMC 0609, Appendix F. The finding affected the detection and manual suppression capability defense-in-depth element. Consequently, the finding met the criteria of step 1 of phase 1 (IMC 0609, Appendix F, Figure 4-1). The cable spreading room was an alternate shutdown area having redundant trains of equipment within the area. Accordingly, IMC 0609, Appendix F, Figure 4-3, was deemed to apply. The finding met the screening criteria for Figure 4-3 because detection was affected.

The inspectors determined that the ignition frequency for transient related ignition sources was the principal contributor for this issue as shown below. In comparison, the inspectors considered the contribution towards the ignition frequency from electrical cables to be negligible. The inspectors estimated that the area of concern for this finding was less than 1/10 of the area for the cable spreading room. The inspectors calculated the ignition frequency as follows (similar to that described in Section 1R05.10.b.1(d)):

Ignition Source	Cable Spreading Room (ignition frequency per year) IPEEE value	Weighting Factor for Area of Concern	Area of Concern (ignition frequency per year)
Transient fires caused by welding and cutting	$7.75 \times 10^{-4}$	1/10	$0.78 \times 10^{-4}$
Cable fires caused by welding	$1.28 \times 10^{-4}$	1/10	$0.13 \times 10^{-4}$
Transient Combustibles	$1.30 \times 10^{-4}$	1/10	$0.13 \times 10^{-4}$
Total			$1.04 \times 10^{-4}$

Using the same factors and reasoning applied in Section 1R05.10.b.1(e), the inspectors calculated the Fire Mitigation Frequency as follows:

$$\begin{aligned}
 \text{FMF} &= \log_{10}(\text{IF}) + \text{FB} + \text{MS} + \text{AS} + \text{CC} \\
 &= \log_{10}(1.04 \times 10^{-4}) + 0 + -0.5 + -0.75 + 0 \\
 &= -3.98 + 0 + -0.5 + -0.75 + 0 \\
 &= -5.23
 \end{aligned}$$

Based on review of IMC 0609, Appendix F, Table 5.4, the inspectors determined that the fire mitigation frequency correlated to an approximate frequency of 1 per  $10^5$  to  $10^6$

years. The finding associated with the detectors had existed since the detectors had been installed in 1979. Based on review of IMC 0609, Appendix F, Table 5.5, the inspectors determined that the estimated likelihood rating was "F." Based on review of the text associated with IMC 0609, Appendix F, Figure 4-3, and IMC 0609, Appendix F, Attachment 1, Example 1C, the inspectors determined that -1 point credit for post-fire safe shutdown operation was applicable. Based on review of IMC 0609, Appendix F, Table 5.6, the inspectors determined that the finding was characterized as having very low safety significance (Green).

Palisades Operating License Section 2.C.(3) required the licensee to implement and maintain in effect all provisions of the approved fire protection program as described in the FSAR. FSAR Section 9.6.3.1 stated, "These detectors were located and installed in accordance with the guidance of NFPA 72E-1974." Section 4-4.6 of NFPA 72E-1974 stated: "If the beams exceed 18 inches in depth and are more than eight feet on centers each bay shall be treated as a separate area requiring at least one detector." Appendix A of NFPA 72E-1974 required that a detector be spaced a minimum of six inches from a wall or beam so that the detector does not fall in a "dead air space." Contrary to the above, there was no detector in the beam pocket area in the southeast area of the cable spreading room and the single detector in the southwest portion of the room was located four inches from a beam in a "dead air space." Consequently, detection of a fire in these areas would be delayed.

This violation is associated with an inspection finding that is characterized by the SDP as having very low safety significance (Green) and is being treated as a NCV consistent with Section VI.A.1 of the NRC Enforcement Policy. This violation was entered into the licensee's corrective action program as condition report CPAL0102430 (NCV 50-255/01-08-02).

### b.3 Smoke Detectors for the 1-D Switchgear Room

A violation of 10 CFR Part 50, Appendix R, Section III.G.3 was identified for failure to provide full area detection in the 1-D switchgear room, fire area 3. The inadequate placement of smoke detectors would result in delayed detection of a fire for certain areas of the room. The violation was determined to be of very low safety significance (Green) due to the low ignition frequency and mitigating equipment available and this violation is being treated as a NCV.

A cableway running between the 1-D switchgear room and the north cable penetration room contained a vertical shaft with high ceiling area in excess of ten feet above the 1-D switchgear room ceiling. Additionally, a stairway leading up to the control room viewing gallery from the 1-D switchgear room also existed. The stairway also formed a high ceiling area which was in excess of ten feet above the 1-D switchgear ceiling. The stairwell and cableway containing the vertical shaft was part of fire area 3. The smoke detectors in the area were located on the ceiling of the 1-D switchgear room or at the same ceiling elevation of the cableway. Neither the stairwell nor the vertical shaft above the cableway contained a smoke detector. Consequently, smoke from a fire in the stairwell area or in the cableway area below the vertical shaft would rise to and accumulate in the high ceiling areas. The smoke would not be readily detected by the smoke detectors in the area.

The licensee provided the inspectors with an engineering evaluation, dated July 18, 1989, as a justification for not having a smoke detector in the vertical shaft with a high ceiling area above the cableway. The evaluation stated that the high ceiling area was a dead air space that was relatively warm and, as such, sufficient stratification would occur to prevent the rise of smoke from a smoldering fire into the high ceiling area. A fire of sufficient size to drive smoke up into the high ceiling area would be large enough to cause other indications (such as strange readings in the control room). The evaluation also stated that the stacking of cable trays would tend to channel smoke to existing detectors. The inspectors disagreed with the licensee's evaluation. Although stratification could occur, potential stratification did not eliminate the requirement for detectors on high ceiling areas. NFPA 72E-1974 required a staggered detector arrangement to address stratification. The purpose of having detection was to detect a fire before significant damage (such as that which would provide strange readings in the control room) would occur. The inspectors noted that there was a detector in the cableway (not in the high ceiling area) and there were detectors in the 1-D switchgear room. However, while the licensee's evaluation for the high space area presumed channeling of smoke in the lower cable trays, no detectors were placed between cable trays. Additionally, smoke from a fire in the upper tray would not channel as the licensee assumed in their evaluation, but would instead rise directly into the high ceiling area. This would also be the case for smoke from a lower tray fire that rose around the side of the trays. Consequently, the inspectors concluded that the licensee's evaluation did not provide an adequate technical basis for not having a detector in the high ceiling area formed by the vertical shaft above the cableway.

With regard to the stairwell area, the licensee had not previously performed an evaluation prior to the inspection to justify not having a smoke detector in the high ceiling area formed by the stairwell. During the course of the inspection, the licensee had also stated that the air in the stairwell would become stratified. However, the licensee had not identified any sources of heat which would cause the air to become stratified. As was similar to the case for the vertical shaft above the cableway, the licensee had not presented an adequate technical basis for not having a detector in the high ceiling area formed by the stairway.

The inspectors evaluated the finding using IMC 0609, Appendix F. The finding affected the detection and manual suppression capability defense-in-depth element. Consequently, the finding met the criteria of Step 1 of Phase 1 (IMC 0609, Appendix F, Figure 4-1). The 1-D switchgear room was an alternate shutdown area having redundant trains of equipment within the area. Accordingly, IMC 0609, Appendix F, Figure 4-3, was deemed to apply. The finding met the screening criteria for Figure 4-3 because detection was affected.

The inspectors considered the area of concern to be less than 1/10 of the area of the 1-D switchgear room. Based on review of information from the licensee's IPEEE, the inspectors estimated the ignition frequency as follows:

Ignition Source	1D Switchgear Room (ignition frequency per year) IPEEE value	Weighting Factor for Area of Concern	Area of Concern (ignition frequency per year)
Transient fires caused by welding and cutting	$7.75 \times 10^{-4}$	1/10	$0.78 \times 10^{-4}$
Cable fires caused by welding	$1.27 \times 10^{-4}$	1/10	$0.13 \times 10^{-4}$
Transient Combustibles	$1.30 \times 10^{-4}$	1/10	$0.13 \times 10^{-4}$
Non-Qualified Cable	$3.02 \times 10^{-4}$	1/10	$0.30 \times 10^{-4}$
Non-Qualified Electrical Boxes	$0.64 \times 10^{-4}$	1/10	$0.06 \times 10^{-4}$
<b>Total</b>			$1.40 \times 10^{-4}$

The inspectors calculated the fire mitigation frequency as follows:

$$\begin{aligned}
 \text{FMF} &= \log_{10}(\text{IF}) + \text{FB} + \text{MS} + \text{AS} + \text{CC} \\
 &= \log_{10}(1.40 \times 10^{-4}) + 0 + -0.5 + -1.25 + 0 \\
 &= -3.85 + 0 + -0.5 + -1.25 + 0 \\
 &= -5.60
 \end{aligned}$$

Based on review of IMC 0609, Appendix F, Table 5.4, the inspectors determined that the fire mitigation frequency correlated to an approximate frequency of 1 per  $10^5$  to  $10^6$  years. The finding associated with the detectors had existed since the detectors had been installed in 1979. Based on review of IMC 0609, Appendix F, Table 5.5, the inspectors determined that the estimated likelihood rating was "F." The inspectors determined that, at a minimum, the power conversion system, make up to the condensate storage tank, and recovery of auxiliary feedwater would be available. Based on review of the Transients significance determination worksheet for Palisades and IMC 0609, Appendix F, Table 5.6, the inspectors determined that the finding was characterized as having very low safety significance (Green).

10 CFR Part 50, Appendix R, III.G.3 requires that "fire detection and a fixed fire suppression system shall be installed in the area." In regard to this requirement, Generic Letter 86-10 states, "In order to comply with these provisions, suppression and detection sufficient to protect against the hazards of the area must be installed. In this regard, detection and suppression providing less than full area coverage may be adequate to comply with the regulation. Where full area suppression and detection is not installed, licensees must perform an evaluation to assess the adequacy of partial suppression and detection to protect against the hazards in the area." Contrary to these requirements, neither of the high ceiling areas in Fire Area 3 contained smoke detectors nor was there an adequate engineering evaluation that supported not having detection.

This violation is associated with an inspection finding that is characterized by the SDP as having very low safety significance (Green) and is being treated as a NCV consistent

with Section VI.A.1 of the NRC Enforcement Policy. This violation was entered into the licensee's corrective action program as CPAL0102514 (NCV 50-255/01-08-03).

.11 Compensatory Measures

a. Inspection Scope

The inspectors conducted a review to verify that adequate compensatory measures were put in place by the licensee for out-of-service, degraded or inoperable fire protection and post-fire safe shutdown equipment, systems, or features. The inspectors also verified that short term compensatory measures were adequate to compensate for a degraded function or feature until appropriate corrective actions were taken.

b. Findings

No findings of significance were identified.

.12 Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed the corrective action program procedures and samples of corrective action documents to verify that the licensee was identifying issues related to fire protection at an appropriate threshold and entering them in the corrective action program. The inspectors reviewed selected samples of condition reports, work orders, design packages, and fire protection system non-conformance documents.

b. Findings

No findings of significance were identified.

**4. OTHER ACTIVITIES**

4OA6 Management Meeting(s)

Exit Meeting(s)

On July 27, 2001, at the conclusion of the on-site inspection activities, the inspectors presented their initial findings to Mr. P. Harden and other members of licensee management at Palisades Nuclear Plant. On August 17, 2001, the lead inspector and Mr. J. Grobe presented the final inspection results to Mr. D. Malone and Mr. P. Harden during exit meetings held by telephone. The licensee representatives acknowledged the findings presented. The inspectors identified the proprietary information reviewed during the inspection and noted that the information would be handled accordingly. The licensee did not identify any other material reviewed during the inspection as being proprietary.



## KEY POINTS OF CONTACT

### Licensee

M. Carlson, Manager, Engineering Programs

J. Ford, Manager, Engineering Programs

P. Harden, Director, Engineering

D. Malone, Director, Licensing and Performance Assessment

K. Smith, Manager, Operations

### NRC

J. Grobe, Director, Division of Reactor Safety

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

050-255/01-08-01	AV	Smoke Detectors Inadequate - Northwest Portion of Cable Spreading Room
050-255/01-08-02	NCV	Smoke Detectors Inadequate - Southern Portions of Cable Spreading Room
050-255/01-08-03	NCV	Smoke Detectors Inadequate - 1-D Switchgear Room

### Closed

050-255/01-08-02	NCV	Smoke Detectors Inadequate - Southern Portions of Cable Spreading Room
050-255/01-08-03	NCV	Smoke Detectors Inadequate - 1-D Switchgear Room

## LIST OF ACRONYMS USED

AC	Alternating Current
AV	Apparent Violation
CC	Common Cause Contribution
CFR	Code of Federal Regulations
DPR	Demonstration Power Reactor
DRS	Division of Reactor Safety
FB	Fire Barrier Effectiveness
FSAR	Final Safety Analysis Report
GL	Generic Letter
IF	Ignition Frequency
IMC	Inspection Manual Chapter
IPEEE	Individual Plant Examination of External Events
IR	Inspection Report
LLC	Limited Liability Company
MS	Manual Fire Fighting Effectiveness
NCV	Non-Cited Violation
NFPA	National Fire Protection Association
NMC	Nuclear Management Company, LLC
NRC	U.S. Nuclear Regulatory Commission
SDP	Significance Determination Process
SER	Safety Evaluation Report
TBD	To Be Determined

## LIST OF DOCUMENTS REVIEWED

The following is a list of licensee documents reviewed during the inspection, including documents prepared by others for the licensee. Inclusion on this list does not imply that NRC inspectors reviewed the documents in their entirety, but, rather that selected sections or portions of the documents were evaluated as part of the overall inspection effort.

### Calculations and Evaluations

EA-95-033	Evaluation of Fire Detection and Suppression Systems in Appendix R Alternate Shutdown Areas	January 2, 1996
EA-APR-95-001	Appendix R Safe Shutdown Equipment List and Logic Diagram	Revision 1
EA-APR-95-002	10 CFR Part 50 Safe Shutdown Circuit Analysis and Cable Selection	Revision 0
EA-APR-95-004	10 CFR Part 50 Appendix R Safe Shutdown Associated Circuits Analysis for Common Power Supply and Common Enclosure	Revision 2
EA-APR-95-006	10 CFR Part 50 Appendix R Function Requirements Analysis	Revision 2
EA-APR-95-007	10 CFR Part 50 Appendix R Fire Safe Shutdown Analysis	Revision 1
EA-APR-95-020	PCP Seal Integrity	Revision 0
EA-APR-95-025	Makeup and Secondary Side Heat Removal Under Appendix R Conditions	Revision 1
EA-APR-95-035	10 CFR Part 50 Appendix R Alternate Shutdown Battery Capacity Analysis	Revision 1
EA-APR-98-011	Technical Justification for the Use of Two (2) Hour Rated Fire Barriers Around the Battery Rooms, Auxiliary Building Stairwell, Turbine Lube Oil Room and the Boiler Rooms	May 26, 1998
EA-APR-99-001	Analysis of the Combustible Pipe Fittings in the Plant with Respect to the Appendix R Analysis	December 23, 1999
EA-DBD-1.07-002	Battery Room Temperature Rise on Loss of Ventilation	Revision 0
EA-FPP-95-013	Analysis of Combustible Loading for Fire Area 3A and B, Switchgear Room 1-D & Cableway North Penetration Room	August 27, 1996
EA-FPP-95-020	Analysis of Combustible Loading for Fire Area 2, Cable Spreading Room	September 27, 1996

EA-FPP-95-48	Evaluation of the Effects of a Fire on the Cableway Floor Located Between Switchgear Room 1-D and the North Electrical Penetration Room	January 29, 1996
EA-FPP-96-002	System Hydraulic Analysis for the 1-D Switchgear Room	Revision 0
EA-FPP-96-006	System Hydraulic Analysis for the Cable Spreading Room	December 7, 1998
EA-FPP-96-006	1-D Switchgear Room, Cableway and North Electrical Penetration Room	Revision 0
EA-PSSA-00-001	Palisades Plant Post-Fire Safe Shutdown Summary Report	Revision 1
EA-RJC-92-0248	Analysis of the Affect of a Fire on the Fire Barrier Penetration Seal Number FZ -0248	October 30, 1992
EE-P1476-001	Cable Spreading Room Fire Detection System Evaluation	Revision 0
Section 4.0	Probabilistic Safety Analysis, Fire Analysis	Revision 1
<u>Condition Reports (CPALs)</u>		
0002274	Failure of FPSP-MO-1, Fire Suppression Water System Valve Alignment, to Identify Inoperability of Fire Pump P-9A	July 2, 2000
0002662	P-41 is Inoperable Due to Failure to Meet the Acceptance Criteria of RO-52 (Fire Pump Capacity IST)	August 30, 2000
0002674	P-9B, Diesel Driven Fire Pump Does Not Meet Ro-52 Acceptance Requirements	August 31, 2000
0002706	Diesel Fire Pump Operability Determination Failed to Address FSAR Operability Requirements	September 5, 2000
0100703	Diesel Fire Pump P-9B Failed to Meet Acceptance Criteria of RO-52	March 3, 2001
0101857	Diesel Fire Pump P-9B Failed to Auto Start on Low System Pressure,	May 7, 2001
0101921	Information in NRC Evaluation of the Effects of a Fire on the West Wall of the Component Cooling Water Room Has Changed	May 14, 2001
0102301	Fire Pump Surveillance Procedure RO-52 Does Not Account for Variances in Lake Level	July 7, 2001

0102158	A Rockbestos 1-hour Fire Rated Cable for Service Water Pump P-7A Needs to Be Re-evaluated	June 18, 2001
0102286	Inadequate Documentation of Compliance Strategy for EX 13 Was Found in Appendix R Analysis	EA-APR-95-007

Condition Reports Initiated as a Result of Inspection

0102335	Fire Protection Procedure FPIP-4 Conflicts with FSAR Requirements for the Hydrostatic Testing of Former Technical Specification Fire Hose Lengths	July 10, 2001
0102337	Discrepancies Identified on the Turbine Building Pre-fire Plan Drawing	July 11, 2001
0102340	Incorrect Reference to a Procedure Section in a Compliance Strategy in EA-APR-95-007	July 11, 2001
0102350	Appendix R Analysis EA-APR-95-006 Contains Inconsistent Times for Starting of Auxiliary Feedwater Pump	July 12, 2001
0102351	Off Normal Procedure ONP-25.2, Alternate Safe Shutdown Procedure, Has Non-Conservative Initiation Time for Auxiliary Feedwater	July 12, 2001
0102369	Fire Detection in the Cable Spreading Room May Not Meet Code of Record Requirements	July 13, 2001
0102376	Pressurizer Power Relief Valve Cable Not Adequately Discussed in Appendix R Analysis and Incorrectly Shown on Schematic Diagram	July 14, 2001
0102377	Appendix R Analysis Has Incorrect Procedure Attachment Number Listed	July 14, 2001
0102379	Inadequate Documentation of Compliance Strategy for the Pressurizer Auxiliary Spray Valve CV-2117 Was Identified in the Appendix R Analysis	July 14, 2001
0102430	No Smoke Detector Is Located in the South-east End of the Cable Spreading Room	July 18, 2001
0102476	Safe Shutdown Cable for Shutdown Cooling Valve MO-3015 Is Missing in EA-APR-95-002	July 23, 2001
0102478	Plant Drawings Do Not Reflect as Build Dimensions for Cable Spreading Room Fire Protection Sprinkler System	July 23, 2001

0102501	The Desired Position of the Pressurizer Auxiliary Spray Valve CV-2117 in the Appendix R Analysis and Procedures Required Calcification	July 25, 2001
0102504	The Conclusion of the Appendix R Analysis EA-APR-95-004 Does Not Fully Incorporate the Entire Discussion in the Body of the Analysis	July 25, 2001
0102509	Appendix R Compliance Strategy for Safety Injection Outlet Valves in Various Fire Areas Is Not Fully Described in off Normal Procedure	July 26, 2001
0102514	Fire Detection in the 1D Switchgear Room May Not Meet the Code of Record Requirements	July 26, 2001
0102517	Hogging Air Ejector Operation is Not Periodically Verified	July 26, 2001
0102526	Inadequate Justification of Engineering Judgment in EA-APR-95-004	July 27, 2001
0102530	ONP25.2 Procedure Complexity and Training Ineffectiveness	July 27, 2001

Procedure Change Requests Initiated as a Result of Inspection

16843	ONP-25.2, For Certain Fire Scenarios Where the Shunt Trip Pushbuttons Are Pushed, Other Procedure Steps Are Made Unnecessary	July 11, 2001
16845	ONP-25.2, the Following Editorial Changes Are Recommended	July 11, 2001
16846	ONP-25.2, During Performance of ONP-25.2, It May Be Possible That Section 4.2 for tripping of the Primary Coolant Pumps Could Be Bypassed	July 11, 2001
16860	ONP-25.2, Step 4.6.3 Instructs the Operator to Open Breakers That Are "Not Expected to Be Used"	July 12, 2001
16873	ONP-25.2, Step 4.8.1.j Talks about Swapping the Suction of the Charging Pumps from the Boric Acid Storage Tank to the SIRW Tank	July 13, 2001
16887	ONP-25.2, Step 4.3 Directs Operator to Grab Radios as They Leave the Control Room	July 13, 2001
16950	Onp-25.2, Valve Number for MO-3015, Shutdown Cooling Return Valve Is Listed Incorrectly	July 25, 2001

## Procedures

AP 4.00	Operations Organization, Responsibilities and Conduct	Revision 23
FPSP-RM-5	Inspection and Testing of Palisades Plant Fire Dampers	Revision 2
FPIP-4	Fire Protection Systems and Fire Protection Equipment	Revision 15
FPIP-5	Requirements for Inspection and Testing of Fire Protection Systems and Fire Protection Equipment	Revision 11
FPIP-7	Fire Prevention Activities	Revision 11
ONP-20	Diesel Generator Manual Control	Revision 20
ONP-25.1	Fire Which Threatens Safety-Related Equipment	Revision 11
ONP-25.2	Alternate Safe Shutdown Procedure	Revision 17
RO-127	Auxiliary Feedwater System, 18-Month Test Procedure	Revision 4
SOP-3	Safety Injection and Shutdown Cooling System	Revision 46

## Drawings, Diagrams, and Figures

1000557	Fire Areas 1, 2, 3A and 4 Detector Location	Revision 2
E-359	Cable Spreading Room General Arrangement EL. 607'-6", Sheet 1A	Revision 11
E-359	Cable Spreading Room Tray Layout, sheet 6	Revision 10
E1	Single line Meter & relay Diagram-480 Volt Motor Control Center-Warehouse, Sheet 1	Revision BR
E1	Plant Single Line Diagram, Sheet 3	Revision 3
E1	Single Line Meter and Relay Diagram, Sheet A	Revision 6
E3	Single Line Meter and Relay Diagram 2400 Volt System, Sheet 1	Revision 47
E4	Single Line Meter and Relay Diagram 480 Volt Load Center, Sheet 1	Revision 36
E4	Single Line Meter and Relay Diagram 480 Volt Load Center, Sheet 2	Revision 27
E5	Single Line Meter and Relay Diagram 480 Volt Load Center, Sheet 2	Revision AZ

E5	Single Line Meter and Relay Diagram 480 Volt Load Center, Sheet 3	Revision 44
E5	Single Line Meter and Relay Diagram 480 Volt Load Center, Sheet 4	Revision 29
E5	Single Line Meter and Relay Diagram 480 Volt Load Center, Sheet 5	Revision 52
E5	Single Line Meter and Relay Diagram 480 Volt Load Center, Sheet 5B	Revision 10
E5	Single Line Meter and Relay Diagram 480 Volt Load Center, Sheet 5C	Revision 10
E5	Single Line Meter & Relay Diagram Radwaste System, Sheet 5D	Revision 29
E8	Single Line Meter & Relay Diagram 125V DC 120V Instrument & Preferred AC System, Sheet 1	Revision 53
E8	Single Line Meter & Relay Diagram 125V DC 120V Instrument & Preferred AC System, Sheet 2	Revision 48
E84	Schematic Diagram Pressurizer Pressure Control & Measurement Channel Instrumentation, Sheet 5	Revision 10
E130	Schematic Diagram Solenoid Operated Circuit Breaker, sheet 1	Revision 17
E133	Schematic Diagram 480 V Load Centers and Switchyard Feeders, Sheet 1	Revision 12
E154	Schematic Diagram Service Water Pumps, Sheet 1	Revision 20
E236	Schematic Diagram Shutdown Cooling Charging and Letdown Line Valves, Sheet 2	Revision 11
E241	Schematic Diagram Boric Acid Tank Motor Operated Valves	Revision 17
E242	Schematic Diagram Volume Control Shutdown Cooling and Pressure Relief MOVs, Sheet 1	Revision 23
E242	Schematic Diagram Volume Control Shutdown Cooling and Pressure Relief MOVs, Sheet 2	Revision 23
E242	Schematic Diagram Volume Control Shutdown Cooling and Pressure Relief MOVs, Sheet, 4	Revision 21
E256	Schematic Diagram Pressurizer Power Relief Valve, Sheet 1	Revision 25



E256	Schematic Diagram Pressurizer Power Relief Valve, Sheet 1A	Revision 12
E617	Connection Diagram Motor Operated Valve VOP-2087, Sheet 1A	Revision 7
E625	Wiring Diagram Battery D01, Fuse Box JL 258	Revision 7
M216	System Level Logic Diagram, sheet 27	Revision 0
M216	Component Cooling Water System Logic Diagram, Sheet 29	Revision 0
M216	Chemical and Volume Control System Logic Diagram, Sheet 30	Revision 2
M216	Chemical and Volume Control System Logic Diagram, Sheet 30	Revision 3
M216	Main Steam System Logic Diagram, Sheet 41	Revision 2
M216	Feedwater System and Condensate System Logic Diagram, Sheet 40	Revision 2
M216	Service Water System Logic Diagram, Sheet 44	Revision 1
M216	HVAC Logic Diagram, Sheet 45	Revision 0
VEN-M66	Layout System #2B and 2G, Sheet 6,	Revision3
VEN-E13AC	General Arrangements & Wiring for CL. 1E Distribution Panel #D-21A, Sheet 37	Revision 4C
VEN-E13AC	General Arrangements and Wiring for Special NEMA 4 Stainless Steel Enclosed Circuit Breaker, Sheet 38	Revision 18
VEN13	General Arrangement and Wiring for CL. 1E Distribution Panel #D-11A, Sheet 36	Revision 4C
<u>Work Orders</u>		
Work Instruction #1302	Fabrication and Installation of Cable Tray Fire Stop	December 7, 1977
<u>Correspondence</u>		
	Letter to Consumers Power Company, Certification and Documentation for the Fire Detection System	September 19, 1980
	Letter to NRC, Docket 50-255 - License DPR-20 Palisades Plant - Proposed Technical Specifications Change: Fire Protection Equipment	January 31, 1980

Letter to NRC, Docket 50-255 - License DPR-20 Palisades Plant, Fire Protection Modifications, dated	February 22, 1980
Letter to NRC, Docket 50-255 - License DPR-20 - Palisades Plant - Technical Specifications Change Request - Alternate Shutdown and Emergency Lighting Systems	November 21, 1985
Letter to NRC, NRC to Consumers Power Company, Fire Protection Rule - Alternate Safe Shutdown Capability - Sections III.G.3 and III.L of Appendix R to 10 CFR Part 50	May 26, 1983
Safety Evaluation Report for Amendment No. 60 to Provisional Operating License No. DPR-20 for the Palisades Plant,	August 21, 1980
Safety Evaluation Report for Amendment No. 64 to Provisional Operating License No. DPR-20 for the Palisades Plant	February 10, 1981
Safety Evaluation Report for Amendment No. 42 to Provisional Operating License No. DPR-20 for the Palisades Plant	September 1, 1978

Pre-Fire Plans

4	Cableway North
5	Cable Spreading Room
7	Aux. Feedwater Pump Room
19	Switchgear 1 -D
23	Turbine Building General

Modifications

FC 407-14D	Specification/Field Change for Modification 14D	January 27, 1980
Modification 2	Smoke Detector System	January 21, 1980
Modification 8	Design Basis and Criteria for Fire Door Modification	November 28, 1978
Modification 10	Fire Curtain Installation	September 19, 1980

Miscellaneous Documents

no number	System and Structure Acceptance Report - Fire Sprinkler System in Fire Areas 3, 6, and 28	January 12, 1981
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CPC-0115-024747	Palisades FPM-02, Smoke Detection System Design Verification	April 24, 1979
MI0789-0060A-TP20	Smoke Detectors in Cableway Between 1-D Switchgear Room and North Cable Penetration Room	July 18, 1989
Chapter 8	Final Safety Analysis Report - Electrical Systems	
Chapter 9.6	Final Safety Analysis Report - Fire Protection	
SDR Log 96-0476	FSAR 1208, Palisades FSAR Change	
SDR Log 96-0144	FSAR 124, Palisades FSAR Change	