UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
2443 WARRENVILLE ROAD, SUITE 210
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May 20, 2012

Mr. Vito Kaminskas
Site Vice President, Nuclear
FirstEnergy Nuclear Operating Company
Perry Nuclear Power Plant
P. O. Box 97, 10 Center Road, A-PY-A290
Perry, OH 44081-0097

SUBJECT: PERRY NUCLEAR POWER PLANT - NRC TRIENNIAL FIRE PROTECTION INSPECTION REPORT 05000440/2012008(DRS)

Dear Mr. Kaminskas:

On April 13, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed a triennial fire protection inspection at your Perry Nuclear Power Plant. The enclosed inspection report documents the inspection results, which were discussed on April 13, 2012, with Mr. E. Larson and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, five NRC-identified findings of very low safety significance were identified. The findings involved violations of NRC requirements. However, because of their very low safety significance, and because the issues were entered into your corrective action program, the NRC is treating the issues as Non-Cited Violations (NCVs) in accordance with Section 2.3.2 of the NRC Enforcement Policy.

If you contest the subject or severity of any NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001; with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission – Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector office at the Perry Nuclear Power Plant. In addition, if you disagree with the cross-cutting aspect assigned to any finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region III, and the NRC Resident Inspector at the Perry Nuclear Power Plant.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any), will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Hironori Peterson, Acting Chief
Engineering Branch 3
Division of Reactor Safety

Docket Nos. 50-440
License Nos. NPF-58

Enclosure: Inspection Report 05000440/2012008(DRS)
w/Attachment: Supplemental Information

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U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-440
License No:	NPF-58
Report No:	05000440/2012008(DRS)
Licensee:	FirstEnergy Nuclear Operating Company
Facility:	Perry Nuclear Power Plant, Unit 1
Location:	Perry, OH
Dates:	March 13, 2012 – April 13, 2012
Inspectors:	R. Langstaff, Senior Reactor Inspector, Lead M. Munir, Reactor Inspector R. Winter, Reactor Inspector
Approved by:	H. Peterson, Acting Chief Engineering Branch 3 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000440/2012008(DRS); 03/13/2012–04/13/2012; Perry Nuclear Power Plant; Routine Triennial Fire Protection Baseline Inspection.

This report covers an announced triennial fire protection baseline inspection. The inspection was conducted by Region III inspectors. Five findings were identified by the inspectors. The findings were considered Non-Cited Violations (NCVs) of NRC regulations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). The cross-cutting aspects were determined using IMC 0310, "Components Within the Cross Cutting Areas." Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Initiating Events

- Green. The inspectors identified a finding of very low safety significance and associated NCV of Technical Specifications Section 5.4.1.a for the failure to control transient combustible materials in accordance with fire protection program requirements. Specifically, the licensee failed to remove transient combustibles from the plant after they were no longer required to support a work activity. Upon discovery the licensee entered the issue into their corrective action program and removed the transient combustibles from the area.

  The inspectors determined that this finding was more than minor because the transient combustible materials were stored below safety-related Division 1 cables in cable trays and formed a credible fire scenario. This finding was of very low safety significance because the materials would not result in ignition of a fire from existing sources of heat or electrical energy. The finding did not have a cross-cutting aspect because it was isolated and not reflective of current performance. (Section 1R05.1.b(1))

Cornerstone: Mitigating Systems

- Green. The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of License Condition 2.C(6) for the failure to ensure design spray density was achieved for the Unit 1 Division 2 cable chase area. Specifically, the placement of spray nozzles for cable trays did not ensure that the design spray density specified by design calculations would be achieved. The licensee entered the issue into their corrective action program and planned to evaluate their calculation and the actual water density required.

  The inspectors determined that the finding was more than minor because the failure to ensure that the design spray density would be achieved resulted in the potential that a fire involving cable trays would not be suppressed. The finding was of very low safety significance due to a combination of low ignition frequencies for the area and only one train of equipment would be affected. The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was an original design issue and not representative of current performance. (Section 1R05.3.b(1))

- Green. The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of License Condition 2.C(6) for the failure to ensure that sprinkler piping could be drained. Specifically, the licensee failed to install sprinkler piping in accordance with the standard for sprinkler systems which required that all sprinkler pipe and fittings shall be so installed that the system may be drained. The licensee entered the issue into their corrective action program and planned to further assess existing conditions of the piping and determine what changes are needed to ensure piping is drained after a system actuation.

  The finding was determined to be more than minor because some corrosion of internal sprinkler piping was observed which could result in blockage of individual sprinkler heads or spray nozzles thereby reducing the effectiveness of the sprinkler system. This finding was of very low safety significance because the inspectors concluded that significantly less than 10 percent of the spray nozzles and sprinkler heads would be affected. This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Operating Experience, because the licensee did not evaluate relevant external operating experience. Specifically, the licensee had reviewed operating experience relating to blockage of pre-action sprinkler systems, but did not sufficiently evaluate the operating experience to recognize that it applied to the Perry Nuclear Power Plant. [P.2(a)] (Section 1R05.3.b(2))

- Green. The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of License Condition 2.C(6) for the failure to install a sequential timing device for the diesel driven fire pump. Specifically, the standard for fire pumps required that controllers for multiple pump units, such as those at the Perry Nuclear Power Plant, incorporate a sequential timing device to prevent any one pump starting simultaneously with any other pump. The licensee entered the issue into their corrective action program and initiated a modification to install a time delay for the pump.

  The inspectors determined that the finding was more than minor because the failure to install a sequential timing device for the diesel driven fire pump could result in both fire pumps starting simultaneously and a significant water hammer which could damage fire protection piping or equipment. The finding was of very low safety significance due to a combination of low ignition frequencies for the affected areas and only one train of equipment would be affected for fires in those areas. This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Self and Independent Assessments, because the licensee did not conduct a self-assessment of sufficient depth. Specifically, a self-assessment reviewed an Unresolved Item (URI) relating to this issue for another plant, but failed to identify that the Perry Nuclear Power Plant had the same configuration and requirements as described in the URI. [P.3(a)] (Section 1R05.3.b(3))

- Green. The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of License Condition 2.C(6) for the failure to provide detection throughout Fire Area 1CC-4a. Specifically, Fire Area 1CC-4a was described by the USAR as having an early warning detection system. However, the corridor area of Fire Area 1CC-4a lacked detection. The licensee entered the issue into their corrective action program and planned to evaluate a change to their detection system.

The inspectors determined that the finding was more than minor because the lack of detection in the corridor area of Fire Area 1CC-4a could result in delayed detection of a fire which, if unmitigated, could affect safety-related cables above the corridor area. The finding was of very low safety significance because the portion of Fire Area 1CC-4a which contained safety-related cables did have smoke detectors and a sprinkler/spray system. This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Self-Assessments, because the licensee did not conduct a self-assessment of sufficient depth. Specifically, a self-assessment reviewed Fire Area 1CC-4a, but did not assess the design of systems in terms of the licensing basis. [P.3(a)] (Section 1R05.3(b)(4))

B. Licensee-Identified Violations

None.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events and Mitigating Systems

1R05 Fire Protection (71111.05T)

The purpose of the fire protection triennial baseline inspection was to conduct a design based, plant specific, risk-informed, on-site inspection of the licensee's fire protection program's defense-in-depth elements used to mitigate the consequences of a fire. The fire protection program shall extend the concept of defense-in-depth to fire protection in plant areas important to safety by:

- preventing fires from starting;
- rapidly detecting, controlling and extinguishing fires that do occur;
- providing protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by fire suppression activities will not prevent the safe shutdown of the reactor plant; and
- taking reasonable actions to mitigate postulated events that could potentially cause loss of large areas of power reactor facilities due to explosions or fires.

The inspectors' evaluation focused on the design, operational status, and material condition of the reactor plant's fire protection program, post-fire safe shutdown systems, and B.5.b mitigating strategies. The objectives of the inspection were to assess whether the licensee had implemented a fire protection program that: (1) provided adequate controls for combustibles and ignition sources inside the plant; (2) provided adequate fire detection and suppression capability; (3) maintained passive fire protection features in good material condition; (4) established adequate compensatory measures for out-of-service, degraded or inoperable fire protection equipment, systems or features; (5) ensured that procedures, equipment, fire barriers and systems exist so that the post-fire capability to safely shut down the plant was ensured; (6) included feasible and reliable operator manual actions when appropriate to achieve safe shutdown; and (7) identified fire protection issues at an appropriate threshold and ensured these issues were entered into the licensee's problem identification and resolution program.

In addition, the inspectors' review and assessment focused on the licensee's post-fire safe shutdown systems for selected risk-significant fire areas. Inspector emphasis was placed on determining 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 inspectors' review and assessment also focused on the licensee's B.5.b related license conditions and the requirements of 10 CFR 50.54(hh)(2). Inspector emphasis was to ensure that the licensee could maintain or restore core cooling, containment, and spent fuel pool cooling capabilities utilizing the B.5.b mitigating strategies following a loss of large areas of power reactor facilities due to explosions or fires. Documents reviewed are listed in the Attachment to this report.

The fire zones and B.5.b mitigating strategies selected for review during this inspection are listed below and in Section 1R05.11. The fire zones selected constituted five inspection samples and the B.5.b mitigating strategies selected constituted two inspection samples, respectively, as defined in Inspection Procedure 71111.05T.

Fire Area	Description
CC-2a	NCC Hx and NCC pump rooms 599 Feet 0 Inches
1CC-4a	Unit 1 Division 2 Cable Spreading Room
1CC-4b	Unit 1 Division 2 Mech/Elec Chase
1CC-5a	Unit 1 Control Room
IB-3	620'/639' Elevation of Intermediate Building

.1 Protection of Safe Shutdown Capabilities

a. Inspection Scope

For each of the selected fire areas, the inspectors reviewed the fire hazards analysis, safe shutdown analysis, and supporting drawings and documentation to verify that safe shutdown capabilities were properly protected.

The inspectors reviewed the licensee's procedures and programs for the control of ignition sources and transient combustibles to assess their effectiveness in preventing fires and in controlling combustible loading within limits established in the fire hazards analysis. The inspectors performed plant walkdowns to verify that protective features were being properly maintained and administrative controls were being implemented.

The inspectors also reviewed the licensee's design control procedures to ensure that the process included appropriate reviews and controls to assess plant changes for any potential adverse impact on the fire protection program and/or post-fire safe shutdown analysis and procedures.

b. Findings

(1) Failure to Implement Transient Combustible Program

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation (NCV) of Technical Specifications (TS) Section 5.4.1.a for the failure to control transient combustible materials in accordance with the fire protection program requirements. Specifically, the licensee failed to remove transient combustibles from the plant after they were no longer required to support a work activity.

Description: During a walkdown on April 11, 2012, in the Unit 1 Nuclear Closed Cooling (NCC) Pump Room, the inspectors identified six plastic 5-gallon pails and coiled plastic tubing stored in a narrow passageway between the back wall of the enclosed Radiation Protection respirator issue area and the outer perimeter wall of the NCC pump room that did not have a transient combustible permit. These materials were located below two safety-related Division 1 cable trays running parallel to and above the narrow passageway.

The inspectors were concerned that ordinary combustibles were stored, left unattended and not removed from a work area after work had been completed and that a fire involving the transient combustibles could affect safety-related components. The licensee could not associate the work materials with any specific job; however, the inspectors believed that the identified transient combustibles had remained in the area for period of time after maintenance workers had completed work. Technical Specification Section 5.4.1.a required that written procedures be established, implemented, and maintained covering activities related to Regulatory Guide (RG) 1.33, Revision 2, Appendix A, February 1978 that included the Plant Fire Protection Program. Procedure PAP-1910, "Fire Protection Program," Revision 24, outlined the procedural requirements for control of transient combustibles. The presence of transient combustibles not necessary to support the work activity was contrary to Procedure PAP-1910, Section 4.6.5, Paragraph 4.d, which stated that combustible materials shall be removed from the plant when they are no longer needed to support the work activity.

After the inspectors identified the issue, the licensee removed the transient combustibles and placed the issue into their corrective action program as Condition Report (CR) CR-2012-5580, "NRC FP Triennial: Housekeeping in the NCC Pump Room."

Analysis: The inspectors determined that the failure to control transient combustibles was contrary to the licensee's fire protection program and was a performance deficiency. Specifically, the licensee failed to remove transient combustibles from the plant after they were no longer required to support a work activity.

The inspectors determined that the finding was more than minor because the finding was associated with the Initiating Events cornerstone attribute of Protection Against External Factors (Fire) and affected the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenge critical safety functions during plant operations. Specifically, the inspectors determined that the transient combustibles in the area of safety-related Division 1 cables could potentially affect instrumentation and control circuits in the event of a fire in the area. In addition, the finding was similar to Inspection Manual Chapter (IMC) 0612, Appendix E, "Examples of Minor Issues," Example 4.k in that the transient combustibles formed a credible fire scenario which could affect equipment important to safety. Specifically, the transient combustibles were located beneath safety-related cable trays between two walls roughly two to three feet apart. The inspectors considered the configuration to be equivalent to that of a fire located in a corner due to the impact of both walls upon air entrainment for the fire plume. For a fire located in a corner, Table 2.3.4, "Calculated Values (in feet) for Use in the Ball and Column Zone of Influence Chart for Fires Adjacent to a Corner," identified the potential damage height above a fire as 9.2 feet for a 200 kiloWatt (kW) fire. For transient fires, the origin of the fire is to be placed two feet above the floor, for a potential damage height of 11.2 feet. The lowest cable tray was within the zone of influence as it was 10 feet 6 inches above the floor.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of Findings," Table 3b the inspectors determined the finding degraded the fire protection defense-in-depth strategies. Therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," was required. The inspectors completed a significance determination of this issue using IMC 0609, Appendix F, Attachment 2, "Degradation Rating Guidance Specific to Various Fire Protection Program Elements,"

dated February 28, 2005. The inspectors determined that the quantity of ordinary combustible materials stored represented a low degradation against the combustible controls program because the materials would not result in ignition of a fire from existing sources of heat or electrical energy. The inspectors determined that the finding screened as having very low safety significance (Green) in Task 1.3.1 of IMC 0609, Appendix F.

The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not representative of current performance in that the incident was isolated.

Enforcement: Technical Specification Section 5.4.1.a required that written procedures be established, implemented, and maintained covering the applicable procedures recommended in Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operation)," Revision 2, Appendix A, February 1978. Regulatory Guide 1.33 recommended that the Plant Fire Protection Program be covered by written procedures. Procedure PAP-1910, "Fire Protection Program," Revision 24, outlined the procedural requirements for the fire protection program including control of transient combustibles. The presence of transient combustibles not necessary to support the work activity was contrary to procedure PAP-1910, Section 4.6.5, Paragraph 4.d, which stated that combustible materials shall be removed from the plant when they are no longer needed to support the work activity.

Contrary to the above, on April 11, 2012, the inspectors identified ordinary transient combustibles stored beneath safety-related cable trays which were not in accordance with procedure PAP-1910. Specifically, the inspectors identified six plastic 5-gallon pails and coiled plastic tubing stored beneath safety-related cable trays which were no longer needed to support the work activity and had not been removed from the plant.

Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CR-2012-5580 and the transient combustibles were removed; this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000440/2012008-01, Failure to Implement Transient Combustible Program.)

.2 Passive Fire Protection

a. Inspection Scope

For the selected fire areas, the inspectors evaluated the adequacy of fire area barriers, penetration seals, fire doors, electrical raceway fire barriers, and fire rated electrical cables. The inspectors observed the material condition and configuration of the installed barriers, seals, doors, and cables. The inspectors reviewed approved construction details and supporting fire tests. In addition, the inspectors reviewed license documentation, such as NRC safety evaluation reports, and deviations from NRC regulations and the National Fire Protection Association (NFPA) standards to verify that fire protection features met license commitments.

The inspectors walked down accessible portions of the selected fire areas to observe material condition and the adequacy of design of fire area boundaries (including walls, fire doors, and fire dampers) to ensure they were appropriate for the fire hazards in the area.

The inspectors reviewed the installation, repair, and qualification records for a sample of penetration seals to ensure the fill material was of the appropriate fire rating and that the installation met the engineering design.

b. Findings

No findings of significance were identified.

.3 Active Fire Protection

a. Inspection Scope

For the selected fire areas, the inspectors evaluated the adequacy of fire suppression and detection systems. The inspectors observed the material condition and configuration of the installed fire detection and suppression systems. The inspectors reviewed design documents and supporting calculations. In addition, the inspectors reviewed license basis documentation, such as, NRC safety evaluation reports, deviations from NRC regulations, and NFPA standards to verify that fire suppression and detection systems met license commitments.

b. Findings

(1) Failure to Ensure Design Spray Density is Achieved

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of License Condition 2.C(6) for the failure to ensure design spray density was achieved for the Unit 1 Division 2 cable chase area. Specifically, the placement of spray nozzles for cable trays did not ensure that the design spray density specified by design calculations would be achieved.

Description: The Unit 1 Division 2 cable chase, Fire Area 1CC-4b, used a combined pre-action sprinkler and spray system. Section 9A.4.4.4.1.2.1 of the Updated Safety Analysis Report (USAR) described the fire area as having closed directional spray nozzles provided at each floor elevation to ensure protection of cable tray runs in the vertical chases. The USAR section further noted that the nozzles were located as required for protection of multi-level cable tray configurations. The inspectors noted that the spray nozzles were generally positioned two to three inches above cable trays with the nozzles aimed parallel with the trays. Nozzles were typically spaced 10 feet apart along the cable trays.

The code of record for the spray portions of the system was NFPA 15 – 1969, “Standard for Water Spray Fixed Systems for Fire Protection.” Section 4041(e) of NFPA 15 – 1969 specified that the design density for extinguishment shall be based upon test data or knowledge concerning conditions similar to those that will apply in the actual installation. Section 4083 of NFPA 15 – 1969 specified that spray nozzles may be placed in any position necessary to obtain proper coverage of the protected area. Positioning of nozzles with respect to surfaces to be protected, or to fires to be controlled, shall be guided by the particular nozzle design and the spray produced. Calculation P54-146, “Unit 1 – Division 2 Sprinkler System Hydraulic Demand Calculation for the Cable Spreading Area, Vertical Cable Chase and Reactor Penetration Area,” original revision dated October 11, 1997, identified that the design density for the cable tray spray nozzles was 0.15 gallons per minute (gpm) per square foot. The inspectors noted that

the 0.15 gpm per square foot value was consistent with the 2012 edition of NFPA 15 for spray protection of cable trays from fires which originate from the cable trays. Calculation P54-146 concluded that the 0.15 gpm per square foot design density was achieved. The calculation assumed that the spray nozzles had a K-factor of 1.6. However, the installed spray nozzles had a K-factor of 1.2 which would result in 25 percent less flow from the nozzles under the same pressure conditions. More significantly, the calculation did not account for wastage and incorrectly assumed that all of the water from spray nozzles would impinge upon the cable trays. During this inspection, the licensee was unable to determine what fraction of water from the spray nozzles would impinge upon the cable trays to satisfy the water density requirement. The inspectors noted that much of the nozzle spray would overspray the sides of the cable trays. Additionally, for lower level trays, much of the spray would impinge the bottom surface of the cable tray above. The inspectors estimated that the achieved design density would be roughly half of the specified design density, even when higher supply pressures were taken into account. As such, the inspectors determined that the requirement to locate spray nozzles to obtain proper coverage was not met in that the design density was not achieved for the surfaces to be protected (i.e., the tops of cable trays).

In response to the concerns raised by the inspectors, the licensee initiated CR-2012-04734, "NRC FP Triennial: Potential Spray Nozzle Coverage Issue in 638' Penetration Room," dated March 28, 2012, and initiated compensatory measures for the affected fire areas. The licensee planned on evaluating the design and installation for the affected fire areas to address the issue.

Analysis: The inspectors determined that the failure to ensure that the design spray density was achieved for the Unit 1 Division 2 cable chase area was contrary to the USAR and NFPA 13 and was a performance deficiency. Specifically, the placement of spray nozzles for cable trays did not ensure that the design spray density specified by design calculations would be achieved.

The finding was determined to be more than minor because the failure to ensure that the design spray density was achieved was associated with the Mitigating Systems cornerstone attribute of Protection Against External Factors (Fire) and affected the cornerstone objective of ensuring capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the failure to ensure that the design spray density would be achieved resulted in the potential that a fire involving cable trays would not be suppressed.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of Findings," Table 3b the inspectors determined the finding degraded the fire protection defense-in-depth strategies. Therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," was required. The inspectors noted that there were no credible fixed ignition sources within the fire area which could affect or ignite other components. As the fire area is normally not occupied and requires a key for entry, the inspectors determined that the ignition frequencies associated with hot work and transient combustibles would be low. Using IMC 0609, Appendix F, Attachment 4, "Fire Ignition Source Mapping Information: Fire Frequency, Counting Instructions, Applicable Fire Severity Characteristics, and Applicable Manual Fire Suppression Curves," the inspectors determined that the total ignition frequency for the area was

2.3×10^{-5}/year (hot work) + 5.5×10^{-5}/year = 7.8×10^{-5}/year per year. The inspectors performed a Phase 3 significance determination process (SDP) evaluation conservatively assuming all cables in the room were affected. Based on the failure of the Division 2 electrical bus, bus EH-12, and Division 3 components (high pressure core spray), a regional Senior Reactor Analyst determined that the conditional core damage probability (CCDP) was less than 1×10^{-5} with a transient as an initiating event. As such, the inspectors determined that change in core damage frequency (ΔCDF) due to the finding would be less than 7.8×10^{-10}/year and that the finding was of very low safety significance (i.e., Green).

The inspectors did not identify a cross-cutting aspect associated with this finding because the finding was not representative of current performance. Specifically, the deficiency associated with failing to achieve design spray density was associated with original design.

Enforcement: License condition 2.C(6) required the licensee to implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report (FSAR), as amended, and as approved through Safety Evaluation Report NUREG-0887dated May 1982 and supplement numbers 1 through 10. Section 9A of the USAR described the approved fire protection program. Section 9A.4.4.4.1.2.1 of the USAR stated closed directional spray nozzles are provided at each floor elevation to ensure protection of cable tray runs in the vertical chases for Fire Area 1CC-4b. The USAR section also stated that the nozzles are located as required for protection of multi-level cable tray configurations.

Contrary to the above, from August 11, 1997 through April 13, 2012, the licensee failed to locate spray nozzles as required for protection of multi-level cable tray configurations in Fire Area 1CC-4b. Specifically, the spray nozzles were not located such that the design density identified as required in hydraulic calculation P54-146 would be achieved.

Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CR-2012-04734 and the licensee initiated compensatory measures for the affected fire areas, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000440/2012008-02, Failure to Ensure Design Spray Density is Achieved).

(2) Failure to Ensure Sprinkler Piping Could be Drained

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of License Condition 2.C(6) for the failure to ensure that sprinkler piping could be drained. Specifically, the licensee failed to install sprinkler piping in accordance with the standard for sprinkler systems which required that all sprinkler pipe and fittings shall be so installed that the system may be drained. During this inspection, a sprinkler pipe was identified in the Unit 1 Division 2 cable spreading room as having residual water and corrosion products which could block spray nozzles and sprinkler heads.

Description: Section 9A.4.4.4.1.1.1 of the USAR described the Unit 1 Division 2 cable spreading room, Fire Area 1CC-4a, fire protection as consisting of a pre-action type sprinkler system equipped with heat detectors for system actuation. The inspectors noted that the system was a combined pre-action sprinkler and spray system which used

galvanized piping. The sprinkler and spray system was fed by a 6-inch main feed line which entered the room at the east wall and dropped to near the floor. The main feed line continued essentially level for a portion of the floor. Drainage for the 6-inch main feed line was provided by a 4-inch line reduced to a 3-inch line fed from the side of the pipe. The 3-inch line, in turn was drained via a 1-inch valve located off the side of an elbow. The drainage points off of the side of the larger lines prevented complete draining of the lines. The sprinkler piping had been installed in this manner since original construction.

The inspectors noted that there has been operational experience where pre-action sprinkler systems have become fouled due to inadequate drainage (see Monticello Nuclear Generating Plant Inspection Report 05000263/2011010, ADAMS Accession Number ML11363A182). Additionally, in response to questions from the inspectors, the licensee identified that there had been four operational experience notifications since 2006 which had discussed pre-action sprinkler systems becoming fouled. Two of the four notifications discussed the need for ensuring effective draining of systems. Pre-action systems are normally dry systems with water only being admitted after a detection device causes a deluge valve for the system to open. If the systems are not fully drained after an actuation or flow testing of the system, residual water in conjunction with oxygen from the air in the sprinkler piping can cause corrosion of the piping internals and result in blockage of portions of the system from the corrosion products. Licensee engineering staff determined that the system had been activated once since initial construction. The code of record for the sprinkler system was NFPA 13 – 1972, "Standard for the Installation of Sprinkler Systems." Section 3211 of NFPA 13 – 1972 specified that all sprinkler pipe and fittings shall be so installed that the system may be drained.

In response to concerns raised by the inspectors, the licensee initiated CR-2012-04712, "NRC FP Triennial; Review of Monticello Special Fire Protection Inspection Report." During a walk down of the system, the inspectors and licensee engineering staff identified the 6-inch pipe section discussed above which could not be drained. During the inspection, the licensee performed boroscopic examination of the 6-inch main feed line internals. Although the galvanized coating appeared to have been maintained for the dry upper portions of the 6-inch pipe, the boroscopic examination revealed that the lower part of the pipe contained residual water and most of the galvanized coating was replaced by corrosion. The boroscopic examination also revealed that there was some loose corrosion materials which could potentially block some spray nozzles and sprinkler heads. The inspectors estimated that the material would block significantly less than 10 percent of the spray nozzles and sprinkler heads in the room. The licensee planned to further assess existing conditions of the piping and determine what changes were needed to ensure piping is drained after a system actuation.

Analysis: The inspectors determined that failure to ensure that sprinkler piping could be drained was contrary to the standard for sprinkler systems and was a performance deficiency. Specifically, the licensee installed a 6-inch pipe for the Unit 1 Division 2 cable spreading room, Fire Area 1CC-2a, spreading room sprinkler system which could not be drained. During this inspection, the 6-inch pipe was identified as having residual water and corrosion products which could block spray nozzles and sprinkler heads.

The failure to ensure that sprinkler piping could be drained was associated with the Mitigating Systems cornerstone attribute of Protection Against External Factors (Fire)

and affected the cornerstone objective of ensuring the reliability and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, some corrosion of internal sprinkler piping was observed which could result in blockage of individual sprinkler heads or spray nozzles thereby reducing the effectiveness of the sprinkler system. In addition, the finding was determined to be more than minor because if left uncorrected, the failure to ensure that sprinkler piping could be drained would become a more significant safety concern. Specifically, the continued presence of residual water would result in additional corrosion products with the potential to foul the sprinkler piping.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of Findings," Table 3b the inspectors determined the finding degraded the fire protection defense-in-depth strategies. Therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," was required. The inspectors concluded that the finding represented a low degradation rated in accordance with IMC 0609, Appendix F, Attachment 2, "Degradation Rating Guidance Specific to Various Fire Protection Program Elements." Specifically, the inspectors concluded that significantly less than 10 percent of the spray nozzles and sprinkler heads. Under Task 1.3.1 Question 1, the finding screens to Green (very low safety significance) due to having a low degradation.

This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Operating Experience because the licensee did not evaluate relevant external operating experience. Specifically, the licensee had reviewed operating experience relating to blockage of pre-action sprinkler systems, but did not sufficiently evaluate the operating experience to recognize that it applied to the Perry Nuclear Power Plant. [P.2(a)]

Enforcement: License condition 2.C(6) required the licensee to implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report (FSAR), as amended, and as approved through Safety Evaluation Report NUREG-0887 dated May 1982 and supplement numbers 1 through 10. Section 9A of the USAR described the approved fire protection program. Section 9A.4.4.4.1.1.1 of the USAR described the Unit 1 Division 2 cable spreading room, Fire Area 1CC-4a, fire protection as consisting of a pre-action type sprinkler system equipped with heat detectors for system actuation. Section 9A.5 of the USAR provided the licensee responses to the positions of NRC Branch Technical Position APCSB 9.5-1 Appendix A. The USAR documented the licensee's response to NRC position E.3(c) as "Automatic water type suppression systems throughout Perry Nuclear Power Plant satisfy the design and installation requirements of the appropriate standards such as NFPA 13 and 15. Section 3211 of NFPA 13 – 1972 specified that all sprinkler pipe and fittings shall be so installed that the system may be drained.

Contrary to the above, from the original issuance of the operating license, November 13, 1986, through April 13, 2012, the licensee failed to ensure that all sprinkler pipe and fittings were so installed that the system may be drained. Specifically, the licensee installed a 6-inch pipe for the Unit 1 Division 2 cable spreading room, Fire Area 1CC-2a, spreading room sprinkler system which could not be drained and was identified as having residual water and corrosion products which could block spray nozzles and sprinkler heads.

Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CR-2012-04712, the licensee performed initial boroscopic examinations, and the licensee planned to further assess existing conditions of the piping and determine what changes were needed to ensure that the piping is drained after a system actuation, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000440/20120008-03, Failure to Ensure Sprinkler Piping Could be Drained).

(3) Failure to Install Sequential Timing Device for Fire Pumps:

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of License Condition 2.C(6) for the failure to install a sequential timing device for the diesel driven fire pump. Specifically, the standard for fire pumps, NFPA 20, required that controllers for multiple pump units, such as those at the Perry Nuclear Power Plant, incorporate a sequential timing device to prevent any one pump starting simultaneously with any other pump.

Description: The Perry Nuclear Power Plant (PNPP) fire pumps were arranged to start sequentially upon decreasing pressure in the fire protection system. Specifically, the electric driven fire pump would start within the range of 115 to 125 pounds per square inch gauge (psig) and the diesel driven pump would start within the range of 100 – 110 psig. Although the original specification, SP-461-4549-00, for fire pump installation at PNPP specified a time delay for the diesel driven fire pump, PNPP engineering staff determined during this inspection that no time delay for either the electric fire pump or the diesel driven fire pump had been installed.

The licensee identified the applicable code of record for fire pump installation as National Fire Protection Association (NFPA) 20 – 1972, "Standard for the Installation of Centrifugal Fire Pumps." The standard requires sequential timing devices to prevent multiple pumps from starting at the same time. Specifically, Section 515.d.3 of NFPA 20 – 1972 for electric motor pump controllers specifies that controllers for multiple pump units incorporate a sequential timing device to prevent any one pump starting simultaneously with any other pump. Similarly, Section 715.d.3 of NFPA 20 – 1972 for engine driven pump controllers specifies that controllers for multiple pump units incorporate a sequential timing device to prevent any one pump starting simultaneously with any other pump. The inspectors noted that Section 12.7.2.4 of the NFPA Stationary Fire Pumps Handbook, third edition, stated that the sequence-starting requirement prevents excessive hydraulic stress to piping, controls valves, and other system components during pump start-up. Additionally, the handbook stated that when sequential starting devices were not installed, pump houses have been destroyed. The inspectors noted that although only one pump would start initially under low demand conditions, both pumps would likely start under initial high demand conditions such as activation of a deluge system or a pre-action system. Additionally, the PNPP engineering staff had contacted two individuals who had previously worked in fire protection at the Perry Nuclear Power Plant and learned that there had been at least one occurrence when both fire pumps had started simultaneously and a significant water hammer had occurred.

The licensee initiated Condition Report (CR) 2012-04553, "NRC FP Triennial – Diesel driven fire pump does not contain a sequence start time delay as required by NFPA

section 515.d.3 code year 1972," dated March 26, 2012, and initiated a modification to provide a time delay.

Analysis: The inspectors determined that the failure to install a sequential timing device for the diesel driven fire pump was contrary to the standard for fire pumps, NFPA 20, and was a performance deficiency. Specifically, NFPA 20 required that controllers for multiple pump units, such as those at Perry Nuclear Power Plant, incorporate a sequential timing device to prevent any one pump starting simultaneously with any other pump. The Perry Nuclear Power Plant had experienced a significant water hammer during an instance when both the diesel driven fire pump and the electric fire pump had started simultaneously. Such water hammers could result in damage to fire protection piping or equipment.

The finding was determined to be more than minor because the failure to install a sequential timing device for the diesel driven fire pump was associated with the Mitigating Systems cornerstone attribute of Protection Against External Factors (Fire) and affected the cornerstone objective of ensuring the reliability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the lack of a sequential timing device could result in both fire pumps starting simultaneously and a significant water hammer which could damage fire protection piping or equipment.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of Findings," Table 3b the inspectors determined the finding degraded the fire protection defense-in-depth strategies. Therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," was required. The inspectors performed a Phase III SDP evaluation. Although the Perry Nuclear Power Plant had experienced a significant water hammer due to simultaneous fire pump starting with no significant damage, the inspectors could not rule out the potential for significant damage to fire protection piping and other equipment should a future water hammer occur. Such damage could result in the temporary loss of water-based fire protection systems adversely affecting water-based fixed suppression systems and manual fire fighting capability. The inspectors had identified four fire areas which had pre-action suppression systems (for which activation could result in simultaneous fire pump starting) and had significant equipment important to safety in the fire areas. The four fire areas were: Fire Area 1CC-4a, Unit 1 Division 2 Cable Spreading Room; Fire Area 1CC-4b, Unit 1 Division 2 Cable Chase; Fire Area 1CC-4e, Unit 1 Division 2 Cable Spreading Room; and Fire Area 1CC-4f, Unit 1 Division 2 Cable Chase. No fixed ignition sources which could contribute to fire scenarios were located in the rooms. Consequently, the only credible ignition sources were hot work and transient combustibles. Using IMC 0609, Appendix F, Attachment 4, "Fire Ignition Source Mapping Information: Fire Frequency, Counting Instructions, Applicable Fire Severity Characteristics, and Applicable Manual Fire Suppression Curves," the inspectors determined that the total ignition frequency for each of the four fire areas was 2.3×10^{5}/year (hot work) + 5.5×10^{-5}/year (transient combustibles) = 7.8×10^{-5}/year per fire area. In addition, a Senior Reactor Analyst calculated the conditional core damage probability associated with each of the affected fire areas. For Fire Areas 1CC-4a and 1CC-4b, Division 2 equipment and Division 3 (high pressure core spray (HPCS)) could be affected by fire. A CCDP of less than 1×10^{-5} was calculated using the Perry Standardized Plant Analysis Risk (SPAR) model for a reactor scram initiating event with

a failure of the Division 2 bus EH-12 and HPCS. For Fire Areas 1CC-4e and 1CC-4f, Division 1 equipment and reactor core isolation cooling (RCIC) could be affected by fire. A CCDP of less than 1×10^{-6} was calculated using the Perry SPAR model for a reactor scram initiating event with a failure of the Division 1 bus EH-11 and RCIC. As such, the inspectors performed a bounding calculation for the change in core damage frequency (ΔCDF) as follows: 4 fire areas × 7.8×10^{-5}/year per fire area (total fire frequency per area) × 10^{-5} (CCDP) = 3.1×10^{-9}per year. As such, the inspectors determined that the finding was of very low safety significance (i.e., Green).

This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Self and Independent Assessments because the licensee did not conduct a self-assessment of sufficient depth. Specifically, self-assessment SN-SA-2012-0006 reviewed an Unresolved Item from Inspection Report 05000282/2009007; 05000306/2009007 for the Prairie Island Nuclear Generating Plant concerning sequential starting of fire pumps. The licensee failed to identify that the Perry Nuclear Power Plant had the same configuration and NFPA 20 requirements as described in the URI. [P.3(a)]

Enforcement: License Condition 2.C(6) required the licensee to implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report (FSAR), as amended, and as approved through Safety Evaluation Report NUREG-0887 dated May 1982 and Supplement No. 1 through 10. Section 9A of the USAR described the approved Fire Protection Program. Section 9A.5, Position E.2(c), of the USAR stated that the fire pump installation conforms to NFPA 20. Section 715.d.3 of NFPA 20 – 1972 for engine driven pump controllers specified that controllers for multiple pump units incorporate a sequential timing device to prevent any one pump starting simultaneously with any other pump. The Perry Nuclear Power Plant had multiple pump units.

Contrary to the above, from the original issuance of the operating license, November 13, 1986, through April 13, 2012, the licensee failed to install fire pumps, which conform to NFPA 20. Specifically, the licensee failed to install a sequential timing device for the diesel driven fire pump to prevent any one pump starting simultaneously with any other pump.

Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as (CR) 2012-04553 and the licensee initiated a modification to provide a time delay, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000440/2012008-04, Failure to Install Sequential Timing Device for Fire Pumps).

(4) Failure to Provide Full Area Detection:

Introduction: The inspectors identified a finding of very low safety significance (Green) and associated Non-Cited Violation of License Condition 2.C(6) for the failure to provide detection throughout Fire Area 1CC-4a. Specifically, Fire Area 1CC-4a was described by the USAR as having an early warning detection system. However, the corridor area of Fire Area 1CC-4a lacked detection.

Description: Fire Area 1CC-4a housed the Division 2 cable spreading room. The zone boundaries consisted of 3-hour rated walls, ceiling, and floor. The area had an approximate 15 foot high ceiling. In addition to the cable spreading room, Fire Area

1CC-4a housed a corridor connecting the area to an outer hallway, the Division 2 125 volts direct current (Vdc) distribution room, the division 2 battery room, and the comparable Division 1 corridor. The corridor had an approximate 8 foot high ceiling with a portion of the cable spreading room directly above the corridor. Although the corridor walls were not rated fire barriers, they would provide substantive fire resistance due to their construction. However, the corridor ceiling construction consisted primarily of a single sheet of 1/2 inch drywall above and below 6 inch joists. Within the ceiling, there were two access hatches for gaining access to the space above. The access hatches did not have a fire rating. Additionally, the inspectors identified three open holes in the ceiling above wall mounted electrical panels. The inspectors determined that the transient combustibles located in the corridor could present an exposure hazard to cables located in cable spreading room above the corridor ceiling.

Section 9A.4.4.4.1.1.1 of the USAR described the area as having a pre-action sprinkler system and smoke detectors. Additionally, section 9A.4.4.4.1.1.3 of the USAR described the area as having an early warning fire detection system. The inspectors noted that although the cable spreading room had a combined pre-action sprinkler/spray system with smoke detector coverage, the corridor lacked suppression and detection.

Section 9A.6 of the USAR provided a point-by-point comparison to 10 CFR Part 50, Appendix R. Section III.F of 10 CFR Part 50, Appendix R specified that automatic fire detection systems be installed in all areas of the plant that contain or present an exposure fire hazard to safe shutdown or safety-related systems or components. The Section 9A.6 licensee response to Section III.F stated that automatic fire detection systems have been provided in all areas containing safety-related systems except for the areas identified in deviation letters. Section 9A.7 of the USAR provided a description of deviations from regulatory guidance. Section 9A.7 of the USAR provided clarification that fire detection described as “provided throughout a Fire Area” indicated detectors were located and spaced in accordance with NFPA 72E, with the type of detector provided appropriate for the hazard within the Fire Area. For Fire Zones or Areas with partial detection, a deviation had been requested from 10 CFR Part 50, Appendix R, Section III.F. These areas were indicated and a description of the extent of area coverage is described in the 10 CFR Part 50, Appendix R, Section III F deviation requests.

The inspectors considered the lack of detectors in the corridor portion of Fire Area 1CC-4a to result in partial detection coverage for the fire area. However, the licensee neither sought nor obtained a deviation for the partial detection in the fire area. The licensee initiated CR 2012-04717, “NRC FP Triennial; Detection Coverage in Unit 1, Division 2, Cable Spreading Area,” dated March 28, 2012, initiated compensatory actions for the fire area, and planned to evaluate the design of detection in the fire area.

Analysis: The inspectors determined that failure to provide detection throughout Fire Area 1CC-4a was contrary to the USAR and was a performance deficiency. Specifically, Fire Area 1CC-4a was described as having an early warning detection system. However, the corridor area of Fire Area 1CC-4a lacked detection.

The finding was determined to be more than minor because the failure to provide detection throughout Fire Area 1CC-4a was associated with the Mitigating Systems cornerstone attribute of Protection Against External Factors (Fire) and affected the cornerstone objective of ensuring the capability of systems that respond to initiating

events to prevent undesirable consequences (i.e., core damage). Specifically, the lack of detection in the corridor area of Fire Area 1CC-4a could result in delayed detection of a fire which, if unmitigated, could affect safety-related cables above the corridor area.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase I - Initial Screening and Characterization of Findings," Table 3b the inspectors determined the finding degraded the fire protection defense-in-depth strategies. Therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," was required. The inspectors determined that the finding represented a low degradation because the portion of Fire Area 1CC-4a, which contained safety-related cables did have smoke detectors and a sprinkler/spray system. Under Task 1.3.1 Question 1, the finding screens to Green (very low safety significance) due to having a low degradation.

This finding has a cross-cutting aspect in the area of Problem Identification and Resolution, Self-Assessments because the licensee did not conduct a self-assessment of sufficient depth. Specifically, self-assessment SN-SA-2012-0006, "Fire Protection Program Self-Assessment," Revision 0 specifically reviewed Fire Area 1CC-4a. However, the review performed by the self-assessment was limited to area walkdowns and did not assess the design of systems in terms of the licensing basis. [P.3(a)]

Enforcement: License Condition 2.C(6) required the licensee to implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report (FSAR), as amended, and as approved through Safety Evaluation Report NUREG-0887dated May 1982 and supplement numbers 1 through 10. Section 9A of the USAR described the approved Fire Protection Program. Section 9A.4.4.4.1.1.1 of the USAR described Fire Area 1CC-4a as having an early warning detection system. Section 9A.7 of the USAR provides a description of deviations from regulatory guidance. Section 9A.7 of the USAR provided clarification that fire detection described as "provided throughout a Fire Area" indicated detectors were located and spaced in accordance with NFPA 72E, with the type of detector provided appropriate for the hazard within the Fire Area. Section 9A.7 of the USAR further clarified that for Fire Zones or Areas with partial detection, a deviation had been requested from 10 CFR Part 50, Appendix R, Section III.F. No such deviation had been requested for the Unit 1 Division 2 cable spreading room, Fire Area 1CC-4a.

Contrary to the above, from the original issuance of the operating license, November 13, 1986, through April 13, 2012, the licensee failed to provide detection throughout Fire Area 1CC-4a. Specifically, the corridor area of Fire Area 1CC-4a did not have detection.

Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CR 2012-04717 and the licensee initiated compensatory measures, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy (NCV 05000440/2012008-05, Failure to Provide Full Area Detection).

.4 Protection from Damage from Fire Suppression Activities

a. Inspection Scope

For the selected fire areas, the inspectors verified that redundant trains of systems required for hot shutdown would not be subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems including the effects of flooding. The inspectors conducted walkdowns of each of the selected fire areas to assess conditions such as the adequacy and condition of floor drains, equipment elevations, and spray protection.

b. Findings

No findings of significance were identified.

.5 Alternative Shutdown Capability

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.

The inspectors conducted selected area walkdowns to determine if operators could reasonably be expected to perform the alternate safe shutdown procedure actions and that equipment labeling was consistent with the alternate safe shutdown procedure. The review also looked at operator training as well as consistency between the operations shutdown procedures and any associated administrative controls.

b. Findings

No findings of significance were identified.

.6 Circuit Analyses

a. Inspection Scope

The inspectors reviewed the licensee's post-fire safe shutdown analysis to verify that the licensee had identified both required and associated circuits that may impact safe shutdown. On a sample basis, the inspectors verified that the cables of equipment required achieving and maintaining hot shutdown conditions, in the event of fire in the selected fire zones, had been properly identified. In addition, the inspectors verified whether these cables had either been adequately protected from the potentially adverse effects of fire damage, mitigated with approved manual operator actions, or analyzed to show that fire-induced faults (e.g., hot shorts, open circuits, and shorts to ground) would not prevent safe shutdown. In order to accomplish this, the inspectors reviewed electrical schematics and cable routing data for power and control cables associated with each of the selected components.

In addition, the inspectors reviewed licensee's evaluation of potential circuit protective coordination issues for the safe shutdown systems' electrical power and instrumentation busses.

(1) Review of Licensee's Multiple Spurious Operations Circuit Analyses In Accordance with Guidance in Regulatory Guide 1.189, Revision 2

Background

In October 2009 the NRC issued guidance in Regulatory Guide (RG) 1.189, "Fire Protection for Nuclear Power Plants," Revision 2, to identify acceptable methods for resolving issues related to circuits required for post-fire safe shutdown and circuits important to post-fire safe shutdown. Equipment required for post-fire safe shutdown (credited train) must use one of the three methods identified in 10 CFR Part 50, Appendix R, Section III.G.2 to protect the circuits located within the same fire area from damage, including single and multiple spurious operations (MSOs). For important to post-fire safe shutdown circuits, the licensee may use operator manual actions if the licensee demonstrates they can be shown to be feasible and reliable or resolve issues using other analysis methods including fire modeling.

In May 2009 the NRC issued Enforcement Guidance Memorandum (EGM) 09-002, "Enforcement Discretion for Fire-Induced Circuit Faults," which described the conditions limiting enforcement discretion during the resolution of the fire protection concerns involving MSOs. The EGM limited the enforcement discretion to three years from the date of issuance of RG 1.189, Revision 2: (1) six months following the issuance of RG 1.189, Revision 2, for licensees to identify non-compliances related to multiple fire-induced circuit faults, place the non-compliances into their corrective action program and implement compensatory measures for the non-compliances; and (2) three years following the issuance of RG 1.189, Revision 2, for licensees to complete the corrective actions associated with non-compliant multiple fire-induced circuit faults. The enforcement discretion would not be granted to identified non-compliances that are found to be willful or findings that the Reactor Oversight Process Significant Determination Process would evaluate as (Red) or categorized at Severity Level I.

Inspection Effort

During this inspection, the inspectors reviewed representative sampling of single and multiple spurious issues throughout the plant to verify:

- The licensee successfully addressed single and multiple spurious issues in a way that met regulations;
- The licensee properly classified equipment required for safe shutdown and equipment important for safe shutdown;
- The adequacy of the licensee's evaluation of multiple spurious actuations, in accordance with RG 1.189 and Nuclear Energy Institute (NEI) 00-01, "Guidance for Post-Fire Safe Shutdown Analysis," Revision 2; and
- The adequacy of the licensee's compensatory actions taken for identified non-compliances.

The inspectors reviewed a selected sample of the licensee's post-fire safe shutdown analysis to verify that the licensee had identified both required and important circuits that could impact safe shutdown, entered the findings into the corrective action program, and initiated appropriate compensatory measures. The inspectors reviewed the Perry's expert panel results for the potential fire-induced operations of component supported safe shutdown at Perry Nuclear Power Plant. The expert panel performed this review in accordance with RG 1.189 and guidance provided in NEI 00-01. The purpose of the expert panel was to review the applicable industry developed generic boiling water reactor (BWR) owners' group list of MSOs for applicability to Perry Nuclear Power Plant. The expert panel was also tasked with considering plant specific MSOs similar to those in the generic list, but not specifically listed. The expert panel identified MSOs as applicable to Perry Nuclear Power Plant and provided recommendations to resolve these issues. The inspectors reviewed a sample of MSO scenarios identified by the expert panel as potential non-compliances requiring further evaluations to determine corrective action needed.

The inspectors verified that the safe shutdown cables had either been adequately protected from the potentially adverse effects of fire damage, mitigated with approved compensatory measures, or analyzed to show that fire-induced faults (e.g., hot shorts, open circuits, and shorts to ground) would not prevent safe shutdown. In order to accomplish this, the inspectors reviewed piping and instrumentation diagrams, electrical schematics and logic diagrams, safe shutdown flow diagrams and cable routing drawings associated with each of the selected safe shutdown components.

The licensee initiated CRs to document the identified non-conforming MSO scenarios. In addition, the licensee implemented alternate compensatory measures as a form of enhanced documented operator rounds as justified by the fire protection engineering evaluation EC-EVAL 379672, "GL 86-10 Evaluation: Use of Alternate Compensatory Measures Related to Multiple Spurious Operations (MSOs)," Revision 1. The inspectors reviewed a sample of the non-conforming MSO scenarios identified by the licensee. The inspectors noted that the licensee has not completed the analyses and evaluations of the identified non-conforming MSOs. The licensee was in the process of determining the appropriate long term corrective actions needed to address these findings. The documents and CRs reviewed by the inspectors are listed in the Attachment to this report. The licensee plans to complete corrective actions to address the identified MSOs prior to November 2, 2012, (the end of the enforcement discretion period per EGM 09-002). The licensee evaluated the identified MSO scenarios for potential significance and determined that none of the 55 identified MSOs were considered to be risk-significant.

b. Findings

No findings of significance were identified.

.7 Communications

a. Inspection Scope

The inspectors reviewed, on a sample basis, the adequacy of the communication system to support plant personnel in the performance of alternative safe shutdown functions and fire brigade duties. The inspectors verified that plant telephones, page systems, sound powered phones, and radios were available for use and maintained in working order. The inspectors reviewed the electrical power supplies and cable routing for these

systems to verify that either the telephones or the radios would remain functional following a fire.

b. Findings

No findings of significance were identified.

.8 Emergency Lighting

a. Inspection Scope

The inspectors performed a plant walkdown of selected areas in which a sample of operator actions would be performed in the performance of alternative safe shutdown functions. As part of the walkdowns, the inspectors focused on the existence of sufficient emergency lighting for access and egress to areas and for performing necessary equipment operations. The locations and positioning of the emergency lights were observed during the walkdown and during review of manual actions implemented for the selected fire areas.

b. Findings

No findings of significance were identified.

.9 Cold Shutdown Repairs

a. Inspection Scope

The inspectors reviewed the licensee's procedures to determine whether repairs were required to achieve cold shutdown and to verify that dedicated repair procedures, equipment, and material to accomplish those repairs were available on-site. The inspectors also evaluated whether cold shutdown could be achieved within the required time using the licensee's procedures and repair methods. The inspectors also verified that equipment necessary to perform cold shutdown repairs was available on-site and properly staged.

b. Findings

No findings of significance were identified.

.10 Compensatory Measures

a. Inspection Scope

The inspectors conducted a review to verify that compensatory measures were in place for out-of-service, degraded or inoperable fire protection and post-fire safe shutdown equipment, systems, or features (e.g., detection and suppression systems, and equipment, passive fire barriers, pumps, valves or electrical devices providing safe shutdown functions or capabilities). The inspectors also conducted a review of the adequacy of short term compensatory measures to compensate for a degraded function or feature until appropriate corrective actions were taken.

b. Findings

No findings of significance were identified

.11 B.5.b Inspection Activities

a. Inspection Scope

The inspectors reviewed the licensee's preparedness to handle large fires or explosions by reviewing selected mitigating strategies. This review ensured that the licensee continued to meet the requirements of their B.5.b related license conditions and 10 CFR 50.54(hh)(2) by determining that:

- Procedures were being maintained and adequate;
- Equipment was properly staged, maintained, and tested;
- Station personnel were knowledgeable and could implement the procedures; and
- Additionally, inspectors reviewed the storage, maintenance, and testing of B.5.b related equipment.

The inspectors reviewed the licensee's B.5.b related license conditions and evaluated selected mitigating strategies to ensure they remain feasible in light of operator training, maintenance/testing of necessary equipment and any plant modifications. In addition, the inspectors reviewed previous inspection reports for commitments made by the licensee to correct deficiencies identified during performance of Temporary Instruction (TI) 2515/171 or subsequent performances of these inspections.

The B.5.b mitigating strategies selected for review during this inspection are listed below. The off-site and on-site communications, notifications/emergency response organization activation, initial operational response actions and damage assessment activities identified in Table A.3 1 of NEI 06-12, "B.5.b Phase II and III Submittal Guidance," Revision 2, are evaluated each time due to the mitigation strategies' scenario selected.

NEI 06-12, Revision 2, Section	Licensee Strategy (Table)
2.3.1	SFP Makeup – External Strategy (A.2-2)
3.4.2	DC Power Supplies to Allow Depressurization of RPV and Injection With Portable Pump (A.5-2)

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4OA2 Problem Identification and Resolution (71152)

a. Inspection Scope

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

b. Findings

No findings of significance were identified.

4OA6 Management Meetings

.1 Exit Meeting Summary

On April 13, 2012, the inspectors presented the final inspection results to Mr. E. Larson, and other members of the licensee's staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

4OA7 Licensee-Identified Violations

No findings were identified.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

E. Larson, Acting Site Vice President
J. Grabnar, Plant General Manager
R. Fili, Director, Site Engineering
H. Hanson, Director, Performance Improvement
J. Veglia, Director, Maintenance
R. Coad, Manager, Regulatory Compliance
L. Vanderhorst, Manager, Emergency Planning
J. Tufts, Manager, Operations
P. McNulty, Manager, Radiation Protection
J. Oelbracht, Manager, Chemistry
T. Hilston, Manager, Design
D. Knopsnider, Manager, Training
J. Davis, Manager, Fleet Oversight
L. Lindrose, Manager, Security
D. Lockwood, Manager, Outage Management
B. Baumgardner, Manager, Special Projects
S. Davis, Manager, Work Management
S. Richardson, Manager, Supply Chain
L. Zerr, Engineer, Regulatory Compliance

Nuclear Regulatory Commission

K. O'Brien, Deputy Director, Division of Reactor Safety
M. Marshfield, Senior Resident Inspector
J. Nance, Resident Inspector

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000440/2012008-01	NCV	Failure to Implement Transient Combustible Program (Section 1R05.1.b.(1))
05000440/2012008-02	NCV	Failure to Ensure Design Spray Density is Achieved (Section 1R05.3.b.(1))
05000440/2012008-03	NCV	Failure to Ensure Sprinkler Piping Could be Drained (Section 1R05.3.b.(2))
05000440/2012008-04	NCV	Failure to Install Sequential Timing Device for Fire Pumps (Section 1R05.3.b.(3))
05000440/2012008-05	NCV	Failure to Provide Full Area Detection (Section 1R05.3.b.(4))

Closed

05000440/2012008-01	NCV	Failure to Implement Transient Combustible Program (Section 1R05.1.b.(1))
05000440/2012008-02	NCV	Failure to Ensure Design Spray Density is Achieved (Section 1R05.3.b.(1))
05000440/2012008-03	NCV	Failure to Ensure Sprinkler Piping Could be Drained (Section 1R05.3.b.(2))
05000440/2012008-04	NCV	Failure to Install Sequential Timing Device for Fire Pumps (Section 1R05.3.b.(3))
05000440/2012008-05	NCV	Failure to Provide Full Area Detection (Section 1R05.3.b.(4))

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety, but rather, that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

ASSESSMENTS

Number	Description or Title	Date or Revision
MS-C-11-05-31	Fire Protection (Biennial/Triennial)	July 21, 2011
SN-SA-2012-0006	Fire Protection Program Self Assessment	March 29, 2012

CALCULATIONS

Number	Description or Title	Date or Revision
17-936	Hydraulic Calculations: Control Complex, Elev. 638'-6" Cable Spreading Area, Unit 1, Division 2	1
JL-133	Water Collection and Removal Capacity of Floor Drain System in Unit 1 Cable Spreading and Cable Chase Rooms and Intermediate Building EL. 599' and 620' Corridor Areas	0
P54-146	Unit 1 – Division 2 Sprinkler System Hydraulic Demand Calculation for the Cable Spreading Area, Vertical Cable Chase and Reactor Penetration Area	0
P54-24	Calculation of Combustible Loading and Allowable Limits for Fire Loading	4
SSC-001	Appendix R Evaluation Safe Shutdown Capabilities Report	5

CORRECTIVE ACTION PROGRAM DOCUMENTS (A/Rs) ISSUED DURING INSPECTION

Number	Description or Title	Date or Revision
CR-2012-03830	FP Triennial Walkdown the Lights in Div 1 Cable Chase Room behind Door CC-429 Elevation CC-638 are out:	March 12, 2012
CR-2012-03903	NRC FP Triennial: Liquid on the Floor in NCC Heat Exchanger Room	March 13, 2012
CR-2012-03908	NRC FP Triennial: Enhancement to B.5.b Quarterly Inspection PM	March 13, 2012
CR-2012-03988	NRC FP Triennial: Geni Lift in Combustible Control Zone	March 14, 2012
CR-2012-04053	2012 NRC FP Triennial Inspection Calc P54-146 Design Input Drawings Void	March 15, 2012
CR-2012-04106	2012 NRC FP Triennial Inspection – Potential Non-conservative Pipe Smoothness Coefficient for the Inner Pipe Lining used for Calc. P54-146	March 16, 2012
CR-2012-04553	NRC FP Triennial: Diesel Driven Fire Pump does not contain a Sequence Start Time Delay as Required by NFPA 20 Section 515.d.3 Code Year 1972	March 26, 2012
CR-2012-04649	NRC FP Triennial: Multiple Spurious Operation (MSO) Scenarios Requiring Additional Documentation	March 27, 2012

ASSESSMENTS

Number	Description or Title	Date or Revision
CR-2012-04655	NRC FP Triennial: Inappropriate Graffiti on Wall in the Plant	March 27, 2012
CR-2012-04658	NRC FP Triennial: Procedure Walkthrough 101-11 Attachment 11 Comments	March 27, 2012
CR-2012-04687	Triennial NRC FP Walkthrough – Appendix R Lighting Enhancements (Emergency Lighting)	March 28, 2012
CR-2012-04712	NRC FP Triennial: Review of Monticello Special Fire Protection Inspection Report	March 28, 2012
CR-2012-04717	NRC FP Triennial: Detection Coverage in Unit 1, Div 2, Cable Spreading Area	March 28, 2012
CR-2012-04729	NRC FP Triennial: Sprinkler Coverage in Unit 1, Div 2 Penetration Room	March 28, 2012
CR-2012-04734	NRC FP Triennial: Potential Spray Nozzle Coverage Issue in 638' Penetration Room	March 28, 2012
CR-2012-04843	NRC FP Triennial: Sprinkler head missing shield/deflector	March 30, 2012
CR-2012-04837	NRC FP Triennial: Improvement for ONI-SPI B-7	March 30, 2012
CR-2012-04849	NRC Triennial FP Inspection Walkdowns of ONI-SPI A-8 and ONI-SPI B-7	March 30, 2012
CR-2012-05307	NRC FP Triennial: Enhancement to SAS Response to Fire Alarms	April 9, 2012
CR-2012-05329	NRC FP Triennial: Self Assessment Deficiencies	April 9, 2012
CR-2012-05580	NRC FP Triennial: Housekeeping in the NCC Pump Room	April 11, 2012
CR-2012-05620	NRC FP Triennial: Organization in the Hot Shop Decon Area	April 12, 2012
CR-2012-05712	FP Triennial: Insufficient Self Assessment Scope	April 13, 2012

CORRECTIVE ACTION PROGRAM DOCUMENTS (A/Rs) REVIEWED

Number	Description or Title	Date or Revision
2009-52125	Possible Missed Fire Watch Location	January 16, 2009
2010-76215	Control Room Fire Induced MSO Potential Vulnerability	April 30, 2010
2010-76216	Fire Induced MSO Potential Vulnerability Document Needed in the SSC Report	April 30, 2010
2010-76220	Fire Induced MSO Potential Vulnerabilities Not in the Safe Shutdown Analysis	April 30, 2010
2010-76499	Incorrect Location Checked on the Fire Watch	May 6, 2010
2010-78122	Additional Consequence Information for CR 10-76499 Investigation	June 12, 2010
2011-04298	Unplanned Fire Impairment to Appendix R Barrier M23 F0599 (FDCC0419)	October 25, 2011

DRAWINGS

Number	Description or Title	Date or Revision
CUN#17745	Deluge Systems Tagging Data	6
D-514-025	Control Complex Steel Framing EL 620' 6" (EAST)	L

ASSESSMENTS

Number	Description or Title	Date or Revision
D-514-401	Control Complex Support Steel Between EL 678' 6" & 707' 2"	C
D-911-629	Intermediate Building Drains	C
D-911-633	Intermediate Building Floor & Equipment Drains EL 599' 0" (NORTH)	C
912-0610	Control Room HVAC and Emergency Recirculation System	FF
D-921-680	Control Complex Drains EL 638' 6" Column CC4 – CC5	A
D-921-681	Control Complex Drains EL 638' 6" Column CC2 – CC4	B
E-023-007	Fire Protection Evaluation Units 1 and 2 Control Complex Plan EL 599' 0"	15
E-023-011	Fire Protection Evaluation Units 1 and 2 Control Complex and Diesel Generator Buildings Plan EL 620' 6"	15
E-023-012	Fire Protection Evaluation Units 1 and 2 Intermediate and Fuel Handling Buildings Plan EL 620' 6"	14
E-023-015	Fire Protection Evaluation Units 1 and 2 Control Complex and Diesel Generator Buildings Plan EL 638' 6" and 646' 6"	15
E-023-019	Fire Protection Evaluation Units 1 and 2 Control Complex Plan EL 654' 6" and 678' 6"	15
17-936	Intermediate Building Supply Piping for Cable Spreading Area, Vertical Chase, Cable Tunnel and Penetration EL 620'6"	4
17-936	Control Complex & Intermediate Building Vertical Cable Chase, Cable Tunnel and Penetration Unit 1 Division 2	1
17-936	Control Complex Sprinklers EL 599' 0"	4
17-936	Control Complex & Intermediate BLDG Cable Spreading Area Division 2	1
17-937	Intermediate Building Floor Wet Pipe Sprinkler System EL 620'6" Sheets 21, 46, & 51	1

MISCELLANEOUS

Number	Description or Title	Date or Revision
SP-461-4549-00	Specification; Design, Fabrication, and Delivery of Fire Protection Water Pumps, Pressure Maintenance Tank, and Accessories	October 31, 1974
10-02	RPTB "B" Fire HB - 647' Fire Report	March 28, 2010
11-02	Unit 1 Drywell Fire Report	May 4, 2011
IP54-A-007	Fire Protection CO2 Control Room , Computer Room and Chart Room Acceptance Test	January 23, 1985
FPI-OCC	Pre-Fire Plan Pages 5, 6, 7, 8,29, 30, 45, 46, 59, 60, 61, 62 & 63	9
1-11-1CC-3C-0430	Hose Station at CC 620' OOS	June 2, 2011
1-11-1CC-5A-0406	Control Room Detector did not Alarm	May 11, 2011

PROCEDURES

Number	Description or Title	Date or Revision
NOP-ER-2005	Flow Accelerated Corrosion Management Program	03
NOP-ER-2007	Underground Piping and tanks Integrity Program	02
PAP-1910	Fire Protection Program	24
PAP-1911	Control Room Envelope Integrity and Tornado Depressurization Barrier Impairment	5
ONI-SPI A-8	LPCS Fire Water	0
ONI-SPI B-7	ADS Valve Emergency Operation	4
ONI-E12-2	Loss of Decay Heat Removal	28
ONI-C61	Evacuation of the Control Room	8
IOI-11	Shutdown from Outside the Control Room	23

VENDOR DOCUMENTS

Number	Description or Title	Date or Revision
----------	ASCOA Model 38-E Design Features	0
----------	FENWAL Detect-A-Fire Units Design Features Sheets B-52, -53, -53A	0

WORK ORDERS (WOs)

Number	Description or Title	Date or Revision
200330502	(24M) M24 Fire Damper Visual Inspection	August 10, 2010
200358462	Control Room CO2 Systems Operability Test	April 28, 2011
200372057	(6M) Magnetically Held Open Fire Door Operability Test	May 17, 2011
200382334	(24M) M23 Fire Damper Inspection	October 25, 2011
200393644	(24M) M25 and M26 Fire Damper Visual Inspection	March 23, 2012
200413358	Repair Pyrocrete Coating on Column E/2	October 6, 2010
200432393	(12M) Unit 1 Cable Spreading Spray Systems Detection/Functional Test	December 7, 2011
200450851	(6M) Semiannual Fire Door Inspection	August 15, 2011
200450852	(6M) Semiannual Fire Door Inspection	February 29, 2012
200454229	(6M) Magnetically Held Open Fire Door Operability Test	November 14, 2011
200454241	(6M) Unit 1 Fire Detection Instrumentation Functional Test for SDP	February 22, 2012

LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access Management System
BWR	Boiling Water Reactor
CR	Condition Report
CFR	Code of Federal Regulations
EGM	Enforcement Guidance Memorandum
FSAR	Final Safety Analysis Report
gpm	gallons per minute
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IPEEE	Individual Plant Examination of External Events
IR	Inspection Report
MSO	Multiple Spurious Operation
NCC	Nuclear Closed Cooling
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NRC	U.S. Nuclear Regulatory Commission
PARS	Publicly Available Records
PNPP	Perry Nuclear Power Plant
RG	Regulatory Guide
TS	Technical Specification
URI	Unresolved Item
USAR	Updated Safety Analysis Report
Vdc	Volts direct current
WO	Work Order

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Sincerely,

/RA/

Hironori Peterson, Acting Chief
Engineering Branch 3
Division of Reactor Safety

Docket Nos. 50-440
License Nos. NPF-58

Enclosure: Inspection Report 05000440/2012008(DRS)
w/Attachment: Supplemental Information

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