June 20, 2008

Mr. Jack M. Davis
Senior Vice President and
Chief Nuclear Officer
Detroit Edison Company
Fermi 2 - 210 NOC
6400 North Dixie Highway
Newport, MI 48166

SUBJECT: FERMI POWER PLANT, UNIT 2; NRC TRIENNIAL FIRE PROTECTION BASELINE INSPECTION REPORT 05000341/2008006(DRS)

Dear Mr. Davis:

On May 8, 2008, the U.S. Nuclear Regulatory Commission (NRC) completed a triennial fire protection baseline inspection at your Fermi Power Plant, Unit 2. The enclosed report documents the inspection findings, which were discussed on May 8, 2008, with Mr. Kenneth Howard and other members of your staff.

The fire protection triennial baseline inspection was conducted in accordance with NRC Inspection Procedure 71111.05T, "Fire Protection (Triennial)," dated April 21, 2006. The fire protection inspection team 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 related to fire protection and post-fire safe shutdown. The inspection consisted of a selected examination of procedures and records, observations of activities, and interviews with personnel.

Based on the results of this inspection, five NRC-identified findings of very low safety significance were identified. The findings involved a violation 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 in accordance with Section VI.A.1 of the NRC Enforcement Policy.

If you contest the subject or severity of a Non-Cited Violation, 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 Fermi 2 Facility.

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/

Julio F. Lara, Chief
Engineering Branch 3
Division of Reactor Safety

Docket No. 50-341
License No. NPF-43

Enclosure: Inspection Report 05000341/2008006
w/Attachment: Supplemental Information

cc w/encl: J. Plona, Vice President,
Nuclear Generation
K. Hlavaty, Plant Manager
R. Gaston, Manager, Nuclear Licensing
D. Pettinari, Legal Department
Michigan Department of Environmental Quality
M. Yudasz, Jr., Director, Monroe County
Emergency Management Division
Supervisor - Electric Operators
T. Strong, State Liaison Officer
Wayne County Emergency Management Division

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Letter to Mr. Jack Davis from Mr. Julio F. Lara dated June 20, 2008

SUBJECT: FERMI POWER PLANT, UNIT 2; NRC TRIENNIAL FIRE PROTECTION BASELINE INSPECTION REPORT 05000341/2008006(DRS)

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ROPreports@nrc.gov

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	50-341
License No:	NPF-43
Report No:	05000341/2008006(DRS)
Licensee:	Detroit Edison Company
Facility:	Fermi Power Plant, Unit 2
Location:	Newport, MI
Dates:	April 21-25 and May 5-8, 2008
Inspectors:	A. Dahbur, Senior Reactor Inspector, Lead R. Langstaff, Senior Reactor Inspector M. Munir, Reactor Inspector
Approved by:	Julio F. Lara, Chief Engineering Branch 3 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000341/2008006(DRS); 04/21/2008 – 05/08/2008; Fermi Power Plant, Unit 2; Triennial Fire Protection Baseline Inspection.

This report covers an announced triennial fire protection baseline inspection. The inspection was conducted by Region III inspectors in accordance with the U.S. Nuclear Regulatory Commission's (NRC's) Inspection Procedure (IP) 71111.05T, "Fire Protection (Triennial)," dated April 21, 2006. Based on the results of this inspection, five findings of very low safety significant (Green) associated with Non-Cited Violations (NCVs) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). 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: Mitigating Systems

- Green. A finding of very low safety significance and an associated Non-Cited Violation (NCV) of the Fermi 2 Facility Operating License Condition 2.C(9),for the fire protection program, was identified by the inspectors for the licensee failure to ensure that one redundant train of systems necessary to achieve and maintain hot shutdown conditions was free of fire damage during the process of implementing a plant modification. Specifically, the licensee failed to ensure that the air supply and its associated tubing for safe shutdown air operated valves T4901F468 and T4901F469 was free of fire damage for III.G.2 fire zones. The modification was lacking thorough review of the separation requirement specified in Appendix R. As a result, subsequent walkdown and analysis were required to verify that the air tubing associated with the above valves was not routed through the fire zone of concern.

  The finding was more than minor because it affected the mitigating systems cornerstone attribute of protection against external factors (fire) and it impacted the objective of the mitigating systems cornerstone. Specifically, spurious closure of the above air operated valves due to loss of air could have rendered the Division II SRVs inoperable and could have complicated plant safe shutdown. The finding was of very low safety significance because the inspectors answered "no" to all five questions under the Mitigating Systems Cornerstone Column of the Phase 1 worksheet. (Section 1R05.2b.(1))

- Green. A finding of very low safety significance and an associated NCV of the Fermi 2 Facility Operating License Condition 2.C(9), for the fire protection program, was identified by the inspectors for the failure to ensure the adequacy of a sprinkler system in Fire Zone 03RB. Specifically, the licensee failed to ensure that the capability of the sprinkler system installed in High Pressure Coolant Injection (HPCI) pump and turbine room (Fire Zone 03RB) was adequate to protect against the identified lubricating oil hazard of the HPCI turbine. The licensee entered the issue into their corrective action program and established hourly fire watches in Fire Zone 03RB as a compensatory measure.

The finding was more than minor because it affected the mitigating systems cornerstone attribute of protection against external factor (fire) and it impacted the objective of the mitigating systems cornerstone. The failure to ensure that the sprinkler system installed in Fire Zone 03RB protected against a fire involving the HPCI turbine impacted a defense and depth element of the fire protection program. The inspectors concluded that the finding was of very low safety significance because the majority of the mitigating systems were not being affected by the finding. (Section 1R05.4b.(1))

- Green. A finding of very low safety significance and an associated NCV of the Fermi 2 Facility Operating License Condition 2.C(9), for the fire protection program, was identified by the inspectors for the failure to install sprinkler system in accordance with the NFPA code of record. Specifically, the licensee failed to install three sprinkler heads located in the Reactor Core Isolation Cooling (RCIC) corner room in accordance with NFPA 13 Guidance in that the sprinkler deflectors were installed in excess of 12 inches below a smooth non-combustible ceiling. The licensee entered the issue into their corrective action program and established hourly fire watches in the RCIC fire zone as a compensatory measure. The finding has a cross-cutting aspect in the area of Human Performance, Decision Making, because the licensee did not use conservative assumptions in decision making in that evaluation FPEE-05-0020 failed to consider that activation of more distant sprinkler heads could result in preventable damage of other equipment. [H.1(b)]

  The finding was more than minor because it affected the mitigating systems cornerstone attribute of protection against external factor (fire) and it impacted the objective of the mitigating systems cornerstone. Specifically the improper sprinkler installation impacted the defense and depth element of the fire protection program in the RCIC room in that it could have resulted in the delayed activation of the sprinkler system and an increased likelihood of damage to other safety-related equipment (i.e., Division 1 Core Spray pumps). The finding has a cross-cutting aspect in the area of Human Performance, Decision Making. The inspectors concluded that the finding was of very low safety significance because the majority of the mitigating systems were not being affected by the finding. (Section 1R05.4b.(2))

- Green. A finding of very low safety significance and an associated NCV of the Fermi 2 Facility Operating License condition 2.C(9), for the fire protection program, was identified by the inspectors for the failure to provide a design basis for the general service water pump house (GSWPH) ambient temperature of 104°F used to evaluate the capacity of the diesel fire pump. The licensee entered the issue into their corrective action program and completed a preliminary analysis that showed the 104°F as a bounding value.

  The finding was more than minor based on review of IMC 0612, “Power Reactor Inspection Reports,” Appendix E, “Examples of Minor Issues,” Example 3k. Specifically, the failure to provide a design basis for the assumed general service water pump house ambient temperature resulted in a reasonable doubt with regards to the functionality of the diesel fire pump because minimal margin for operability existed. The finding affected the mitigating systems cornerstone attribute of protection against external factor (fire) and it impacted the objective of the mitigating systems cornerstone. The inspectors concluded that the finding was of very low safety significance because the finding represented a low degradation since the functionality of the diesel fire pump was not affected. (Section 1R05.4b.(3))

- Green. A finding of very low safety significance and an associated NCV of the Fermi 2 Facility Operating License Condition 2.C(9), for the fire protection program, was identified by the inspectors for the failure to have adequate shutdown procedure in the event of a fire in any of the alternate shutdown areas. Specifically, Abnormal Operating Procedure (AOP) 20.000.18 "Control of the Plant from the Dedicated Shutdown Panel," did not specify the need to complete time-critical operator actions early in the procedure. Upon discovery, the licensee entered the issue into their corrective action program and revised procedure 20.000.18 and added an override caution note directed the operators to immediately perform the required steps in the event of multiple spurious operations of the SRVs.

  The finding was more than minor because it affected the mitigating systems cornerstone attribute of procedure quality in the event of a fire and it impacted the objective of the mitigating systems cornerstone. Specifically, the failure to perform actions to mitigate the spurious opening of multiple SRVs in timely manor could have complicated plant shutdown in the event of a fire. The finding was of very low safety significance based on a phase 3 SDP evaluation completed by Region III senior reactor analyst (SRA) in accordance with IMC 0609, Appendix F, "Fire Protection Significance Determination Process." (Section 1R05.6b.(1))

B. Licensee-Identified Violations

No violations of significance were identified.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R05 Fire Protection (71111.05T)

The purpose of the fire protection triennial baseline inspection was to conduct a design-based, plant specific, risk-informed, onsite 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; and
- 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.

The inspectors' evaluation focused on the design, operational status, and material condition of the reactor plant's fire protection program and post-fire safe shutdown systems. 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 inspection was performed in accordance with U. S. Nuclear Regulatory Commission (NRC) Inspection Procedure (IP) 71111.05T, "Fire Protection (Triennial)," dated April 21, 2006. The NRC regulatory oversight process IP used a risk-informed approach for selecting the fire areas and/or fire zones and attributes to be inspected. The inspectors with assistance from a senior reactor analyst used the licensee's Individual Plant Examination for External Events (IPEEE) to select several risk-significant areas for detailed inspection and review.

The fire zones selected for review during this inspection are listed below and constitute three samples as defined in Inspection Procedure 71111.05T. For each of these fire zones, the inspectors focused on the fire protection features, the systems and

equipment necessary to achieve and maintain safe shutdown conditions, determination of licensee commitments, and changes to the fire protection program.

Fire Zone	Description
03RB	HPCI Pump and Turbine and CRD Pump Room
06RB	Reactor Building 2nd Floor
07AB	Cable Spreading Room

.1 Shutdown from Outside Main Control Room

a. Inspection Scope

The inspectors reviewed the functional requirements identified by the licensee as necessary for achieving and maintaining hot shutdown conditions to ensure that at least one post-fire safe shutdown success path was available in the event of fire in each of the selected fire areas and for alternative shutdown in the case of control room evacuation. 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 area selected for review. Specifically, the review was performed to determine the adequacy of the systems selected for reactivity control, reactor coolant inventory makeup, reactor heat removal, process monitoring, and support system functions. The review also included the fire safe shutdown analysis to ensure that all required components in the selected systems were included in the licensee's safe shutdown analysis.

The inspectors reviewed the licensee's post-fire safe shutdown analysis, normal and abnormal operating procedures, piping and instrumentation drawings, electrical drawings, their updated final safety analysis report, and other supporting documents to verify that hot and cold shutdown could be achieved and maintained from outside the control room for fires that rely on shutdown from outside the control room. This review included verification that shutdown from outside the control room could be performed both with and without the availability of offsite power.

The inspectors also examined the operators' ability to perform the necessary manual actions for achieving safe shutdown by reviewing post-fire shutdown procedures, the 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 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 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 Ensure Air Supply Tubing for Safe Shutdown Valves Free of Fire Damage

Introduction: A finding of very low safety significance and associated violation of Fermi 2 Facility Operating License Condition 2.C(9) was identified by the inspectors for the failure to ensure that one redundant train of systems necessary to achieve and maintain hot shutdown conditions was free of fire damage. Specifically, the licensee failed to ensure that air supply tubing for two safe shutdown valves associated with Division II SRVs was free of fire damage in the event of a fire in III.G.2 fire zones.

Description: In accordance with the current Appendix R analysis DC-4921, Revision G, safe shutdown for a fire in Reactor building fire zone 06RBN (north side of reactor building second floor) was achieved by using emergency depressurization with Division II Safety Relief Valves (SRVs) and injecting low pressure coolant into the reactor core by using Division II Residual Heat Removal (RHR) pumps B or D or Core Spray (CS) pumps B or D. This safe shutdown strategy was relied upon by the licensee in the event that both High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) are not available due to fire-induced damage to their cabling and circuitry. The Division II SRVs required nitrogen supply to operate in the event of a fire in fire zone 06RBN. The nitrogen supply, from reserved nitrogen gas bottles, to the SRVs is controlled by two air operated solenoid valves T4901F468 and T4901F469. These valves fail closed upon loss of air. As described in Updated Final Safety Analysis Report (UFSAR), Section 9.3.1, the air supply to these valves is described as NIAS, non interruptible air supply from a safety-related air compressor.

Prior to licensee's implementation of modification EDP-33934 in 2006, the safe shutdown analysis indicated that for a fire in Fire Zone 06RBN, only one Division II SRV, B2104F013G, would have been available for depressurization of the RPV because this

is the only SRV with an accumulator and the normal supply of nitrogen to the remaining Division II SRVs would have been lost due to loss of offsite power (LOOP). One SRV was not sufficient for depressurization. In addition, prior to the modification, for a fire in this area, the licensee safe shutdown analysis included preemptive manual action to disconnect the power supply to the HPCI pump turbine steam supply inboard isolation valve E4150F002. During the 2005 triennial fire protection inspection, inspectors questioned the feasibility of this preemptive manual action as documented in NCV 05000341/2005006-01.

Against the backdrop of the above discussion and in light of the NRC 2005 inspection violation, the licensee implemented a modification, EDP– 33934, Revision A, in 2006 to restore Appendix R, III.G.2 compliance. This modification installed back up nitrogen bottles into the Division II Drywell pneumatic line which could supply nitrogen to the SRVs in case of failure of normal supply due to LOOP. This modification allowed the operators to restore the supply of nitrogen to the SRVs from the control room during a LOOP. As discussed earlier, the nitrogen supply to the SRVs were controlled by two air operated solenoid valves which failed closed upon loss of air and/or loss of power. During the process of implementing this Appendix R modification, the divisional separation requirements of the cables associated with the valves were analyzed. However, the routing of the air tubing to the valves was not verified to ensure that they were not routed through a fire zone of concern. These air operated valves are required to remain open to facilitate the supply of nitrogen to the SRVs. The inspectors were concerned that a fire-induced failure could have caused air leakage and lack of sufficient air pressure supply to valves T4901F468 and T4901F469, which could have affected safe shutdown.

As discussed in Appendix R analysis DC-4921, Revision G, the Division II SRVs are now being credited for hot shutdown of the plant for an Appendix R III.G.2 fire in fire zone 06RBN. Therefore, in the absence of any evaluation of the instrument air tubing to the valves, the inspectors concluded that one train necessary to achieve and maintain hot shutdown conditions was not assured to be free of fire damage in the event of a fire in this zone.

The licensee entered this issue into their corrective action program as CARD 08-22929 “Are Air Piping Routes Analyzed for Fire Protection,” and verified by a walkdown that air tubing to the above air operated valves were not routed through a fire zone of concern.

Analysis: The inspectors determined that the failure to ensure that one redundant train of systems necessary to achieve and maintain hot shutdown conditions was free of fire damage was contrary to requirements of Appendix R III.G.2 and was a performance deficiency. The finding was determined to be more than minor because it affected the mitigating systems cornerstone attribute of design control for protection against external factors (fire) and affected the mitigating systems objective of ensuring the availability of systems that respond to initiating events to prevent undesirable consequences. Specifically, spurious closure of air operated valves T4901F468 and T4901F469 due to loss of air supply could have rendered the Division II SRVs inoperative and could have complicated safe shutdown.

The inspectors determined that the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 – Initial Screening and Characterization of Findings," Table 4a for Mitigating Systems Cornerstone. The inspectors answered "no" to all five questions under the Mitigating Systems Cornerstone Column of the Phase 1 worksheet. In addition, the inspectors determined that the finding also degraded a fire protection/safe shutdown defense-in-depth strategy; therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," was required. Based on review of IMC 0609, Appendix F, the inspectors concluded that the finding represented a low degradation within the post-fire safe shutdown strategy since functionality was not affected by the finding. Based on the above, the finding screened as having very low significance.

The inspectors did not identify a cross-cutting aspect associated with this finding.

Enforcement: License Condition 2.C(9) 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) through Amendment 60 and as approved in the Safety Evaluation Reports through Supplement No. 5.

Section 9A of the UFSAR outlined the licensee commitments for fire protection. Section 9A.5, "Point-by-Point Comparison," of the UFSAR provided the licensee's responses with respect to NRC positions established in Appendix A to NRC Branch Technical Position APCSB 9.5-1, dated August 23, 1976. The licensee's response documented in Paragraph c.1 of UFSAR Section 9A.5 stated that design control and procurement document control measures are part of the quality assurance program, described in Section 17.2 of the UFSAR.

Section 17.2.3, "Design Control," of the UFSAR stated that design documents (e.g., drawings, calculations, specifications, procedures, and instructions) originating from or released for review by the technical organization will contain the required regulatory requirements, quality standards, and design bases in accordance with NRC licensing requirements, also stated that plant modifications, including fire protection systems, shall be reviewed to assure that appropriate fire protection requirements as stipulated in Appendix A to BTP APCSB 9.5-1 are met.

Section d.1(a.2) of Appendix A to BTP APCSB 9.5-1, required separation of redundant safety-related systems from each other so that both are not subject to damage from a single fire hazard.

Contrary to the above, in July 2006 when modification EDP-33934, Revision A was implemented, the licensee failed to ensure that the separation requirements for redundant systems in the event of a fire were met. Specifically, during the modification process, the licensee failed to verify that the air tubing that supplied air to the air operated valves T4901F468 and T4901F469 did not traverse through a fire area of concern to assure that one train to achieve and maintain hot shutdown conditions was free of fire damage. Because the modification was lacking thorough review of the separation requirement specified in Appendix R, a subsequent walkdown and analysis were required and necessary to verify that air tubing associated with valves did not traverse through the fire area of concern. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CARD 08-22929, this violation is being treated

as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/2008006-01).

.3 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 codes 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.

.4 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 the National Fire Protection Association codes to verify that fire suppression and detection systems met license commitments.

b. Findings

(1) High Pressure Coolant Injection Room Sprinkler System Failed to Protect Against Hazard

Introduction: A finding of very low safety significance and associated violation of Fermi 2 Facility Operating License Condition 2.C(9) was identified by the inspectors for the failure to ensure that the capability of the sprinkler system installed in Fire Zone 03RB was adequate to protect against the identified lube oil hazard of the HPCI turbine.

Description: The High Pressure Coolant Injection (HPCI) pump and turbine was installed in Fire Zone 03RB, which was comprised of two levels: the control rod drive (CRD) pump

room for the upper level, and the HPCI pump room for the lower level (in which the HPCI pump and turbine were located). Although a concrete floor separated the two levels, the upper and lower levels were connected by a 12 foot by 16 foot open hatch directly above the HPCI turbine and an approximate 5 foot by 14 foot stairway opening. The sprinkler system, which was installed to protect against the lubricating oil located primarily within the HPCI turbine, was a partial installation and only installed below the ceiling of the lower level.

The inspectors noted that a number of National Fire Protection Association (NFPA) 13-1980, "Standard for the Installation of Sprinkler Systems," deficiencies associated with this zone had been identified in EVAL-DE0035-01, "Evaluation of Fermi 2 Wet Pipe Sprinkler Systems for Compliance with the Requirements of NFPA- 13, Standard for the Installation of Sprinkler Systems," which had been performed by a contractor in 2002. The identified deficiencies included an upright sprinkler installed instead of a sidewall sprinkler as specified by the drawing, the maximum area of coverage had been exceeded for 17 of 26 sprinklers, and baffle plates had not been installed between two sprinklers located close to each other. The licensee had accepted these deficiencies as part of FPEE-05-0020, "NFPA 13-1980 Non-compliances for Several Sprinkler System," which had been performed by licensee engineering staff in 2005.

The inspectors noted that although the identified deficiencies adversely affected the sprinkler system, the more significant issue was the partial installation of the sprinkler system. The inspectors noted that much of the heat from a fire involving the HPCI turbine would rise through the hatch to the upper level ceiling where no sprinklers were installed. The inspectors performed several fire modeling simulations using National Institute of Standards and Technology (NIST) Fire Dynamics Simulator (FDS) (http://fire.nist.gov/fds/) to gauge the effectiveness of the installed sprinkler system. The majority of simulations were conducted with five minutes of simulation time beyond initiation of the fire. The simulations modeled both a 0.8 meter (m) by 0.8 m pool fire and a 1.2 m by 1.2 m pool fire with intensities of 1.16 MegaWatts (MW) and 2.6 MW, respectively. For the simulations, the fires were located on the turbine pedestal centered below the open hatch, adjacent to the north side of the pedestal centered between north side sprinklers, and adjacent to the south side of the pedestal centered between south side sprinklers. The modeling results showed that activation of the installed sprinklers would be substantially delayed for the 2.6 MW fires in comparison to sprinklers modeled (but not installed) on the upper level ceiling above the hatch. In addition, the modeling results indicated that although sprinklers modeled on the upper level ceiling above the hatch would activate for a 1.16 MW fire, the sprinklers installed on the lower level ceiling would not activate within 5 minutes of fire initiation. An additional ten minute simulation using a 1.16 MW fire on the pedestal was performed. The additional simulation indicated that the installed sprinklers would not activate within ten minutes after fire initiation. The inspectors concluded that the installed sprinkler system was not adequate to protect against the HPCI turbine hazard. The inspectors showed the results of the fire modeling simulations to the licensee and the licensee subsequently initiated a 1-hour fire watch as a compensatory measure for the HPCI sprinkler system. In addition, the licensee entered the issue into their corrective action program under CARD 08-22727, "Fire protection Triennial Inspection question re: activation of HPCI room sprinkler system TPFI-021."

The licensee initially posed the argument that the sprinkler system was not required. The inspectors noted that the licensee's point-by-point comparison with Appendix A to NRC Branch Technical Position APCSB 9.5-1, dated August 23, 1976, stated that their fire

hazards analysis outlined the protection for containment areas in response to Criterion F.1(a) which specified that fire protection requirements for the primary and secondary containment areas should be provided on the basis for specific identified hazards. The fire hazard analysis for the HPCI room (discussed in UFSAR Section 9A.4.1.4) identified the lubricating oil in the HPCI turbine as a specific fire hazard. The fire hazard analysis further stated that the objective for the fire zone was to prevent a fire from damaging functionally redundant equipment located in an adjacent zone and the objective was achieved, in part, by provision of an automatic sprinkler system for the specific fire hazard (i.e., the HPCI turbine). In addition, the safety evaluation report for Fermi, NUREG 0798, listed the HPCI turbine and pump room as having a sprinkler system. The inspectors concluded that the sprinkler system was part of the licensing basis for Fermi and that the sprinkler system was required to protect against the HPCI turbine lubricating oil hazard.

Analysis: The inspectors determined that the failure to ensure that the capability of the sprinkler system installed in Fire Zone 03RB was adequate to protect against the lube oil hazard of the HPCI turbine was contrary to the licensing basis as described in the UFSAR and was a performance deficiency. The finding was determined to be more than minor because the failure to ensure that the sprinkler system installed in Fire Zone 03RB protected against the identified hazard of the HPCI turbine was associated with the Mitigating System 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. Specifically, the ineffectiveness of the sprinkler system to protect against a fire involving the HPCI turbine impacted the defense and depth element of the fire protection program and would adversely affect the ability to rapidly control such a fire and potentially could affected the fire fighting activities.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 – Initial Screening and Characterization of Findings," the inspectors performed an SDP Phase 1 screening and determined the finding degraded a fire protection defense-in-depth strategy. Therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," was required. Based on review of IMC 0609, the inspectors concluded that the finding represented a high degradation within the fixed fire protection systems category. Based on Review of IMC 0609F, 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 an ignition frequency of 2.7×10^{-3} per year (the value specified for a main feed pump oil fire) was appropriate. The inspectors determined that a duration factor of 1.0 was appropriate because the sprinkler system had been installed since original construction. Based on review of Transients worksheet from the reactor safety notebook for Fermi 2, the inspectors concluded that a conditional core damage probability of 1×10^{-7} was appropriate due to the majority of mitigating systems not being affected by the finding. The inspectors assumed that HPCI and the CRD pumps would be affected by the fire. Based on these conservative estimates, the inspectors established a bounding value of 2.7×10^{-10} per year for core damage frequency contribution. Based on review of IMC 0609 Table 2.9.1, "Risk Significance Based on ΔCDF," the inspectors concluded 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.

Enforcement: License Condition 2.C(9) 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) through Amendment 60 and as approved in the Safety Evaluation Reports through Supplement No. 5. Section 9A.4.1.4 of the UFSAR, Revision 14, stated that the objective for Fire Zone 03RB was to prevent a fire in the zone from damaging functionally redundant equipment in an adjacent zone. Section 9A.4.1.4 of the UFSAR also stated that the objective was achieved, in part, through an automatic sprinkler system for the specific fire hazard (HPCI turbine).

Contrary to the above, as of May 8, 2008, the licensee failed to have an automatic sprinkler system for the specific fire hazard (HPCI turbine) for Fire Zone 03RB. Specifically, the sprinkler system installed in Fire Zone 03RB would not protect against the HPCI turbine specific hazard because activation of the sprinkler system would either be significantly delayed or not occurred in the event of a fire involving the HPCI turbine. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CARD 08-22727, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/2008006-02).

(2) Reactor Core Isolation Cooling Room Sprinkler System Improperly Installed

Introduction: A finding of very low safety significance and associated violation of Fermi 2 Facility Operating License Condition 2.C(9) was identified by the inspectors for the failure to install sprinklers in accordance with NFPA 13 contrary to the licensing basis as described in the UFSAR. Specifically, three sprinkler heads were installed in Reactor Core Isolation (RCIC) corner room in access of 12 inches below the ceiling.

Description: Section 4-3.1 of NFPA 13-1980 requires that sprinklers be installed no more than 12 inches below the ceiling for smooth ceilings. The inspectors identified two sprinklers located approximately 19 inches below the ceiling in northeast reactor building quadrant which housed the RCIC turbine and pump along with the Division I core spray pumps. Section 9A.4.1.3 of the UFSAR stated that the sprinkler system was installed in the area for the specific hazard of the RCIC turbine.

The inspectors noted that EVAL-DE0035-01, "Evaluation of Fermi 2 Wet Pipe Sprinkler Systems for Compliance with the Requirements of NFPA-13, Standard for the Installation of Sprinkler Systems," performed in 2002 by a contractor had identified that two-sprinkler heads (other than the two sprinklers identified by the inspectors) were located in excess of 12 inches below the ceiling. The evaluation judged the location of one of the sprinklers to be acceptable because of a ventilation duct obstruction. However, the evaluation judged the other sprinkler (located in the northwest corner) to be greater than 2-feet below the ceiling and to be not acceptable. In 2005, licensee engineering staff performed evaluation FPEE-05-0020, "NFPA 13-1980 non-compliances for Several Sprinkler Systems." Evaluation FPEE-05-0020 noted the one sprinkler located near the northwest corner was located several feet below the ceiling, because of obstructions determined at the time of construction. Based on field observation, the inspectors determined that the sprinkler located in the northwest corner was approximately 6-feet below the ceiling and that there were no obstructions which prevented the sprinkler from being placed within 12 inches of the ceiling. Evaluation FPEE-05-0020 accepted the condition by noting that the hydraulic analyses had been calculated for all of the sprinklers flowing and that any delay in actuation of the sprinkler that may cause additional sprinklers to open would not be of concern.

Although the inspectors agreed that the system had sufficient hydraulic margin to provide flow to all of the sprinkler heads, the inspectors noted that the objective of the sprinkler system was to control a fire, preferably with as few sprinkler heads open as possible. Because of the sprinkler head being located significantly below the ceiling, there was a potential that other sprinkler heads further away from a fire would open, but would not assist in controlling a fire. As a result, there would be a greater likelihood of damage to other equipment in the room such as the Division I core spray pumps due to water from sprinklers. The inspectors also noted that whether the sprinkler head located approximately 6-feet below the ceiling would activate in the event of a fire was questionable because a developing hot gas layer would be vented though the stairway opening for the room. As such, the inspectors considered the evaluation performed for FPEE-05-0020 to be inappropriate and non-conservative. When this issue was brought to the licensee's attention, the licensee entered the issue into their corrective action system under CARD 08-23072, "Sprinklers in RCIC Room distance from ceiling exceed NFPA requirements," and initiated hourly fire watches as a compensatory measure.

In 2008, licensee engineering personnel had performed a fire protection self-assessment (TMPE-08-0037, "2008 Fire Protection Triennial Inspection Self-Assessment Final Report"). Evaluation FPEE-05-0020 was reviewed as part of the self-assessment. The self-assessment noted that the station had identified a number of NFPA 13 non -compliances, including sprinklers exceeding the maximum allowable distance below the ceiling, and that the non-compliances had been evaluated with the conclusion that they would not adversely affect the required function of the systems. As such, the inspectors concluded that the non-conservative decision making as documented in FPEE-05-0020 was representative of current licensee performance.

Analysis: The inspectors determined that the failure to install RCIC room sprinkler system in accordance with NFPA 13 was contrary to the licensing basis as described in the UFSAR and was a performance deficiency. The finding was determined to be more than minor because the failure to install the RCIC room sprinkler systems in accordance with NFPA 13 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. Specifically, the improper sprinkler installation could result the sprinkler system not activating near a fire involving the RCIC turbine and an increased likelihood of damage to equipment located near by, such as the Division I core spray pumps, not initially affected by the fire.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 – Initial Screening and Characterization of Findings," the inspectors performed an SDP Phase 1 screening and determined the finding degraded a fire protection defense-in-depth strategy. Therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," was required. Based on review of IMC 0609, the inspectors concluded that the finding represented a moderate degradation within the fixed fire protection systems category and performed a Phase 2 analysis. Based on Review of IMC 0609, 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 an ignition frequency of 2.7×10^{-3} per year (the value specified for a main feed pump oil fire) was appropriate. The inspectors determined that a duration factor of 1.0 was appropriate because the sprinkler system had been installed since original construction. The inspectors conservatively

assumed that the Division I core spray pumps, in addition to RCIC, would be affected by a fire. Based on review of the reactor safety notebook for Fermi, the inspectors concluded that a conditional core damage probability of 1×10^{-7} was appropriate due to the majority of mitigating systems not being affected by the finding. Based on these conservative estimates, the inspectors established a bounding value of 2.7×10^{-10} per year for core damage frequency contribution. Based on review of IMC 0609 Table 2.9.1, "Risk Significance Based on ΔCDF," the inspectors concluded that the finding was of very low safety significance (i.e., Green). This finding has a cross-cutting aspect in the area of Human Performance, Decision Making, because the licensee did not use conservative assumptions in decision making. Specifically, the evaluation documented in FPEE-05-0020 was inappropriate and non-conservative in that evaluation accepted that the sprinkler head would not activate in a timely manner and that the evaluation failed to consider that activation of more distant sprinkler heads could result in preventable damage of other equipment. [H.1(b)]

Enforcement: License Condition 2.C(9) 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) through Amendment 60 and as approved in the Safety Evaluation Reports through Supplement No. 5.

Section 9A.5, "Point-by-Point Comparison," of the UFSAR provided the licensee's responses with respect to NRC positions established in Appendix A to NRC Branch Technical Position APCSB 9.5-1, dated August 23, 1976. The licensee's response documented in Paragraph e.3(c) of UFSAR Section 9A.5 stated sprinkler systems throughout the plant were installed using NFPA 13 and/or NFPA 15 for guidance. Section 4-3.1 of NFPA 13 specified that deflectors for sprinklers be located 1 to 12 inches below smooth non-combustible ceilings.

Contrary to the above, as of May 8, 2008, the licensee failed to install the sprinkler for the RCIC turbine hazard using NFPA 13 for guidance in that sprinkler deflectors were installed in excess of 12 inches below a smooth non-combustible ceiling. Specifically, the licensee installed the sprinkler system for the RCIC turbine hazard with two sprinklers with deflectors located approximately 19 inches below the ceiling and one sprinkler with its deflector located approximately 6 feet below the ceiling. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CARD 08-23072, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/2008006-03).

(3) Lack of Basis for Diesel Fire Pump Temperature De-Rating

Introduction: A finding of very low safety significance and associated violation of Fermi 2 Facility Operating License Condition 2.C(9) was identified by the inspectors for the failure to provide a design basis for the general service water pump house ambient temperature.

Description: Licensee engineering staff evaluated the capacity of the diesel fire pump in FPEE-03-0009, "NFPA 20-1970 Deviation, Replacement of Diesel Fire Pump with Refurbished Original Electric Fire Pump – ERE 31911." The inspectors noted that evaluation showed minimal available margin for the diesel fire pump. Specifically, the evaluation showed the pump as having 301.0 horsepower (hp) available versus 300.8 hp required in order to meet Technical Requirements Manual (TRM) specifications. The

inspectors noted that there was some margin between the TRM requirement and what was required to support the fire protection system hydraulically for functionality. The inspectors further noted that evaluation FPEE-03-0009 was sensitive to combustion air temperatures assumed for de-rating purposes.

Evaluation FPEE-03-0009 used a diesel fire pump room temperature of 163 degrees (°) Fahrenheit (F) for combustion air based on the value determined by calculation DC-5547, "GSWPH, Diesel Fire Pump Ambient Temperature," original version. Calculation DC-5547 was subsequently revised to provide a temperature of 165°F to correct a calculational error. The diesel fire pump room temperatures calculated by DC-5547 were based on the air coming into the room from the general service water pump house having a temperature of 104°F. The inspectors noted that the general service water pump house relied upon ventilation which would be lost upon a loss of offsite power. As such, the validity of the 104°F value was in question. During this inspection, licensee engineering staff was unable to determine the basis for 104°F being used for general service water pump house temperatures. The source document referenced by DC-5547 for the 104°F value did not contain 104°F as a calculated value, nor provided a basis for the value. As such, the inspectors concluded that there was a reasonable doubt regarding the functionality of the diesel fire pump because minimal margin for operability existed. During this inspection, the licensee entered the issue into their corrective action system under CARD 08-23092, "DFP Design Calculations Apply Inconsistent Maximum GSWPH Temperature," and performed a preliminary analysis of the general service water pump house temperature without ventilation. The licensee's preliminary analysis showed the 104°F as bounding. Based on the licensee's preliminary analysis and that there was some margin between the TRM requirement and what was required to support the fire protection system hydraulically, the inspectors concluded that functionality was not affected by this issue.

Analysis: The inspectors determined that the failure to provide a design basis for the general service water pump house ambient temperature, which resulted in a reasonable doubt with regards to the functionality of the diesel fire pump, was contrary to was contrary to the licensing basis as described in the UFSAR and was a performance deficiency. The finding was determined to be more than minor because the finding was similar to IMC 0612, Appendix E, Example 3.k. Specifically, the failure to provide a design basis for the assumed general service water pump house ambient temperature resulted in a reasonable doubt with regards to the operability of the diesel fire pump because minimal margin for operability existed. Therefore, this performance deficiency also impacted 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. Specifically, the doubt with respect to diesel fire pump operability potentially impacted both automatic and manual fire suppression capability.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 – Initial Screening and Characterization of Findings," the inspectors performed an SDP Phase 1 screening and determined the finding affected a fire protection defense-in-depth strategy. Therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process," was required. Based on review of IMC 0609, Appendix F, the inspectors concluded that the finding represented a degradation within the fixed fire protection systems finding category in addition to manual suppression. Since functionality was not affected by the finding, the inspectors concluded that the finding represented a low degradation. Under Task 1.3.1, Question 1, the finding screened to very

low safety significance (i.e., Green) because the finding was assigned a low degradation rating. The inspectors did not identify a cross-cutting aspect associated with this finding.

Enforcement: License Condition 2.C(9) 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) through Amendment 60 and as approved in the Safety Evaluation Reports through Supplement No. 5.

Section 9A.5, "Point-by-Point Comparison," of the UFSAR provided the licensee's responses with respect to NRC positions established in Appendix A to NRC Branch Technical Position APCSB 9.5-1, dated August 23, 1976. The licensee's response documented in Paragraph c.1 of UFSAR Section 9A.5 stated that design control and procurement document control measures are part of the quality assurance program, described in Section 17.2 of the UFSAR.

Section 17.2.3, "Design Control," of the UFSAR stated that design documents (e.g., drawings, calculations, specifications, procedures, and instructions) originating from or released for review by the technical organization will contain the required regulatory requirements, quality standards, and design bases in accordance with NRC licensing requirements.

Contrary to the above, as of May 8, 2008, the licensee failed to ensure that calculations originating from the technical organization contained the required design bases in accordance with NRC licensing requirements. Specifically, site engineering personnel of the technical organization failed to ensure a design basis existed for the general service water pump house ambient temperature assumed in Calculation DC-5547. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CARD 08-23092, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/2008006-04).

.5 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.

.6 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 team 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

(1) Alternate Shutdown Procedure Failed to Identify Time-Critical Steps

Introduction: A finding of very low safety significance and associated violation of the Fermi 2 Facility Operating License Condition 2.C(9) was identified by the inspectors for the failure to have adequate shutdown procedure in the event of a fire in any of the alternate shutdown zones. Specifically, Abnormal Operating Procedure AOP 20.000.18 did not specify the need to complete time-critical operator actions early in the procedure.

Description: Procedure AOP 20.000.18 pertained to post-fire shutdown in the event of a fire in certain plant areas (i.e., alternate fire area) and entailed the evacuation of the control room and the plant shutdown from a dedicated shutdown panel, assisted by manual actions performed at various plant locations. The procedure identified four goals that need to be accomplished; the most limited goal was to start standby feed water injection into the Reactor Pressure Vessel (RPV) within 29 minutes of reactor scram. This goal was accomplished by the completion of the steps in Section "A" (start CGT11-1) and the steps in Section "C" (start the East and West Stand-by Feedwater (SBFW) pumps). However, operators were not prompted to take actions to preclude the uncontrolled RPV blowdown due to spurious actuation of SRVs, until steps in Section "D" on pages 10 and 11 of the procedure.

Calculation DC-4921 "Appendix R Calculation", Revision G, Section A.5.3 "SRV Operation" indicated that fire-induced fault (i.e., hot short) of cables associated with the SRVs can cause one or more of the valves to open. The calculation showed that a worst case scenario involved the faulting of multi-conductor (12-conductor) cables 235080-1C or 235070-1C with multiple intra-cable hot shorts, which can cause six SRVs to open, three SRVs per cable. The described scenario required 6 of 12-conductors, 2 per SRV to short. The calculation also indicated that for fire zones using dedicated shutdown, the actions to de-energize the SRVs to preclude uncontrolled RPV, were taken immediately and were specified as preemptive actions and once the source of power was removed, an open SRV will close. Calculation DC-6119 "Appendix R Database" showed that cables 235070-1C and 235080-1C were only located in Division I zones and the Relay Room, which is

considered an Alternate Shutdown zone. Since Division II equipment (i.e., automatic actuation of low pressure injection source) were assumed to be available in the event of a fire in the Division I Zones, fast depressurization of the RPV as a result of multi-spurious opening of SRVs was not an Appendix R concern. However, this issue was of more concern for a fire in the relay room because injection into the RPV was accomplished via the standby feedwater system using manual actions from outside the control room and the low pressure injection sources were assumed to be unavailable due to fire faults.

Calculation DC-6197 "Reactor Coolant System Response Analysis to Support 10 CFR Part 50, Appendix R Compliance", Revision 0, Figure 7.2 showed that the reactor level would reach the Top of Active Fuel (TAF) in approximately 10 minutes in the event that three SRVs spuriously opened. Therefore, the inspectors concluded that assuming the worst case scenario involved the spurious opening of six SRVs, the time that the reactor level reach the TAF would be much less than 10 minutes and would have been critical.

Calculation FPEE-05-0012 "Manual Action Feasibility Study for AOP 20.000.18," dated July 25, 2005, documented the walkdown completion time for Steps D.1 and D.2 as 12:05 and 13:10 minutes respectively. The calculation also included a footnote indicating that although that Steps D.1 and D.2 were completed in 12:05 and 13:10 minutes in the sequence established by AOP 20.000.18, however, should the operators receive indication, that one or more SRVs have spuriously opened, the operators would take immediate actions to de-energize the valves. The licensee performed another time-line walkdown of actions required per procedure 20.000.18 on April 9, 2008. The latest walkdown showed that the licensee performed the actions specified per Step "D" in 30 minutes. The licensee at the time, did not question the acceptance of the result of the wallkdown, specifically, the 30 minutes completion time for Step "D" because the completion time for this step was not specified as critical and the only goal that was required per the procedure to be completed within 29 minutes was to injecting into the PRV.

The licensee provided additional information indicated that during the walkdown on April 9, 2008, the operators did not commence Step "D" following the reactor scram. They waited 25 minutes for CGT startup and then started performing Step "D". The step took only 4 to 5 minutes to perform therefore following scram SRVs spurious actuation would be prevented about 5 minutes after reactor scram. In addition, the structure of the AOPs is not sequential; operators were trained in AOP format to review the condition and perform actions if applicable and continue in the AOP to next condition.

However, based on the above information which indicated that spurious opening of six SRVs needed to be immediately mitigated, the inspectors were concerned that lack of adequate instructions (i.e., caution/notes) earlier in procedure 20.000.18 directing the operators to perform Steps D.1 or D.2 could have delayed de-energizing the SRVs and could have complicated shutdown of the plant. The licensee entered this issue into their corrective action program as CARD 08-22904 "Procedure Improvement" and revised procedure 20.000.18 and added an override action, on every odd pages from 2-10, directed the operators to perform Step "D" and remove power if spurious SRV(s) actuation was observed.

Analysis: The inspectors determined that failure to have adequate procedural instructions for safe shutdown of the plant from outside the control room in the event of a fire in any of the alternate shutdown fire zones was contrary to the license condition for the fire protection

program and was a performance deficiency. The finding was determined to be more than minor because it affected the mitigating systems cornerstone attribute of procedure quality for protection against external factors (fire) and impacted the cornerstone objective of ensuring the capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to have adequate instructions, in AOP 20.000.18, to promptly mitigate a spurious opening of multiple SRVs could have adversely impacted the operator's ability to promptly take appropriate actions and could have complicated plant safe shutdown in the event of a fire.

In accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 – Initial Screening and Characterization of Findings," the inspectors performed an SDP Phase 1 screening and determined the finding degraded a fire protection defense-in-depth strategy involving a post fire safe shutdown system. Therefore, screening under IMC 0609, Appendix F, "Fire Protection Significance Determination Process" was required.

The inspectors completed a Phase 1 SDP evaluation using IMC 0609. The inspectors determined that the finding could have affected the safe shutdown only for a fire in the Relay Room (Fire Zone 03AB) because as shown in Calculation DC-6119, a fire in this zone could potentially affect the circuits for six SRVs as a result of a fire-induced damage to cables 235070-1C and 235080-1C located in the area.

The inspectors assigned a degradation rating of Moderate because of procedural inconsistencies between AOP 20.000.18 and the Fire Safe Shutdown analysis which required immediate actions to de-energize the SRVs. Since the duration of this issue was greater than 30-days, a duration factor of 1.0 was assigned. The inspectors assumed a generic fire area frequency of 6E-3/yr for the relay room based on Table 1.4.2 of Appendix F (cable spreading room - cables plus other electrical equipment). Using the above information, the finding did not screen less than 1E-6. Therefore, further evaluation was performed.

A Region III SRA conducted a Phase 3 evaluation for this issue since the Phase 2 SDP process described in IMC 0609 Appendix F did not include treatment of fires leading to main control room abandonment. The Phase 2 process did, however, provide useful information for performing a Phase 3 risk assessment. The SRA also referred to the licensee's Individual Plant Examination for External Events (IPEEE), and NUREG/CR-6850, "PRA Methodology for Nuclear Power Facilities."

The inspectors and the SRA eliminated Division 2 safe shutdown equipment from consideration in postulated fire damage scenarios. The horizontal distance between Division 1 SRV cable trays and Division 2 cable trays was approximately 28 feet. IMC 0609, Appendix F, Attachment 3 states that fire in horizontal cable trays spread along the tray at the rate of 10 feet per hour. Given the approximate 2.8-hour time frame, damage to Division 2 equipment due to horizontal propagation was not considered credible. In addition, based on the physical dimensions and layout of the relay room, using NUREG 1805, "Fire Dynamics Tools Spreadsheet," Worksheet 2.02 "Predicting Hot Gas Layer Temperature in a Room Fire with Forced Ventilation," the inspectors determined that a 650 kW large electrical fire (Appendix F Table 2.3-1) would result in a hot gas layer temperature of less than 300^{o} F, which is below the damage threshold of 625^{o} F, for thermoset cables. The SRA determined that damage to the Division 2 safe shutdown equipment due to hot gas layer impact was likewise not credible.

The licensee's IPEEE Table 4-11 lists the fire ignition frequency for a relay room fire at 1.32E-2/yr. The SRA assumed a duration factor of 1.0. The SRA assumed that the finding only affected fire scenarios during the first 15 minutes, since the licensee was able to demonstrate their ability to start both standby feedwater pumps and start injecting into the RPV after this time. The manual non-suppression probability assuming 15 minute fire was estimated at 0.16 for an electrical cabinet per NUREG/CR-6850, "Fire PRA Methodology for Nuclear Power Facilities." The automatic non-suppression probability for the halon system was estimated at 0.05 per NUREG/CR-6850. The probability that a specific hot short failure mode will occur in 12-conductor cables that could result in spurious operation of 6 SRVs was 0.15 per NUREG/CR-6850, Appendix "J" Technical Basis for Circuit Failure Mode Likelihood Equations." The SRA assumed that fire scenarios which would cause 6 SRVs to open would be similar to a large break loss of coolant accident without Division 1 mitigating equipment. Using the Fermi risk-informed inspection notebook, the SRA estimated the conditional core damage probability at 1E-3. Considering the above information, the SRA estimated the ΔCDF at 1.5E-8, which is of very low safety significance (i.e., Green).

The inspectors did not identify a cross-cutting aspect associated with this finding.

Enforcement: License Condition 2.C(9) 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) and as approved through Amendment 60 and as approved in the Safety Evaluation Report (SER) through Supplement No. 5.

Fermi 2 SER, Appendix E "Fire Protection Review," Section IX, "Appendix R Statement," stated, in part, that by a letter dated June 9, 1981, the applicant has made a commitment to meet the technical requirements of Appendix R to 10 CFR Part 50 or provide equivalent protection. In addition, Section 9A.3 of the UFSAR for the facility stated, in part, that an alternative shutdown system had been designed and installed to meet the technical requirements of 10 CFR Part 50, Appendix R, Sections III.G.3, and III.L. Appendix R of 10 CFR Part 50, Section III.L.3, required the alternative shutdown capability shall be independent of the specific fire area(s) and procedures shall be in effect to implement this capability.

Contrary to the above, in April 30, 2008, the inspectors identified that procedure 20.000.18 "Control of the Plant from the Dedicated Shutdown Panel," Revision 42, was not adequate to implement the alternative shutdown capability. Specifically, the actions to mitigate the spurious activation of the SRVs were not clearly identified as time critical actions earlier in the procedure and they were needed to be performed immediately. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CARD 08-22904, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/200806-05).

.7 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 that 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, on a sample basis, the adequacy of circuit protective coordination for the safe shutdown systems' electrical power and instrumentation busses were evaluated. Also, on a sample basis, a cable tray that contain both safe shutdown and non-safe shutdown cables was evaluated for proper circuit protection to ensure that cables are protected by a proper protective device in order to preclude common enclosure concerns.

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 onsite. 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 onsite 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 on 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.

4. OTHER ACTIVITIES

4OA2 Problem Identification and Resolution (71152B)

a. Inspection Scope

The inspector 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 May 8, 2008, at the conclusion of the inspection, the inspectors presented the inspection results to Mr. K. Howard, and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary.

.2 Interim Exit Meetings

No interim exits were conducted.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

G. Almes, Shift Manager, Plant Operations
K. Amin, Plant Support Engineering – Electrical
M. Caragher, Director, Nuclear Engineering
B. Cummings, Plant Support Engineering – Mechanical/Civil
P. Fallon, Fire Protection Specialist, Plant Operations
G. Givens, Plant Support Engineering – Electrical
S. Hassoun, Supervisor, Licensing
K. Howard, Manager, Plant Support Engineering
R. Johnson, Supervisor, Compliance
G. Najjar, Supervisor, System Engineering
G. Richards, Lead Engineer, Engineering First Team
S. Reity, Shift Manger, Plant Operations
R. Salmon, Engineer, Licensing
L. Sharpe, Chairman, Fermi Division Local 223
K. Snyder, System Engineering
T. Stack, Manager, Security
J. Tibai, Supervisor, Plant Engineering
C. Walker, Director, Nuclear Organizational Effectiveness

Nuclear Regulatory Commission

T. Steadham, Resident Inspector
A. M. Stone, Chief, Engineering Branch 2, Division of Reactor Safety

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000341/2008006-01	NCV	Failure to Ensure Air Supply Tubing for Safe Shutdown Valves Free of Fire Damage (Section 1R05.2b.(1))
05000341/2008006-02	NCV	High Pressure Coolant Injection Room Sprinkler System Failed to Protect Against Hazard (Section 1R05.4b.(1))
05000341/2008006-03	NCV	Reactor Core Isolation Cooling Room Sprinkler System Improperly Installed (Section 1R05.4b.(2))
05000341/2008006-04	NCV	Lack of Basis for Diesel Fire Pump Temperature De-Rating (Section 1R05.4b.(3))
05000341/2008006-05	NCV	Alternate Shutdown Procedure Failed to Identify Time-Critical Steps (Section 1R05.6b.(1))

Closed

05000341/2008006-01	NCV	Failure to Ensure Air Supply Tubing for Safe Shutdown Valves Free of Fire Damage (Section 1R05.2b.(1))
05000341/2008006-02	NCV	High Pressure Coolant Injection Room Sprinkler System Failed to Protect Against Hazard (Section 1R05.4b.(1))
05000341/2008006-03	NCV	Reactor Core Isolation Cooling Room Sprinkler System Improperly Installed (Section 1R05.4b.(2))
05000341/2008006-04	NCV	Lack of Basis for Diesel Fire Pump Temperature De-Rating (Section 1R05.4b.(3))
05000341/2008006-05	NCV	Alternate Shutdown Procedure Failed to Identify Time-Critical Steps (Section 1R05.6b.(1))

Discussed

None

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.

CALCULATIONS

Number	Description or Title	Date or Revision
DC-6197	Reactor Coolant System Response Analysis to Support 10 CFR Part 50, Appendix R Compliance	0
DC-6119	Appendix R Database	B
DC-4921	Appendix R Calculation	G
DC-5547	GSWPH, Diesel Fire Pump Ambient Temperature	A
DC-5713	Hydraulic Evaluation of the Fire Distribution Loop	D
EVAL-DE0035-01	Evaluation of Fermi 2 Wet Pipe Sprinkler Systems for Compliance with the Requirements of NFPA-13, Standard for the Installation of Sprinkler Systems	0
FPEE-05-0009	NFPA 20-1970 Deviation, Replacement of Diesel Fire Pump with Refurbished Original Electric Fire Pump–ERE 31911	May 1, 2003
FPEE-05-0020	NFPA 13-1980 Non-compliances for Several Sprinkler Systems	August 2, 2005
DC-4921	Appendix R Calculations	G
DC-5783	Appendix R Equipment and Cable Justifications	C

CORRECTIVE ACTION PROGRAM DOCUMENTS (CARDS) ISSUED DURING INSPECTION

Number	Description or Title	Date
08-22695	Missing Baffle in Suppression System	April 23, 2008
08-22727	Activation of HPCI Room Sprinkler System	April 24, 2008
08-22729	Rag Bin in HPCI Pump Room	April 24, 2008
08-22730	Fire Extinguisher Indicating Slight Overpressure	April 24, 2008
08-22732	Cold Shutdown Matrix in 23.205 Disagree with 23.205 Section 6.1.2	April 24, 2008
08-22739	NFPA-13 Code Non-compliance	April 24, 2008
08-22759	50 No. Extinguisher Found not Mounted Per MMA10	April 25, 2008
08-22791	LER No. 99-012-00 Insufficient Breakers Trip Settings	April 28, 2008

CORRECTIVE ACTION PROGRAM DOCUMENTS (CARDS) ISSUED DURING INSPECTION

Number	Description or Title	Date
08-22876	NFPA-13 Need for Draft Stops in RCIC	April 29, 2008
08-22904	Procedure Improvement	April 30, 2008
08-22929	Are Air Piping Routes Analyzed for Fire Protection	May 1, 2008
08-23072	Sprinklers in RCIC Room Distance From Ceiling Exceed NFPA Requirements	May 7, 2008
08-23074	NRC Triennial Fire Protection Inspection Question Regarding Calculation DC-6197	May 7, 2008
08-23087	NRC Triennial Fire Protection Inspection Question Regarding Calculation DC-6197 and Procedure 20.000.18	May 7, 2008
08-23092	Diesel Fire Pump Design Calculations Apply Inconsistent Maximum General Service Water Pumps House Temperature	May 8, 2008
08-23095	Fire protection System Hydraulic Analysis	May 8, 2008
08-23100	Fire Zone Boundary Between CRD Room (03RB) and T-Room (04RBS) has Hole	May 8, 2008
08-23140	Correct Minor Drawing Error on Drawing I-2201-01	May 8, 2008

CORRECTIVE ACTION PROGRAM DOCUMENTS (CARDS) ISSUED PRIOR TO INSPECTION

Number	Description or Title	Date
05-24176	Use of Manual Actions in DC-4921	July 14, 2005
08-21088	Fire Protection Self-Assessment Concern 08SA-RFI-020	February 14, 2008
08-20901	Fire Protection Program does not Utilize Repair Procedure to Perform Cold Shutdown Repairs	February 7, 2008
02-21266	Determine if the Fire Detection Installation in UFSAR Fire Zone 1AB, Control Air Compressor Room is Required To Conform to the NFPA 72E 1974 Ed. Criteria For “High Ceilings”	December 2, 2002
06-27418	Required Appendix R Fire Wrap Removed and not Replaced	November 17, 2006
06-27749	EFP Motor Amp Trend	December 7, 2006
08-21262	Fire Protection Self-Assessment Concern with Potential Damage Due To Suppression	February 21, 2008
03-16520	Fire Induced Spurious Actuation Potentially Result in RHR Piping Exceeding Design Pressure	November 20, 2003

CORRECTIVE ACTION PROGRAM DOCUMENTS (CARDS) ISSUED PRIOR TO INSPECTION

Number	Description or Title	Date
07-21014	NRC Information Notice 2007-07, Potential Failure of All Control Rod Groups to Insert in a Boiling Water Reactor Due to Fire	February 21, 2007

DRAWINGS

Number	Description or Title	Revision
6I721-2868-3	Installation, Fire Detection system, Cable Spreading Room, Zone 11	C1
6I721-2868-76	Installation Fire Detection Sys., Cable Spreading Rm. El. 630'-6" (Zone 11) Computer Room Under Floor Elevator 655'-6" (Zone 13)	G
6M721-5062	R.C.I.C. Turbine and Pump Room, Subbasement Elevator 540'-0"	J
6M721-5063	H.P.C.I. Turbine & Pump room, Subbasement Elevator 540'-0"	H
6M721-5007	Primary Containment Pneumatic Supply System	X
6M721-2035	High Pressure Coolant Injection System (HPCI)	BH
6I721-2784-01	Dedicated Shutdown System Diagram	B
6M721-2083	Residual Heat Removal (RHR) Division II	BJ
6I721-2661-3	Primary Containment Pneumatic Supply – Supply Valves	F
6I721-2661-02	Primary Containment Pneumatic Supply System Isolation Valves – Div 2	N
6I721-2095-04	Automatic Depressurization System Solenoid Valves B2104F013F, G and H	U
6I721-2201-07	Suppression Pool to Pump B Valve E1150F004B	Q
6I721-2201-05	Reactor Recirculation Extractor to RHR Outboard Iso Valve E1150F008	Y
6I721-2221-09	HPCI-Steam Supply Valve E4150F002	R
6I721-2221-03	HPCI Steam Supply and Cond Storage Tank Suction Valves E4150F001 and F004	Z
6I721-2221-04	HPCI Sys.- Steam Supply Line Outboard Isolation Valves E4150F003, E4150F600	AC
6SD721-2500-01	One Line Diagram Plant 4160 V and 480 V System Service Unit 2	AI
6SD721-2530-11	One Line Diagram 260/130V Essential Dual Battery 2PB Distribution – Division II	AG

10 CFR 50.59 DOCUMENTS (SCREENINGS/SAFETY EVALUATIONS)

Number	Description or Title	Date
06-0025	50.59 Screen Provide Backup Nitrogen Bottles to Division II SRVs	September 2, 2004

MISCELLANEOUS

Number	Description or Title	Date or Revision
TMPE-08-0037	2008 Fire Protection Program Triennial Inspection Self-Assessment Final Report	February 29, 2008
3071-128-EZ-06	Design Specification – Electrical Design Instructions Molded Case Circuit Breakers	A

MODIFICATIONS

Number	Description or Title	Date or Revision
EDP-33791	Install Firewrap On Cable Trays 1K-014, 1K-034, 1K-029 and conduit JA-001-1K In Fire Area 02abn(1) To Provide A One Hour Fire Barrier For the circuits involved	0
EDP-33934	Provide Back up Nitrogen Bottles to Division II SRVs	July 20, 2006

PROCEDURES

Number	Description or Title	Revision
AOP 20.000.18	Control of the Plant From the Dedicated Shutdown Panel	42 and 43
AOP 20.000.22	Plant Fire	38
FP-AB-2M-11	Auxiliary Building, Cable Spreading Room, Zone 11, El. 630’	5
FP-AB-B-4b	Control Rod Drive Pump Room, Zone 4, El. 561’0”	3
FP-RB-2-10a	Reactor Building Emergency Equipment Cooling Water, North, Zone 10, El. 613’6”	2
FP-RB-2-10b	Reactor Building, Emergency Equipment Cooling Water, South, Zone 10, El. 613’6”	3
FP-RB-2-10c	Reactor Building, 2nd Floor Cable Tray Area, Zone 10, El. 613’6”	2
FP-RB-SB-4a	High Pressure coolant Injection Pump and Turbine Room, Zone 4	4

SURVEILLANCES (COMPLETED)

Number	Description or Title	Date or Revision
EL05080226	Perform 37.000.014 Emergency Lighting Performance Evaluation for Group 5	March 03, 2008
EL18071016	Perform 37.000.014 Emergency Lighting Performance	February 13, 2008

LIST OF ACRONYMS USED

ADAMS	Agency-wide Document Access and Management System
AOP	Abnormal Operating Procedure
CARD	Condition Assessment Resolution Document
CDF	Core Damage Frequency
CFR	Code of Federal Regulations
CRD	Control Rod Drive
CS	Core Spray
DC	Direct Current
DRS	Division of Reactor Safety
FDS	Fire Dynamic Simulator
FSAR	Final Safety Analysis Report
GSWPH	General Service Water Pump House
HP	Horsepower
HPCS	High Pressure Coolant Injection
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination of External Events
IR	Inspection Report
LOOP	Loss of Offsite Power
NCV	Non-Cited Violation
NFPA	National Fire Protection Association
NIST	National Institute of Standard and Technology
NRC	U.S. Nuclear Regulatory Commission
PI&R	Problem Identification and Resolution
PARS	Publicly Available Records
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
RPV	Reactor Pressure Vessel
SBFW	Standby Feedwater
SDP	Significance Determination Process
SRA	Senior Reactor Analyst
SRV	Safety Relief Valve
UFSAR	Updated Final Safety Analysis Report