September 11, 2007

Mr. Jack 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 COMPONENT DESIGN BASES INSPECTION (CDBI)
REPORT 05000341/2007003(DRS)

Dear Mr. Davis:

On September 6, 2007, the U .S. Nuclear Regulatory Commission (NRC) completed an inspection at your Fermi Power Plant, Unit 2. The enclosed report documents the inspection findings which were discussed on July 27, 2007, with you and on September 6, 2007, with Mr. R. Gaston, and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety, and to compliance with the Commission's rules and regulations, and with the conditions of your license. The inspectors reviewed selected calculations, design bases documents, procedures, and records; observed activities; and interviewed personnel. Specifically, this inspection focused on the design of components that are risk significant and have low design margin.

Based on the results of this inspection, three NRC-identified findings of very low safety significance were identified, all of which involved violations of NRC requirements. However, because these violations were of very low safety significance and because they were entered into your corrective action program, the NRC is treating the issues as Non-Cited Violations (NCVs) in accordance with Section VI.A.1 of the NRC's Enforcement Policy. Additionally, a licensee identified violation is listed in Section 4OA7 of this report.

If you contest the subject or severity of a NCV, you should provide a response with a basis for your denial, within 30 days of the date of this inspection report, 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 NRC Resident Inspector 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 document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety

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

Enclosure: Inspection Report 05000341/2007003(DRS)
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
Waste and Hazardous Materials Division
M. Yudasz, Jr., Director, Monroe County
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State Liaison Officer, State of Michigan
Wayne County Emergency Management Division

component of NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

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

Report No: 05000341/2007003(DRS)

Licensee: Detroit Edison Company

Facility: Fermi Power Plant, Unit 2

Dates: June 25 through July 27, 2007, and
September 6, 2007

Location: Newport, Michigan

Inspectors: A. Dunlop, Senior Engineering Inspector (Lead)
M. Shlyamberg, Mechanical Contractor
F. Baxter, Electrical Contractor
C. Acosta Acevedo, Engineering Inspector
M. Munir, Engineering Inspector
D. Passehl, Senior Reactor Analyst
B. Palagi, Operations Inspector

Approved by: Ann Marie Stone, Chief
Engineering Branch 2
Division of Reactor Safety (DRS)

SUMMARY OF FINDINGS

IR 05000341/2007003(DRS); 06/25/2007 - 09/06/2007; Fermi Power Plant, Unit 2; Component Design Bases Inspection.

The inspection was a 3-week onsite baseline inspection that focused on the design of components that are risk significant and have low design margin. The inspection was conducted by regional engineering inspectors and two consultants. Three findings of very low safety significance were identified all associated with Non-Cited Violations (NCVs). 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 3; dated July 2000.

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance (Green) involving inadequate cable design. Specifically, the inspectors identified that the licensee failed to implement licensing and design basis requirements when specifying and purchasing safety-related and non-safety-related cables. The cables installed between the residual heat removal (RHR) complex and the reactor building, which were located below the maximum ground water level, were not designed for continuous underwater service. The licensee performed an operability evaluation and concluded that the cables remained operable, but were non-conforming. The licensee entered this performance deficiency into their corrective action program for resolution. This finding also has a cross-cutting aspect in the area of problem identification and resolution associated with the corrective action program because the licensee did not thoroughly evaluate the conditions identified in previous corrective action documents. (P.1(c))

  The finding was more than minor because the failure of these cables could prevent both onsite and offsite power from energizing safety-related busses and could have affected the mitigating systems cornerstone objective of design control. The finding was of very low safety significance based on the results of the licensee's analysis and screened as Green using the SDP Phase 1 screening worksheet. (Section 1R21.3.b.1)

- Green. The inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance (Green) involving the available Net Positive Suction Head ($NPSH_A$) and vortex calculation for the high pressure core injection (HPCI) pump. Specifically, the inspectors identified that the licensee failed to evaluate the effect of the system controller set point being set to control the HPCI flow at 5250 gallons per minute (gpm); whereas the calculation established the $NPSH_A$ and vortex limits based on the nominal system flow of 5000 gpm. There was not an operability issue, as the licensee verified through calculations that there was still a

positive margin available to ensure the pump would function as designed. The licensee entered this performance deficiency into their corrective action program for resolution.

The finding was more than minor because the failure of the pump could have prevented the HPCI system from injecting water into the reactor vessel as required and could have affected the mitigating systems cornerstone objective of design control. The finding was of very low safety significance based on the results of the licensee's analysis and screened as Green using the SDP Phase 1 screening worksheet. (Section 1R21.3.b.2)

- Green. The inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance (Green) involving a non-conservative acceptance criteria used to verify that HPCI pump could meet its Technical Specifications performance requirement. Specifically, the inspectors identified that the licensee failed to evaluate the effect of the instrument error. The licensee determined that the current acceptance criterion was non-conservative with respect to the system performance requirement. The licensee's review of previous test results identified that with the exception of one point, all previous tests conducted during past two and a half years exceeded the minimum required performance. The licensee entered this performance deficiency into their corrective action program for resolution with actions including addressing past reportability of the test point below the system performance requirement and development of the new acceptance criterion. This finding also has a cross-cutting aspect in the area of problem identification and resolution associated with the corrective action program because the licensee did not thoroughly evaluate the known low margin conditions existing in the system as noted in previous corrective actions documents (P.1(c)).

  The finding was more than minor because the failure of the pump to provide its design flow could have prevented the HPCI system from performing it safety function and could have affected the mitigating systems cornerstone objective of design control. The finding was of very low safety significance based on the results of the licensee's analysis and screened as Green using the SDP Phase 1 screening worksheet. (Section 1R21.3.b.3)

B. Licensee-Identified Violations

One violation of very low safety significance, which was identified by the licensee, has been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. This violation and corrective action tracking numbers are listed in Section 4OA7 of this report.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstone: Initiating Events, Mitigating Systems, and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Introduction

The objective of the component design bases inspection is to verify that design bases have been correctly implemented for the selected risk significant components and that operating procedures and operator actions are consistent with design and licensing bases. As plants age, their design bases may be difficult to determine and an important design feature may be altered or disabled during a modification. The Probabilistic Risk Assessment (PRA) model assumes the capability of safety systems and components to perform their intended safety function successfully. This inspectible area verifies aspects of the Initiating Events, Mitigating Systems, and Barrier Integrity cornerstones for which there are no indicators to measure performance. Specific documents reviewed during the inspection are listed in the attachment to the report.

In addition, the inspectors reviewed several licensee audits and self-assessments to assess how effective licensee personnel were at self-identifying problems. The assessment was accomplished by comparing licensee-identified problems with problems that the inspectors identified during this inspection. The sample included a self-assessment in preparation for the inspection and selected assessments of the engineering design control program.

.2 Inspection Sample Selection Process

The inspectors selected risk significant components and operator actions for review using information contained in the licensee's PRA and the Fermi Standardized Plant Analysis Risk Model. In general, the selection was based upon the components and operator actions having a risk achievement worth of greater than 2.0. The operator actions selected for review included actions taken by operators both inside and outside of the control room during postulated accident scenarios.

The inspectors performed a margin assessment and detailed review of the selected risk-significant components to verify that the design bases have been correctly implemented and maintained. This design margin assessment considered original design reductions caused by design modification, or power uprates, or reductions due to degraded material condition. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as failed performance test results, significant corrective action, repeated maintenance activities, maintenance rule (a)(1) status, components requiring an operability evaluation, NRC resident inspector input of problem areas/equipment, and system health reports. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in depth margins. A summary of the

reviews performed and the specific inspection findings identified are included in the following sections of the report.

.3 Component Design

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TS), design basis documents, drawings, calculations and other available design basis information, to determine the performance requirements of the selected components. The inspectors used applicable industry standards, such as the American Society of Mechanical Engineers Code, the Institute of Electrical and Electronics Engineers Standards (IEEE), and the National Electric Manufacturers Association, to evaluate acceptability of the systems' design. The review was to verify that the selected components would function as designed when required and support proper operation of the associated systems. The attributes that were needed for a component to perform its required function included process medium, energy sources, control systems, operator actions, and heat removal. The attributes to verify that the component condition and tested capability was consistent with the design bases and was appropriate may include installed configuration, system operation, detailed design, system testing, equipment and environmental qualification, equipment protection, component inputs and outputs, operating experience, and component degradation.

For each of the components selected, the inspectors reviewed the maintenance history, system health reports, operating experience-related information and licensee corrective action program documents (Condition Assessment Resolution Documents (CARDs)). Field walkdowns were conducted for all accessible components to assess material condition and to verify that the as-built condition was consistent with the design. Other attributes reviewed are included as part of the scope for each individual component.

The following 17 components were reviewed (17-inspection samples):

- Emergency Diesel Generator (EDG) No. 14: The inspectors reviewed the EDG purchase specification, the governor controls, the neutral grounding resistor calculation, the EDG cable specification, and EDG cable routing to verify equipment met acceptable design standards. The EDG loading calculation was reviewed to assure that worst case loading had been considered, and that process controlled loads, load increases due to frequency increase, and 480 volt (V) induction regulator losses, had been included in the calculation. Periodic surveillance tests were reviewed to assure that test results were in compliance with TS requirements. The alarm response procedure used for EDG ground fault annunciation was reviewed to ensure of an adequate response in the event of a ground fault. The inspectors reviewed the susceptibility of the EDGs to the effects of tornados and witnessed portions of the monthly EDG surveillance test.

- 4160V Engineered Safety System (ESS) Bus No.14 ED: The inspectors reviewed the one-line diagrams and the switchgear purchase specification to verify acceptable equipment qualification. The EDG loading calculations were

reviewed to assure that worst case loads had been applied, and the schematic diagrams were checked to ensure loading and load shedding were per design requirements. The short circuit and voltage calculations were reviewed to verify that they were representative of the worst case line-up of power sources and bus configurations. The switchgear maintenance program was also reviewed to ensure conformance with industry and vendor recommendations.

- ESS Bus No. 72F: The inspectors reviewed the one-line diagrams and the switchgear purchase specification to verify acceptable equipment qualification. The bus loading, short circuit, and voltage calculations were reviewed to verify acceptable system design. The ratings of the circuit breakers, including a test program that increased the interrupting rating of the breakers over the manufacturers rating was also reviewed to ensure the breakers would function as designed. The inspectors reviewed the induction voltage regulator's function, accuracy, performance, and associated surveillance procedures to assure that voltage of the 480V bus was controlled and maintained within required limits. The fuse sizing criteria for control circuits, and control circuit voltage drop calculations were also reviewed to verify that adequate protection and voltage would be available to operate end devices such as relays, solenoids, and contactors.

- Division 1 Batteries (2PA): The inspectors reviewed calculations associated with battery sizing, battery charger sizing, battery capacity for coping with station blackout (SBO), battery room heating, ventilation, and air-conditioning (HVAC) and hydrogen generation. Battery service and performance discharge tests, battery surveillance tests, and the battery charger testing and surveillances were reviewed to assess potential component degradation. In addition, the battery electrical maintenance procedure, battery operation procedure, float and equalizing voltages, and overall battery capacity were reviewed.

- Direct Current (DC) Main Distribution Cabinet (2PA-2): The inspectors reviewed calculations associated with short circuit analysis, electrical coordination, and voltage drop. The fuse sizing criteria and basis, the fuse control program, and associated maintenance procedures were also reviewed. The inspectors also performed a walkdown of selected panels to verify the fuse types and ratings against the fuse specification and the drawings.

- Battery Fuse Cabinets (R3200S007A/B): The inspectors reviewed fuse types and rating, fuse control program, electrical coordination, and maintenance program associated with the battery fuse cabinet.

- EDG No. 14 Fuel Oil Tank: The inspectors reviewed the EDG's fuel oil consumption and calculations addressing fuel consumption. The fuel oil storage tank and day tank volumes were reviewed to verify adequate onsite fuel inventory, including the implementation of the TS required surveillances for these tanks. The inspectors performed a review of calculations, system normal operating procedures, and surveillance test procedures to assess whether component operation and alignments were consistent with design and licensing bases assumptions.

- Condensate Storage Tank (CST): The inspectors reviewed the licensing and TS basis for the CST. The inspectors reviewed the analyses associated with the tank capacity and level setpoints, including potential vortexing concerns. The inspectors' review also included the temperature limits of the tank, the instrument uncertainty analyses, and the capacity of the tank during a station blackout event. These reviews were to verify the capability of the tank to perform its required function. Operating procedures associated with the CST were also reviewed.

- High Pressure Core Injection (HPCI) Pump: The inspectors reviewed vortexing calculations for HPCI pump suction alignment to the suppression pool and CST. Hydraulic calculations were reviewed to ensure design requirements for flow and pressure were translated as acceptance criteria for pump in-service testing (IST). The inspectors reviewed calculations related to pump's net positive suction head (NPSH) to ensure the pump was capable of functioning as required. Design change history, related corrective actions, and IST results were reviewed to assess potential component degradation and impact on design margins. In addition, the licensee responses and actions to Bulletin 88-04, "Potential Safety-Related Pump Loss," were reviewed to assess implementation of operating experience. Additionally the effects of the power up-rate and the change of safety relief valve (SRV) setpoint tolerance on the HPCI system's performance was reviewed. A modification to replace the booster pump impeller was also reviewed.

- HPCI Steam Supply Valve (E4150F003): The inspectors reviewed the motor-operated valve (MOV) calculations including required thrust, degraded voltage calculations, thermal overload settings, weak link, and maximum differential pressure, to ensure the valve was capable of functioning under design conditions. Diagnostic test results were reviewed to verify acceptance criteria were met and performance degradation would be identified.

- HPCI Injection Isolation Valve (E4150F006): The inspectors reviewed the MOV calculations including required thrust, degraded voltage calculations, thermal overload settings, weak link, and maximum differential pressure, to ensure the valve was capable of functioning under design conditions. Diagnostic test results were reviewed to verify acceptance criteria were met and performance degradation would be identified.

- Residual Heat Removal (RHR) Heat Exchanger Division 1: The inspectors reviewed the heat exchanger specifications and heat removal calculations to ensure that design basis heat removal requirements were met. The review included heat exchanger capacities, performance requirements during normal and accident conditions, performance trending data, flow rates, fouling factors, plugging criteria, test instrumentation, uncertainty analyses, and limiting service water temperatures.

- RHR Suppression Pool Spray Valve (E1150F028A): The inspectors reviewed the MOV calculations, including required thrust, degraded voltage, maximum differential pressure, and valve weak link analysis, to ensure the valve was

capable of functioning under design conditions. Diagnostic and IST results were reviewed to verify acceptance criteria were met and performance degradation would be identified. The inspectors reviewed the MOV thermal overload heater sizing criteria and calculation to verify that the MOV heater was sized in accordance with the established criteria.

- Residual Heat Removal Service Water (RHRSW): The inspectors reviewed piping and instrumentation diagrams, pump line up, pump capacities, and IST data for the RHRSW pumps. Design calculations related to pump head, minimum required flow, NPSH and vortexing were reviewed to ensure the pumps were capable of providing their accident mitigation function during all ambient conditions. Design change history was reviewed to assess potential component degradation and impact on design margins. The RHR reservoir condition was also reviewed (temperature limits, water volume requirements, and mechanical draft cooling tower performance) to ensure that the water source design basis was maintained.

- Diesel Generator Service Water (DGSW) Pump: The inspectors reviewed calculations to verify RHR complex reservoir levels were maintained above DGSW pump suction submergence and NPSH requirements to ensure the pump was capable of performing its safety functions. Hydraulic calculations were reviewed to ensure design requirements for flow and pressure were appropriately translated as acceptance criteria for pump IST and to verify the pump would perform under worst case design conditions. The minimum flow valves' qualifications were reviewed to ensure flow was not inadvertently diverted from the system flow path. Design change history and IST results were reviewed to assess potential component degradation and impact on design margins. The inspectors reviewed the control circuit of the pump to assure that the pump started when the EDG was running.

- Standby Gas Torus Hard Vent Valve (T4600F421): The inspectors reviewed the air-operated valve (AOV) calculations, including required torque and maximum differential pressure, to ensure the valve was capable of functioning under design conditions. Design change history and IST results were reviewed to verify acceptance criteria were met and performance degradation would be identified.

- EDG 11 Aftercooler Air Coolant System 3-Way Temperature Control Valve (R3000F023A): The inspectors reviewed the AOV calculations including required thrust, weak link, and maximum differential pressure, to ensure the valve was capable of functioning under design conditions. Diagnostic test results were reviewed to verify acceptance criteria were met and performance degradation would be identified

b. Findings

The inspectors identified three finding of very low safety significance all associated with Non-Cited Violations (NCVs). Three unresolved items were also identified.

b.1 EDG Cable Design Deficiency

Introduction: The inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,” having very low safety significance (Green) involving inadequate cable design. Specifically, the inspectors identified that the licensee failed to implement licensing and design basis requirements when specifying and purchasing safety-related and non-safety-related cables. The cables installed between the RHR complex and the reactor building, which were located below the maximum ground water level, were not designed for continuous underwater service.

Description: UFSAR Sections 3.4.3 and 8.3.1.1.8.1 identified that the two buried redundant reinforced concrete duct banks carrying cables between the RHR complex and the reactor building were located below the maximum ground water level, and stated that the cables contained therein were designed for continuous underwater service. The cables contained in these two redundant duct banks consist of 5000 volt (V) power cables, 600V power cables, 600V control cables, and various types of instrumentation and signal cables.

The inspectors reviewed the specifications used to purchase the above cables and noted that they had not been specified or qualified for continuous underwater service as required. Furthermore, the inspectors reviewed the duct bank layout drawings and noted that the duct banks sloped downwards as they left the RHR complex and reactor building, and then upwards as they approached the intermediate manholes located in both of the duct banks. This bathtub configuration ensured that if water entered the manholes it would remain trapped in the low-elevation duct bank conduits with no means of evacuation. In addition, the manhole covers were located approximately one-foot below grade level and were covered with crushed stone with no berm or other barrier that would prevent ground surface water from entering the manholes. The inspectors noted that water had been periodically pumped from the manholes in the past, and therefore concluded that portions of these cables would be submerged on a continuous basis.

This physical configuration of the duct banks necessitate that the service conditions for the cables included withstanding continuous underwater submergence, as stated in the UFSAR. Additionally, IEEE Standard 323-1971, “IEEE Standard for Qualifying Class 1E Equipment,” specified that the service condition for Class 1E equipment include environmental loading expected as a result of normal and abnormal operating environments throughout the installed life of equipment. These requirements were not met for the installed cables.

Analysis: The inspectors determined that the failure to ensure that the installed cables were designed for the anticipated environmental condition was a performance deficiency and a finding. The inspectors determined that the finding was more than minor in accordance with Inspection Manual Chapter (IMC) 0612, “Power Reactor Inspection Reports,” Appendix B, “Issue Dispositioning Screening,” because it was associated with the attribute of design control, which affected the mitigating systems cornerstone objective of ensuring the availability and reliability of safety-related power to respond to initiating events to prevent undesirable consequences. Specifically, the common cause failure of the power and control cables in these duct banks could prevent both onsite and offsite power from energizing safety-related busses of both electrical divisions.

The inspectors evaluated the finding using IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power-Situations," Phase 1 screening, and determined that the finding screened as Green because it was not a design issue resulting in loss of function per Part 9900, Technical Guidance, "Operability Determinations, and Functionality Assessments for Resolution of Degraded, or Non-Conforming Conditions Adverse to Quality or Safety," did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation. The basis for this conclusion was determined by the licensee in EFA-R16-07-003, "Evaluation of Adequacy of Underground Cables Continuously Submerged in Water to perform their Intended Safety-Related Function," which concluded that although the cables were not designed for continued submergence, based on the satisfactory performance to date, the cables could survive the anticipated environmental effects for a period of time. The licensee had not identified any cable failures in these duct banks for the life of the plant.

This finding has a cross-cutting aspect in the area of problem identification and resolution associated with the corrective action program because the licensee failed to thoroughly evaluate problems such that the resolutions address causes and extent of condition. Specifically, the licensee failed to ensure that the installed cables were designed for the anticipated environmental condition because the licensee did not thoroughly evaluate the conditions identified in CARDs 03-11668, 04-23947, 04-24082, 07-10001, and 07-10002. (P.1(c))

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control", required, in part, that design control measures shall provide for verifying or checking the adequacy of design, such as by performance of design reviews, by the use of alternate simplified calculational methods, or by performance of a suitable testing program.

Contrary to the above, as of July 27, 2007, the licensee's design control measures failed to ensure the adequacy of the design of the cables located in duct banks between the RHR complex and the reactor building. Specifically, the as-built design failed to meet the requirements of UFSAR sections 3.4.3 and 8.3.1.1.8.1, as well as those of IEEE Standard 323-1971. The licensee entered the finding into their corrective action program as CARDs 07-23612 and 07-23878 to investigate the qualification of the cables and institute a cable management program. Because this violation was of very low safety significance, and it was entered into the licensee's corrective action program, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/2007003-01).

b.2 HPCI Vortex and Available Net Positive Suction Head ($NPSH_A$) Calculations were not Based on Maximum System Flow Rate

Introduction: The inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low-safety significance (Green) involving the $NPSH_A$ and vortex calculations for HPCI pump. Specifically, the inspectors identified that the licensee failed to evaluate the effect of the system controller being set to control HPCI flow at 5250 gallons per minute (gpm); whereas the calculations established the $NPSH_A$ and vortex limits based on the nominal system flow of 5000 gpm.

Description: The inspectors' review of design calculations DC-0501, "High Pressure Coolant Injection System Hydraulic Analysis," and DC-0885, "ECCS [emergency core cooling system] Suction Line Air Ingestion", determined that the limiting values for the $NPSH_A$ and were based on a nominal HPCI flow rate of 5000 gpm and not the maximum system flow rate of 5250 gpm, maintained by the system controller. Furthermore, the actual flow might be higher due to the instrument error associated with this controller. Additionally, calculation DC-0501 established $NPSH_A$ based on 140 degrees Fahrenheit (°F), whereas, Note 3 of 6M721-5860, "HPCI Process Diagram," and system specification 3071-504, "HPCI System Design Specification," stated that the maximum HPCI temperature requirement was 170°F based on potential torus temperature.

Based on inspectors' questions, the licensee performed operability evaluation EFA-E41-07-001, "$NPSH_R$ and Vortex Calculations from CST and Torus - Effects of HPCI flow Instrument Uncertainties." The licensee determined that the instrument error associated with the flow controller was approximately 150 gpm; hence, the maximum predicted HPCI flow was 5400 gpm. Evaluation of the results provided in the operability evaluation indicated that the $NPSH_A$ margin for the torus decreased from 12.72 feet to 3.76 feet, while the CST $NPSH_A$ margin was reduced from 34.21 feet to 23.52 feet. Although the calculation assumptions were not conservative, there was not an operability concern as adequate NPSH margin still existed to ensure the HPCI pump would function as designed. The licensee initiated CARD 07-23633 to address this issue.

Analysis: The inspectors determined that the failure to account for the higher flow could create conditions where the pump would not be able to perform its safety function was a performance deficiency and a finding. The inspectors determined that the finding was more than minor in accordance with IMC 0612, Appendix B, "Issue Dispositioning Screening," because it was associated with the attribute of design control, which affected the mitigating systems cornerstone objective of ensuring the availability and reliability of safety-related HPCI pump to respond to initiating events to prevent undesirable consequences. Specifically, the failure to consider higher HPCI pump flow rates for could impact its safety function.

The inspectors evaluated the finding using IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power-Situations," Phase 1 screening, and determined that the finding screened as Green because it was not a design issue resulting in loss of function per Part 9900, Technical Guidance, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation. The basis for this conclusion was that despite the higher than assumed flow through this pump, and therefore, reduction in NPSH and vortex margin, there was still adequate $NPSH_A$ and submergence for the pump to perform its safety function. The inspectors did not identify a cross-cutting aspect with this finding.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," required, in part, that design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

Contrary to the above, as of July 27, 2007, the licensee's design control measures failed to verify the adequacy of design, in that the maximum flow assumptions in calculations DC-0501 and DC-0885 were non-conservative. Specifically, the system flow maintained by the flow controller (up to 5400 gpm including the effect of the instrument error) was greater than the 5000 gpm assumed in the analyses, which resulted in a significant reduction of the NPSH margin. The licensee entered the finding into their corrective action program as CARD 07-23633 to perform an extent of condition and revise the affected calculation. Because this violation was of very low safety significance, and it was entered into the licensee's corrective action program, this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/2007003-02).

b.3 HPCI Pump IST Acceptance Criterion Was Not Conservative with Respect to System Performance Requirements

Introduction: The inspectors identified a Non-Cited Violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," having very low safety significance (Green) involving a non-conservative acceptance criteria used to verify that HPCI pump could meet its TS performance requirement. Specifically, the inspectors identified that the licensee failed to evaluate the effect of the instrument error.

Description: The inspectors' review of design calculation DC-0501, "High Pressure Coolant Injection System Hydraulic Analysis," and IST surveillance procedure 24.202.01, "HPCI Pump Time Response and Operability Test at 1025 psi," determined that the acceptance criterion provided in the procedure did not take into account the effect of instrument error.

Based on inspectors' question, the licensee performed a technical evaluation TE-E41-07-019, "Inadequate Accounting of HPCI System Instrument Accuracy in IST Test Basis." The evaluation determined that the current acceptance criterion was non-conservative with respect to the system performance requirement when the instrument effect error was considered; and significantly reduced the margin between the system performance requirements and the results of past surveillances. The licensee's review of previous test results identified that with the exception of one point, all previous IST surveillances conducted during past two and a half years exceeded the minimum required performance. Although the majority of the results were acceptable, the inspectors' evaluation identified that the maximum margin of these test was less than seven feet of total developed head (TDH). Considering that the pump TDH is greater than 2800 feet, this margin was considered very small. The licensee initiated CARD 07-23851 to address this issue. This CARD had a number of actions including addressing past reportability of the test point below the system performance requirement and development of the new acceptance criterion.

The team determined that the licensee had multiple opportunities to identify that neither the design calculations nor the surveillance procedure acceptance criterion took into account instrument error. Specifically:

- In July of 2004 the licensee initiated CARD 04-23296 and CARD 04-23363 to address whether or not the HPCI pump could pass IST testing, but would not be

able to inject at the SRV setpoint of 1169 psig. Corrective actions included a revision of the acceptance criterion for HPCI pump, however, there was no considerations for the effect of instrument error.

- In September of 2004 the licensee initiated CARD 04-24497, which stated that HPCI pump had very low margin to the acceptance criteria. The CARD stated "The HPCI design basis is not questioned in this CARD. Since HPCI meets its licensing and design basis criteria for speed and flowrate, CARD evaluation concluded that, with a flowrate of 5000 gpm, the safety function of the HPCI system is met." This CARD also did not consider the effect of the instrument error.
- In March of 2005 CARD 05-21665, which stated that the HPCI system was a marginal system. This CARD developed an action plant without any consideration of the effect of the instrument error.

Based on the teams cross-cutting aspect of problem identification and resolution, the licensee initiated CARD 07-24191.

Analysis: The inspectors determined that the failure to account for the instrument error could create conditions where the pump could not be able to perform its safety function was a performance deficiency and a finding. The inspectors determined that the finding was more than minor in accordance with IMC 0612, Appendix B, "Issue Dispositioning Screening," because it was associated with the attribute of design control, which affected the mitigating systems cornerstone objective of ensuring the availability and reliability of safety-related HPCI pump to respond to initiating events to prevent undesirable consequences. Specifically, the failure to consider instrument error in establishing the HPCI pump acceptance criterion could impact its safety function.

The inspectors evaluated the finding using IMC 0609, Appendix A, "Significance Determination of Reactor Inspection Findings for At-Power-Situations," Phase 1 screening, and determined that the finding screened as Green because it was not a design issue resulting in loss of function per Part 9900, Technical Guidance, did not represent an actual loss of a system safety function, did not result in exceeding a TS allowed outage time, and did not affect external event mitigation. The basis for this conclusion was, that after the instrument error was factored in the system performance requirement all the test results for the past two and a half years, with one exception, were greater than system performance requirement.

This finding has a cross-cutting aspect in the area of problem identification and resolution associated with the corrective action program because the licensee failed to thoroughly evaluate problems such that the resolutions address causes and extent of condition. Specifically, the licensee failed to account for instrument error associated with the HPCI system because the licensee did not thoroughly evaluate the known low margin conditions existing in the system as documented in CARDs 04-23296, 04-23363, 04-24497, and 05-21665 (P.1(c)).

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," required, in part, that design control measures shall provide for verifying or checking the adequacy

of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

Contrary to the above, as of July 27, 2007, the licensee's design control measures failed to verify the adequacy of design, in that the instrument error contribution was not considered in calculation DC-0501 or procedure 24.202.01. Specifically, the TS surveillance acceptance criterion established for HPCI pump in procedure 24.202.01 was non-conservative with respect to the system performance requirement when the instrument error effect was considered. The licensee entered the finding into their corrective action program as CARD 07-23851 to resolve the issue.

Because this violation was of very low safety significance, and it was entered into the licensee's corrective action program, this violation is being treated as a NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/2007003-03).

b.4 Change of Requirements to the Ultimate Heat Sink Cooling Capability

Introduction: The inspectors identified an unresolved item (URI) involving the adequacy of a 10 CFR 50.59 safety evaluation for UFSAR changes that the licensee had implemented. Specifically, the inspectors questioned the licensee's basis for determining that revisions to UFSAR section 9.2.5, "Ultimate Heat Sink," did not require prior NRC approval before implementation. The change concluded that the ultimate heat sink (UHS) capacity could only provide a seven days supply versus the originally approved 30-day supply without the need for a make-up water source. This issue is unresolved pending further NRC review of Fermi's licensing basis for the period of time in which the ultimate heat sink needs to supply sufficient cooling capacity to the safety-related service water pumps without make-up.

Description: On May 23, 1995, the licensee completed 10 CFR 50.59 safety evaluation (SE) 95-0017 that changed the period of time that the UHS needed to provide sufficient cooling capacity to the safety-related service water pumps without make-up. Before the change, the UHS was required to provide 30 days of water without make-up to the safety-related service water pumps, which includes the RHRSW pumps, the emergency equipment service water pumps, and the DGSW pumps. This safety evaluation changed this period of time requirement from 30 days to seven days.

The reasons for this change, as stated by the licensee, were higher evaporation rates than originally accounted for, an added assumption of a structural crack in the UHS reservoir, and higher water level needed in the UHS reservoir due to safety-related service water pumps degradation. As a result of this evaluation, the licensee determined that the change did not involved an unreviewed safety question and therefore, it did not required prior NRC approval.

The inspectors reviewed SE 95-0017 and were concerned about the adequacy of the licensee's basis for determining that changes to UFSAR did not require a licensee amendment. More specifically, the inspectors were concerned that TS Limiting Conditions for Operations (LCO) stated, before the change, that a minimum water volume of 2,990,000 gallons, equivalent to an indicated water level of 25-feet, was required for each reservoir in order for the UHS to be operable. The TS basis for this LCO stated that

sufficient cooling capacity was available for continued operation of safety-related equipment during normal and accident conditions. The original Fermi Safety Evaluation Report (NUREG-0798) provided the basis for this sufficient cooling capacity as 30 days of water without make-up.

At the time of the change, 10 CFR 50.59 (2)(iii) stated, in part, that a proposed change, test, or experiment shall be deemed to involve an unreviewed safety question if the safety of margin for any TS basis was reduced.

Following identification of this issue, the licensee entered the issue into their corrective action program as CARD 07-23998. This issue is unresolved pending further NRC review of Fermi's licensing basis for the period of time required for the UHS to provide sufficient cooling capability to the safety-related service water pumps and to determine if the licensee had adequately analyzed if the changed involved an unreviewed safety question. (URI 05000341/200703-04)

b.5 Inrush Current of Spring Charging Motors not Considered

Introduction: The inspectors identified an unresolved item concerning calculation DC-0213, "Sizing of 130/260V Batteries," for not considering the inrush current of the spring charging motors associated with closing mechanism of 4160V and 480V switchgear circuit breakers. The licensee recognized this condition in 2003 and issued a CARD to incorporate the inrush current of spring charging motors into the calculation and re-evaluate the battery's 1 minute rating. However, four years later the licensee has failed to revise the calculation. At the end of the inspection, the licensee was still evaluating the impact of the inrush current on the battery's 1 minute rating and had not completed their final assessment. The inspectors needed this information to complete the assessment of this issue.

Description: During a review of battery sizing calculation DC-0213, the inspectors identified that the calculation used average current values instead of inrush current values of spring charging motors associated with closing mechanism of 4160V and 480V switchgear circuit breakers. Per IEEE Standard 485-1997, "IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications," momentary loads such as the switchgear operations and inrush currents should be used when determining battery's 1 minute rating. Momentary loads could occur one or more times during the duty cycle, but would be of short duration, not exceeding 1 minute at any occurrence. Although momentary loads may exist for only a fraction of a second, it was common industry practice to consider that each load would last for a full minute because the battery voltage drop after several seconds often determined the battery's 1 minute rating. Sizing for a load lasting only a fraction of a second, based on the battery's 1 minute performance rating, would result in a conservatively sized battery. When several momentary loads occur within the same 1 minute period and a discrete sequence cannot be established, the load for the 1 minute should be assumed to be the sum of all momentary loads occurring within that minute. During the minute, depending on how many momentary loads occur, the inrush current pulls the battery voltage down and therefore it would be necessary to ensure that the battery was adequately sized to provide the required voltage to the loads. Because of the failure to consider the inrush

current in sizing the batteries, the inspectors were concerned that the batteries might not have been adequately sized to provide the required voltage to the loads.

The licensee recognized this condition in 2003 and entered this issue into their corrective action program, CARD 03-16683, which called for revising the calculation based on inrush current of the spring charging motors. This CARD was assigned a low priority level of four and closed out to Technical Service Request 34807. As a result, four years later, this calculation had not been revised.

The licensee tested three spring charging motors to determine their inrush currents because the information was not available. Out of the three motors tested, one motor registered twice the inrush current of the other two. The licensee had the breaker manufacturer (Asea Brown-Bovari) conduct tests on Ametek charging motors in Kline 800 amp breakers. At the end of the inspection, the licensee had not finished their assessment, but took some temporary compensatory measures to reduce load on the batteries as part of operability determination, EFA R32-07-002. The compensatory measures consisted of turning off power to the spring charging motors associated with breakers feeding non-safety-related loads. However, the inspectors noted that the licensee did not follow the 10 CFR 50.59 process for implementing compensatory measures as required. The licensee performed 10 CFR 50.59 screening 07-0162 that concluded a safety evaluation was not required. The inspectors review of the licensee's operability determination and 10 CFR 50.59 screening did not identify any concerns with their conclusions.

Since the licensee had not finished their assessment and had not validated the battery sizing calculation based on incorporating the inrush current of the spring charging motors, the NRC concluded that additional review and evaluation were required to assess whether or not the batteries were adequately sized for the application. Therefore, this issue is considered an unresolved item (URI 05000341/2007003-05) pending the licensee completion of an analysis to assess the battery sizing and subsequent NRC review.

b.6 Inadequate Determination of Maximum Allowable Temperature for HPCI Pump Operation

Introduction: The inspectors identified an unresolved item concerning the licensee's operational restrictions for the HPCI pump. The HPCI pump specification identified a maximum design temperature for operation of HPCI pump as 140°F. However, the licensee's emergency operating procedure (EOP) allow operation of HPCI and reactor core isolation cooling (RCIC) pumps above 140°F without providing an adequate description of the consequences of this operation. At the end of the inspection, the licensee did not resolve this concern. The inspectors needed this information to complete the assessment of this issue.

Description: The HPCI pump data sheet 21A9243AR specified a maximum design fluid temperature of 140°F. However, Note 3 of 6M721-5860, "HPCI Process Diagram," specified that piping expansion calculations shall be performed at 170°F. In addition, system specification 3071-504, "HPCI System Design Specification," specified a design temperature of 170°F for the pump discharge piping, minimum flow piping, and pump suction piping from the torus. The licensee confirmed that the HPCI piping was analyzed

up to 170°F. The inspector's review of EOP 29.100.01, Sheet 6 "Curves, Cautions and Tables," indicated that HPCI operation is permitted at temperatures significantly greater than 140°F and even 170°F without any restrictions. The only exception was note two caution in procedure 29.100.01, Sheet 6, "Operation of HPCI and RCIC turbines with suction temperatures above 140°F may result in equipment damage."

The inspectors identified the following concern with operation of HPCI pump above 140°F. The HPCI pump and turbine lubrication oil and turbine governor fluid were self-cooled by HPCI process flow. Hence, high HPCI fluid temperatures could lead to loss of lubrication. The consequences of this loss could go beyond the loss of the HPCI pumping function. The loss of lubrication and turbine governor fluid for a multistage high-pressure pump could lead to a loss of pressure boundary due to the loss of pump and/or turbine seals, resulting in possible catastrophic failure of the pump and/or turbine cases, and even possible missile generation. Additionally should the HPCI's rotating equipment survive operation above 140°F; operation above 170°F (current analyzed temperature limit for HPCI piping) could further jeopardize the integrity of the HPCI piping including containment penetrations. The inspectors concluded that the caution note did not provide sufficient information to make an informed risk based decision since it did not address the potential pressure boundary failure.

Based on the inspectors' concerns, the licensee initiated CARD 07-24172 to review training on all EOP cautions and perform an engineering evaluation of operating beyond the limits imposed by EOPs cautions to determine if there were subsequent equipment failure limits that need to be either incorporated into EOPs or EOP training to provide the operators the necessary information to make emergency operating decisions.

Based on fact that at the end of the inspection, the licensee did not complete the evaluation of this concern, the NRC concluded that additional review and evaluation were required following completion of the licensee's corrective actions to assess whether or not the licensee has established adequate limits for operation of HPCI pump. Therefore, this issue is considered an unresolved item (URI 05000341/2007003-06) pending completion of the licensee's review to assess the limits of the HPCI pump's operation and subsequent NRC review.

.4 Operating Experience

a. Inspection Scope

The inspectors reviewed six operating experiences (six samples) to ensure that NRC generic concerns had been adequately evaluated and addressed by the licensee. The operating experiences listed below were reviewed as part of this inspection effort:

- Regulatory Information Summary 2001-05, "Performance of DC-Powered Motor-Operated Valve Actuators";
- Bulletin 88-04, "Potential Safety-Related Pump Loss";
- Information Notice 06-18, "Significant Loss of Safety-Related Electrical Power at Forsmark";

- NUREG 0737, TMI Action II.K.3.22, “Automatic Switchover of Reactor Core Isolation Cooling System Suction”;

- Generic Letter 89-13, “Service Water System Problems Affecting Safety-Related Equipment”; and

- Information Notice 82-56, “Robertshaw Thermostatic Flow Control Valves.”

b. Findings

No findings of significance were identified. One unresolved item was identified.

b.1 Inadequate Determination of Minimum Flow Setting for HPCI Pump

Introduction: The inspectors identified an unresolved item concerning the licensee’s response to Bulletin 88-04, “Potential Safety-Related Pump Loss,” regarding establishing minimum flow requirements for the HPCI pump. The licensee recognized that the conditions reported in the bulletin were present in all safety-related pumps, including the HPCI pump, but did not determine an appropriate minimum pump flow value to minimize and manage, or to eliminate, the potential for pump damage. Additionally, the inspectors’ review identified that the calculation used to verify the currently specified minimum flow rate was non-conservative. At the end of the inspection, the licensee dad not received a specific minimum flow value for the HPCI pump from its manufacturer. The inspectors needed this information to complete the assessment of this issue.

Description: Bulletin 88-04, in part, identified a concern regarding the adequacy of minimum flow capacities for safety-related centrifugal pumps. The bulletin required licensees to evaluate the capability of safety-related pumps to run long-term at minimum recirculation flow rates. The bulletin stated that many pump vendors had accounted for thermal considerations in setting the minimum recirculation flow rates, but had failed to consider flow instability effects. The latter consideration could necessitate a considerable increase in minimum flow settings, especially for pump operation for extended periods of time. This potential increase occurred because centrifugal pumps demonstrated a flow condition described as hydraulic instability or impeller recirculation at some flow point below approximately 50 percent of the best efficiency point on the characteristic pump curve. These unsteady flow phenomena become progressively more pronounced if flow was further decreased, and could result in pump damage when operated for extended periods of time. The inspectors reviewed the licensee’s responses to Bulletin 88-04, which were described in a 1988 letter to the NRC.

The licensee’s response for all ECCS pumps was not based on a specific pump vendor evaluation. Hence, the licensee did not properly verify the minimum flow settings with the HPCI pump manufacturer (Byron-Jackson) in accordance with what was stated in their response to the bulletin. The licensee had concluded that the original, manufacturer-supplied minimum recirculation flows contained in the pump purchase specifications were adequate to meet the issues discussed in Bulletin 88-04. The inspectors questioned whether the current minimum flow HPCI setting was reviewed and approved by the pump’s manufacturer (now Flowserve), as specified in the licensee’s response to the bulletin. The licensee had not contacted the pump manufacturer and

relied upon information provided by General Electric (1988 Boiling Water Reactor Owner's Group letter to NRC) to conclude that no changes were needed for ECCS pumps including the HPCI pump. Furthermore, subsequent to the licensee's response to the bulletin, the HPCI booster pump impeller was changed from a four to a 5-vane impeller, which may change the required minimum flow rate. Based on the inspectors concern, the licensee contacted the HPCI pump manufacturer to perform a new analysis of the HPCI pump's minimum flow settings. The inspectors noted that this issue might be applicable to other ECCS pumps.

The inspectors also identified a related concern with calculation DC-0204, "Sizing Restricting Orifice Diameters and Thickness." This calculation established the HPCI minimum flow based on the CST suction alignment and maximum fluid temperature of 100°F. These were non- conservative assumptions because the suppression pool suction alignment would have resulted in much higher temperatures (up to 170°F) and no suction pressure contribution. As such, these assumptions predicted a non-conservatively high calculated flow through the minimum flow line. Since there was no installed flow instrument the licensee was unable to measure actual flow through the minimum flow line.

Several other concerns were also identified including the calculation was not revised to reflect the change from a four to 5-vane impeller for the booster pump and the calculation used a methodology that over-predicted the point of choked flow through the orifice. Furthermore, although this calculation predicted cavitation, it did not evaluate the effect of the cavitation on the orifice and other downstream components and piping. The justification provided in the calculation and in the initial licensee's response was that the operating period in minimum flow was short and significant cavitation erosion was not expected. The inspectors' review of the operating procedures (normal and emergency) and discussions with the licensee's operating staff determined that there were no procedural restraints for the HPCI minimum flow operation.

The licensee concurred with the inspectors' concerns and initiated CARD 07-24128 that restricted the minimum HPCI flow operation pending further evaluations and potentially an orifice modification.

As a result of the response to Bulletin 88-04, HPCI pump was operated since original plant start-up with an increased potential for unusual wear and aging. Based on fact that at the end of the inspection, the licensee did not receive specific minimum flow value for the HPCI pump from its manufacturer, the NRC concluded that additional review and evaluation were required to assess whether or not the licensee has established adequate minimum flow requirement for HPCI pump. Additionally, the same concern may apply to the remaining ECCS pumps since the licensee did not obtain vendor specific minimum flow requirements for these pumps and they may operate at minimum flow conditions for extended periods of time under accident conditions. Also, pending completion of the corrective actions outlined in CARD 07-24128, the ability of the HPCI system to provide the currently required minimum flow of 500 gpm was undetermined. Therefore, this issue is considered an unresolved item (URI 05000341/2007003-07) pending completion of an analysis to assess the HPCI pump minimum flow requirement and the system's ability to provide this flow and subsequent NRC review.

.5 Modifications

a. Inspection Scope

The inspectors reviewed four permanent plant modifications related to selected risk significant components to verify that the design bases, licensing bases, and performance capability of the components had not been degraded through modifications. The modifications listed below were reviewed as part of this inspection effort:

- EDP 33458, “Setpoint for DGSW Minimum Flow AOV”;
- RID 73135, “Replacement Actuator for EDG Air Coolant Temperature Control Valve”;
- PDC 7042, “HPCI Booster Pump Impeller/Shaft Assembly Change-out 3-way EDG valve”; and
- ERE 32566, “Replace Voltage Regulator Operator Control Units on 480V Voltage Regulators.”

b. Findings

No findings of significance were identified.

.6 Risk Significant Operator Actions

a. Inspection Scope

The inspectors performed a margin assessment and detailed review of five risk significant, time critical operator actions (five samples). These actions were selected from the licensee’s PRA rankings of human action importance based on risk achievement worth values and the difficulty of the operator action required. Where possible, margins were determined by the review of the assumed design basis and UFSAR response times and performance times documented by job performance measures results. The inspectors walked through operator in plant performance of required tasks, and observed plant control room simulator demonstrations of the selected operator actions that would be performed from the control room. Operator knowledge, adequacy of procedures, in plant equipment accessibility, use of special equipment, and compliance with the time limits assumed in the plant PRA were evaluated.

The following operator actions were reviewed:

- Actions to vent via the primary containment hardened vent;
- Actions to align RHRSW for cross-tie injection to reactor pressure vessel;
- Actions to align the 4160V maintenance crosstie breakers 64T/65T;

- Actions to defeat HPCI and reactor core isolation cooling high area temperature isolation; and

- Actions to manually operate eight RHR and RHRSW valves locally.

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES (OA)

4OA2 Problem Identification and Resolution

.1 Review of Condition Reports

a. Inspection Scope

The inspectors reviewed a sample of the selected component problems that were identified by the licensee and entered into the corrective action program. The inspectors reviewed these issues to verify an appropriate threshold for identifying issues and to evaluate the effectiveness of corrective actions related to design issues. The specific corrective action documents that were reviewed by the inspectors are listed in the attachment to this report.

b. Findings

No findings of significance were identified.

4OA6 Meetings, Including Exits

Exit Meeting Summary

- The inspectors presented the inspection results to Mr. Jack Davis and other members of licensee management at the conclusion of the inspection on July 27, 2007, and with Mr. Ron Gaston on September 6, 2007. Proprietary information was reviewed during the inspection and was handled in accordance with NRC policy.

4OA7 Licensee-Identified Violations

The following violation of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements which meet the criteria of Section VI of the NRC Enforcement Policy, NUREG-1600, for being dispositioned as an NCV.

Cornerstone: Mitigating Systems

Criterion III, "Design Control," of 10 CFR Part 50, Appendix B requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions. The licensee did not adequately translate design basis information into EDG fuel oil storage tank capacity calculations. Specifically, calculations DC-0547, "Fuel Oil Storage Tank Capacity," and DC-6309, "Design Basis of EDG Fuel Oil Storage Tank High Level and Low Level Alarms; and EDG Fuel Oil Day Tank Low Level Alarm," contained a number of non-conservative assumptions including the following:

- Increased EDG load was not considered;
- Effect of the vortexing was not considered;
- Effect of the fuel oil storage tank's manufacturing tolerances were not considered;
- Combustion rate was established based on an original vendor warranty and did not consider tolerances; and
- Effect of the instrument error was not considered.

The cumulative effect of the above described non-conservative assumptions prompted the licensee to increase the administrative levels to preserve the TS required volume for the fuel oil storage tank. This was identified in the licensee's corrective action program as CARD 07-22929 and CARD 07-23074. The licensee's investigation of the consequences of these errors was ongoing and the preliminary review indicated that the old administrative levels might have been not adequate to protect the TS limits and the licensee had potentially exceeded this limit in the past. The final resolution including past operability will be determined at a later date based on the outcome of this review. The inspectors determined that the finding was more than minor because if the licensee had not recognized the error, the fuel oil storage tank volume could have been below its' TS limit. The inspectors determined that the finding was of very low safety significance because it did not represent an actual loss of system safety function.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee
J. Davis, Senior Vice President and Chief Nuclear Officer
J. Plona, Site Vice President
K. Hlavaty, Plant Manager
K. Amin, Plant Support Engineering
L. Bugoci, Manager, Corrective Action Program
M. Caragher, Director Nuclear Engineering
R. Gaston, Manager, Nuclear Licensing
B. Hare, Supervisor, Component Engineering
A. Hassoun, Principal Licensing Engineer
R. Haupt, System Engineering
T. Horan, General Supervisor, Operations Training
K. Howard, Manager, Plant Support Engineering
R. Johnson, Supervisor, Compliance
J. Korte, Manager, Nuclear Stategy
T. Lang, Plant Support Engineering
A. Lim, Supervisor, Plant Support Engineering
B. Meath, Supervisor, Plant Operations
J. Moyers, Manager, Nuclear Quality Assurance
D. Sadowyj, Plant Support Engineering
K. Snyder, Manager, System Engineering
L. Tremonti, Supervisor System Engineering
S. Uema, Supervisor, Plant Support Engineering
G. Wojtowicz, Plant Support Engineering

Nuclear Regulatory Commission
A. Hsia, Acting Deputy Director, Division of Reactor Safety (DRS)
A. M. Stone, Chief, Engineering Branch 2, DRS
M. Morris, Senior Resident Inspector
T. Steadman, Resident Inspector

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000341/2007003-01	NCV	EDG Cable Design Deficiency (Section 1R21.3.b.1)
05000341/2007003-02	NCV	HPCI Vortex and $NPSH_A$ Calculations Were Not Based on Maximum System Flow Rate (Section 1R21.3.b.2)
05000341/2007003-03	NCV	HPCI Pump IST Acceptance Criterion Was Not Conservative with Respect with the System Performance Requirements (Section 1R21.3.b.3)
05000341/2007003-04	URI	Change of Requirements to the Ultimate Heat Sink Cooling Capability (Section 1R21.3.b.4)
05000341/2007003-05	URI	Inrush Current of Spring Charging Motors not Considered (Section 1R21.3.b.5)
05000341/2007003-06	URI	Inadequate Determination of Maximum Allowable Temperature for HPCI Pump Operation (Section 1R21.3.b.6)
05000341/2007003-07	URI	Inadequate Determination of Minimum Flow Setting for HPCI Pump (Section 1R21.4.b.1)

Closed

05000341/2007003-01	NCV	EDG Cable Design Deficiency (Section 1R21.3.b.1)
05000341/2007003-02	NCV	HPCI Vortex and $NPSH_A$ Calculations Were Not Based on Maximum System Flow Rate (Section 1R21.3.b.2)
05000341/2007003-03	NCV	HPCI Pump IST Acceptance Criterion Was Not Conservative with Respect with the System Performance Requirements (Section 1R21.3.b.3)

Discussed

None

LIST OF DOCUMENTS REVIEWED

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

1R21 Component Design Bases Inspection

Calculations

Number	**Title**	**Revision**
DC-0182, Vol. I	RHRSW Mechanical Draft Cooling Towers - Post LOCA Analysis of UHS	Revision F
DC-0182, Vol. VI	RHRSW Mechanical Draft Cooling Towers - Heat Load After a Design Basis Tornado	Revision B
DC-0204, Vol. I	Sizing Restricting Orifice Diameters and Thickness	Revision E
DC-0213	Sizing of 130/260V Batteries	Revision Q
DC-0214	Short Circuit Calculation for DC System	Revision F
DC-0501, Vol. I	High Pressure Coolant Injection System Hydraulic Analysis	Revision E
DC-0547, Vol. I	Fuel Oil Storage Tank Capacity – RHR Complex	Revision C
DC-0559	Volume of Reservoir - RHR Complex	Revision C
DC-0885, Vol. I	ECCS Suction Line Air Ingestion	Revision D
DC-4685, Vol. IV	Assessing the Impact of Power Uprate on the Maximum Differential Pressure Contained in DC- 4685 Vol. I, II, and III for HPCI and RCIC	Revision C
DC-4943	DC Equipment Operability	Revision L, M
DC-4987	Review of Battery Capacity for Coping with SBO	Revision E
DC 5003, Vol. I	Emergency Diesel Generator Load Calculation	Revision H
DC-5036, Vol XII	Maximum Differential Pressure for Valves E1150F028A/B	Revision 0
DC-5147	DBTF Concerns with Battery Room/Charger Area HVAC	Revision 0
DC-5272	Sizing Criteria and Basis for Fuses Used in Power Distribution System and Control Circuits	Revision C
DC-5272, Vol. I	Sizing Criteria and Basis for Fuses Used in Power Distribution System and Control Circuits	Revision B, C

Calculations

Number	Title	Revision
DC-5349, Vol. I	AC Control Cable Voltage Drop Calculation for QA1, Division I	Revision F
DC-5350, Vol. I	AC Control Cable Voltage Drop Calculation for QA1, Division II	Revision E
DC-5351	DC Control Cable Voltage Drop Calculation for QA-1, Div 1	Revision E
DC-5373, Vol. I	Calculation for the Neutral Grounding Resistor for the Emergency Diesel Generators	Revision A
DC-5405, Vol. I	Third Party Review for Thrust Capabilities of Wm. Powell Co. MOVs	Revision G
DC-5589	Reactor Building Environmental Response for HELB and LOCA Conditions	Revision B
DC-5598, Vol. I	Review of MOV Thermal Overload Heater Sizes	Revision 0
DC-5719, Vol. I	Minimum Required Target Thrust (MRTT) for Generic Letter 89-10 Gate, Globe and Quarter-turn Valves (Torque)	Revision L
DC-5803	RHRSW Design Basis Requirements	Revision B
DC-5804, Vol. I	DGSW Design Basis Requirements	Revision E
DC-5894	RHR Reservoir Requirements	Revision A
DC-5951, Vol. I	AOV Design Basis Parameters - T4600F407, T4600F420 and T460F421	Revision A
DC-5973, Vol. I	WS13 Vortex Limit	Revision A
DC-5975, Vol. I	WS15 NPSR Limits	Revision A
DC-5983, Vol. I	AOV Stem Torque Requirements and Actuator Capability Calculation for T4600F400, F401, F402, F407, F411, F412, F420, F421	Revision A
DC-6056, Vol. I	Design Basis System Parameters for AOVs R3000F023A, B, C, D	Revision 0
DC-6057, Vol. I	Thrust Requirements and Actuator Capacity Calculation for AOVs R3000F7023A, R3000F023B, R3000F023C, R3000F7023D3	Revision 0
DC-6057, Vol. II	Thrust Requirements and Actuator Capacity Calculation for AOVs R3000F7023A, R3000F023B, R3000F023C, R3000F7023D3	Revision D

Calculations

Number	Title	Revision
DC-6121	Design Basis for the Inservice Performance Testing of the RHR Heat Exchanger	Revision A
DC-6170	Design Basis System Parameters for AOV T4600F406 and T4600F410	Revision 0
DC-6186, Vol. I	Electrical Loading Short Circuit Current, and Running Voltages for 4.16kV, 480V, and 120V Using ETAP	Revision C
DC-6249, Vol. I	Service Water Systems Calibrated Hydraulic Model	Revision 0
DC-6309, Vol. I	Design Basis of EDG Fuel Oil Storage Tank High Level and Low Level Alarms; and EDG Fuel Oil Day Tank Low Level Alarm	Revision 0
DE-FR-005	MOV Seismic/Weak Link Analysis for Powell 10" Gate Valves	Revision 0
DSN: 2206C	Torque Requirements for T4600F-400,-401,-402, -412,-420,-421 Butterfly AOVs, and P43F402 Ball AOV at Fermi 2	Revision 1
TDVCAL-2206C	Torque Requirements for T4600F400, 401, 402, 412, 420, 421 Butterfly AOVs and P43F402 Ball AOV at Fermi 2	Revision 1

Corrective Action Documents Generated Due to the Inspection

Number	Title	Date
07-23566	Revise DC-6057, Vol. I to Delete Assumption 3	6/28/07
07-23578	Swinging Lamp in EDG Room	6/27/07
07-23612	Discrepancy Between UFSAR and Edison Specifications for Cable	6/28/07
07-23620	DC-0214, Vol 1 Typographical Error	6/28/07
07-23622	MEDP for AOVs R3000F023A-D Could Be Non-conservative	6/28/07
07-23624	NRC Walkdown Identified Fuse Not Fully Seated	6/28/07
07-23625	Discrepancy Exists Between the K600S Breaker Rating in the UFSAR and DC-6186	6/28/07
07-23628	Voltage Regulator Response Time	6/28/07
07-23630	UFSAR Anti-Vortex Methodology Non-conservative	06/28/07
07-23632	Discrepancy between Drawing and Fuse Spec 3071-128-EJ	6/29/07

Corrective Action Documents Generated Due to the Inspection

Number	Title	Date
07-23633	Nominal HPCI Flow Rather than Error Adjusted Flow Was Used for NPSH and Vortex	06/27/07
07-23657	Breakers Coils Minimum Pick-Up Voltage	6/29/07
07-23660	Divisional Batteries Capacity/Capabilities During SBO Condition	6/29/07
07-23661	DC-0213, Vol 1, has a Typographical Error	6/29/07
07-23701	Procedure Enhancement	7/2/07
07-23703	DGSW Flow Element Bias Not Explicitly Addressed in DC-5804	7/2/07
07-23770	Procedure Enhancement	7/5/07
07-23777	EDG Contribution Not Included in DC-6186	7/6/07
07-23778	PSA Items Identified during CDBI	7/6/07
07-23780	Diagnostic Testing Was Not Performed as Required by RID	7/6/07
07-23781	DC-5373 Total Capacitance Formula Appears Incorrect	7/6/07
07-23782	No Certified Pump Curves for HPCI Booster Pump with 5 Vane Impeller	7/6/07
07-23783	23.208 RHR Complex Service Water System SOP Enhancement	7/6/07
07-23822	Procedure 23.309 Typo	7/10/07
07-23846	Request Clarification and Correction of Minor Error in DC-5803	7/11/07
07-23849	Errors in Calc. DC-5350	7/11/07
07-23850	Clarify DC-0182	7/11/07
07-23851	HPCI IST Test Acceptance Criterion Inadequate	7/11/07
07-23857	Add Long Sleeve Welding Jacket to ESP Drawer	7/12/07
07-23860	DC-6309, VOL. I Cites Incorrect Resource for Technical Input	7/12/07
07-23875	DC-4943 Omitted Required Seating Current Assumption	7/12/07
07-23877	Sizing of the Divisional Batteries	7/13/07
07-23878	Water Submergence of Cables	7/12/07
07-23881	Discrepancy Between DC-5983 and Kalsi Analysis 2206C	7/13/07
07-23884	Design Calculation Improvement	7/13/07
07-23888	Non-Existent Design Calculation	7/13/07

Corrective Action Documents Generated Due to the Inspection

Number	Title	Date
07-23927	Line Pressure for E4150F006 in Calculation Should Be Revised	7/20/07
07-23968	Insufficient Engineering Evaluation of EOP Directed Operation of T4600F410	7/18/07
07-23994	Confirm HPCI System Design Temperature is 140 deg-F	7/20/07
07-23998	CDBI RAI on Two RHR Safety Evaluations	7/18/07
07-24005	Revise DC-4685 Table 6.4.1 to Correct MEDP for E4150F002/003	7/19/07
07-24008	Restricting Orifices with Predicted Cavitation	7/19/07
07-24082	Request UFSAR Clarification of Remote Manual Isolation Capability for RCIC Torus Line Penetration (X-226)	7/23/07
07-24084	Division 1 ESF Battery Cell # 96 Corrosion	7/24/07
07-24086	Division 1 ESF Battery Connection Washer and Grease Questions	7/24/07
07-24102	Enhancement to Ops Procedure Regarding EDG Derating	7/24/07
07-24120	Safety-Related Duct Banks Are Not Inspected	7/25/07
07-24126	Revise DC-4685 to Apply 3% where SRV Setpoint is Used	7/25/07
07-24127	Clarification Required for UFSAR Section 2.4.2.2.3	7/25/07
07-24128	HPCI Minimum Flow Calculation Discrepancies	7/25/07
07-24142	Bus Duct Monitoring Program for Bird Nests	7/25/07
07-24144	UFSAR Inconsistent and Contradictory Statements Regarding Compliance with RG 1.9	7/25/07
07-24145	EDG Monitoring of Voltage and Frequency Dips/Recovery	7/25/07
07-24151	Battery Surveillance Procedure Enhancement	7/25/07
07-24161	Application of 10 CFR 50.59 Process	7/25/07
07-24162	Inconsistencies in Attachments of EFA-R32-07-002	7/25/07
07-24165	Need DC to Support Values in UFSAR Table 8.3-8	7/26/07
07-24172	Concern Regarding Possible Consequences of Operating HPCI after Torus Temperature Exceeds 140°F per EOP Caution 2	7/27/07
07-24191	Evaluate PI&R Aspects Associated with HPCI IST Test Criteria	7/27/07

Corrective Action Documents Reviewed During the Inspection

Number	Title	Date
96-0330	Seismic Qualification of QA I Air Operated Valves (AOVs)	8/23/96
99-16197	Unverified Assumptions and Negative Margin in Calculation DC-5983	8/25/99
02-11042	NRC IN 2002-12	4/8/02
02-14822	ERE/IRID Required by RF09	8/2/02
03-11084	All EDGs Declared Inoperable Due to DGSW Flow < 920 gpm	1/16/03
03-11597	Emergency Power Reliability	1/21/03
03-11668	Question Regarding Testing of Underground Cables	3/3/03
03-16683	Update DC-0213, Vol 1 to Incorporate the Inrush Current of the Breaker Charging Motor	5/30/03
04-21564	Valve Not Stroking Closed (E4150-F003)	4/8/04
04-23296	IST Acceptance Criteria for HPCI pump	7/23/04
04-23647	Valve Failed To Stroke Closed Again	8/12/04
04-23947	Suitability of RTD Thermocouple Cable in Existing Environment	8/31/04
04-24082	Manholes Installed by SBO Do Not Have Water Removal Capability	9/7/04
04-24745	Abnormal Valve Position Indications During 24.202.01	10/13/04
04-24908	Evaluate DC MOV Thermal Overload Sizes For Longer Stroke Time	10/25/04
04-25625	Margin Improvement Required for E4150F003	11/15/04
04-23363	HPCI Flow At Design Pressure May Not Meet Design Requirement	7/27/04
04-24497	HPCI Pump Has Very Low Margin To Acceptance Criteria	9/28/04
05-21665	HPCI and RCIC Systems Identified as "Marginal" Systems	3/14/05
06-23393	Compliance with NUREG 0737 TMI Action II.K.3.22	5/16/06
06-23781	Revise Alarm Procedures for DGSW Low Flow	6/1/06
06-25361	Unanticipated CMC Indication During 000Z062857 and 000Z062858	8/20/06
06-26629	Specified Testing Is Not Performed	10/13/06
06-27108	Review of Large Pump Related Events Resulting in Scrams, Shutdown, and Outage Extensions	11/21/05
06-27719	Loss of 400 kV Switchyard and Two Safety-Related Electrical Trains Because of a Common Mode Failure	12/6/06

Corrective Action Documents Reviewed During the Inspection

Number	Title	Date
06-27966	Technical Specification for Safety-Related Battery Inter-cell Resistance Determined to be Non-Conservative	12/14/06
07-10001	Fermi Vulnerability to Underground Cable Failures	1/5/07
07-10002	Inadequate Problem Resolution Concerning Submerged Cables	1/5/07
07-20442	EDG 11 DGSW Pump DP Trend, Need Replacement Pump	1/25/07
07-22408	CDBI Self Assessment: DC-0566 Redundant to DC-5804	5/2/07
07-22508	Issues Related to Operator Action to Start CTG 11	5/7/07
07-22620	Lighting Repairs	5/14/07
07-22825	Injection Leak off and Vortexing is Not Considered in FOST Calcs	5/22/07
07-22929	CDBI Self Assessment: DC-5003 (EDG Loading) Issues/questions	5/25/07
07-23074	EDG Fuel Oil Tank Volume vs Level Requirements Investigation	6/1/07
07-23561	Review Margin List to Verify All Margin Issues Are Addressed	6/26/07
07-24045	Undervoltage/Degraded Voltage Value Review	7/20/07

Design Changes/Modifications

Number	Title	Revision
ECR-33458-1	Revise DGSW Pump Min Flow Valve Setpoint	Revision 0
ERE 32566	Replace Voltage Regulator Operational Control Units on 480 Voltage Regulators	Revision A
PDC 7042	HPCI Booster Pump Impeller/Shaft Assembly Change-out	Revision C
RID 73135	Replacement Actuator for EDC Air Coolant Temperature Control Valve	Revision 0

Drawings

Number	Title	Revision
11907105	Fuel Oil day Tank	Revision 5
6E721-2980-18	Underground Ducts Class I South and West of Reactor Building	Revision G
6I721-2220-05	Logic Diagram High Pressure Coolant Injection System	Revision E

Drawings

Number	Title	Revision
6I721-2221-04	Schematic Diagram HPCI Sys - Steam Supply Line Outboard Isolation Valves E4150F003 and E4150F006	Revision AB
6I721-2572-53	Schematic Diagram 4160V ESS Bus No. 64B, Pos “B8"	Revision L
6I721-2714-35	EDG Loading Sequencing List Division I EDGs No. 11 & 12	Revision K
6I721-2714-36	EDG Loading Sequencing List Division II EDGs No. 13 & 14	Revision K
6I721N-2572-51	Schematic Diagram 4160 V ESS Diesel Bus 11EA Pos EA3	Revision X
6I721N-2711-09	Schematic Dgm. Diesel Generator Service Water Pump B and D R3001C007 and C008 Div. II	Revision T
6I721N-2711-38	Schematic Dgm. Diesel Generator No.14 Annunciator System	Revision T
6I772N-2572-20	Schematic Dgm. 4160V ESS Diesel Bus 14ED Load Shedding Strings	Revision Y
6I772N-2578-12	Relaying and Metering Dgm. Diesel Generator No.14	Revision AA
61721N-2711-09	Schematic Dgm. Diesel Generator Service Water Pump B and D R3001C007 and C008 Div. II	Revision T
6M721-2083	Diagram Residual Heat Removal (RHR) Division II	Revision BJ
6M721-2084	Diagram Residual Heat Removal (RHR) Division I	Revision BF
6M721-5737	Stand-by Gas Treatment System Functional Operating Sketch (FOS)	Revision T
6M721-5860	Process Diagram High Pressure Coolant Injection System	Revision E
6M721N-2035	High Pressure Coolant Injection System Reactor Bldg	Revision BH
6M721N-2035	High Pressure Coolant Injection System Barometric Cndr Reactor Bldg	Revision AG
6M721N-2046	Diesel Generator System Division 1, RHR Complex	Revision AB
6M721N-2048	Diesel Fuel Oil System and Lube Oil System Division 1, RHR Complex	Revision AH
6M721N-2053	RHR Service Water System, Division 2, RHR Complex	Revision AF
6SD721-2500-01	One Line Dgm. Plant 4160V and 480V System Service	Revision A1
6SD721-2500-03	One Line Dgm. 4160V System Service Buses 64B, 64C	Revision 0
6SD721-2500-04	One Line Dgm. 4160V System Service Buses 65E, 65F, 65G - Reactor Bldg.	Revision P

Drawings

Number	Title	Revision
6SD721-2510-01	One Line Dgm. 480V E.SS. Bus 72B, 72C, 72E, and 72F	Revision X
6SD721-2530-10	One Line Diagram 260/130V ESS Dual Battery 2PA Distribution -Division 1	Revision AF
5SD721-2530-13	Frontal Elevation 260V DC MCC 2PA-1 Div 1	Revision AJ
6SD721-2581-14	Schematic Dgm. 1500kVA Regulator Bus 72F	Revision 0
NE-36347-16	No.144-480V MCC	Revision J
NL-10276	Horizontal Diesel Fuel Oil Storage Tanks	Revision 9
NP 268703	GE Transformer No. 65 Nameplate Drawing	Revision 2

Job Performance Measures

Number	Title	Revision
JP-OP-315-0168-001	RHRSW Crosstie to RHR	Revision 2
JP-OP-315-0286-001	Blackstart Operation from CTG-11 Control Center	Revision 3
JP-OP-315-0157-002	Restore Off-Site Power to an EST and EDG Bus	Revision 0
JP-OP-802-3006-303	Defeat of HPCI Low RPV Pressure and High Area Temperature Isolations	Revision 3
JP-OP-802-3106-008	Vent the Torus Irrespective of Offsite Release Rates	Revision 0

Miscellaneous Documents

Number	Title	Revision/Date
50.59 Screen 04-0591	Revise DGSW Pump Min Flow Valve Setpoints	11/7/05
50.59 Screen 07-0162	STR C2007-000883 for Repositioning of Spring Charging Motors on 480V Switchgear	8/2/07
20.300.SOP Bases	Loss of Offsite and Onsite Power Bases	Revision 5
021-014-AW1	BWROG DC Motor Method	Revision 3
21A9243AR	HPCI Pump Data Sheet	Revision 4
3071-128-EJ	Class 1E Fuse Specification Standard EJ-2-1	Revision CJ
3071-128-EZ-03	Electrical Design Instructions Thermal Overload Heaters Sizing	Revision C
3071-504	HPCI System Design Specification	Revision E

Miscellaneous Documents

Number	Title	Revision/Date
Bingham Pumps Letter	IEB 88-04 - Minimum Pump Flow Concern	11/8/88
BWROG-8836	Response to NRC Bulletin 88-04, “Potential Safety-Related Pump Loss”	6/29/88
Cable ID 20007A-1P	As-Built Cable Pull Card	Revision 1
Cable ID 20007B-1P	As-Built Cable Pull Card	Revision 1
Cable ID 200011A-1P	As-Built Cable Pull Card	Revision 1
Cable ID 200011B-1P	As-Built Cable Pull Card	Revision 1
Cable ID 200022A-2P	As-Built Cable Pull Card	Revision 1
Cable ID 200022B-2P	As-Built Cable Pull Card	Revision 1
Cable ID 200026A-2P	As-Built Cable Pull Card	Revision 1
Cable ID 200026B-2P	As-Built Cable Pull Card	Revision 1
FermiHRACalcV7b	Operator Actions Basic Event Summary	05/19/07
LP-OP-315-0168	Residual Heat Removal Service Water	Revision 9
MES27	Conduct Manual Verification of System Operability	Revision 12
Memo 0801.21	Seismic Upgrade of Pressure Control Valves E41F035, E51F015, E11F400A-D, P45F400, P45F401, R30F400-403 from Passive to Active	5/13/96
NEDC-32788P DRF B21-01895	Safety Review for Enrico Fermi Center Unit 2 Safety/Relief Valve Setpoint Tolerance Relaxation Analysis	1/99
NRC-88-0182	Response to NRC Bulletin 88-04, “Potential Safety-Related Pump Loss”	7/11/88
Report No. 35-56199-I	Interruption Tests K-600S Circuit Breakers	10/19/87
ST-OP-802-3006-001	Emergency Operating Procedures Emergency Support Procedures	Revision 3
ST-OP-315-0068-001	Residual Heat Removal Service Water	Revision 16
VME11-1	Vendor Manual 130/260 VDC Stationary Batteries	Revision F
	Preparation for Component Design Bases Inspection (CDBI) Self Assessment Report	5/25/07
	IST Pump and Valve Trend Data, 2004 - 2007	

Operability Determinations

Number	Title	Date
EFA-E41-07-001	Engineering Functional Analysis: NPSHR and Vortex Calculations from CST and Torus - Effects of HPCI flow Instrument Uncertainties	7/3/07
EFA-R32-07-002	Capacity of Divisional Batteries	7/15/07
EFA-R16-07-003	Evaluation of Adequacy of Underground Cables Continuously Submerged in Water to perform their Intended Safety-Related Function	7/18/07
TE-E41-07-019	Technical Evaluation: Inadequate Accounting of HPCI System Instrument Accuracy in IST Test Basis	7/13/07

Operator Training Scenarios

Number	Title	Revision
SS-OP-202-0741	LOR Cycle 07-04, Crew Training Scenarios	Revision 2
SS-OP-202-0511	LOR Crew Training Simulator Scenarios, Cycle 05-01	Revision 2
SS-OP-202-0752	LOR Cycle 07-05, Crew Task Training: Low Power Tasks/Fundamentals Review	Revision 1
SS-OP-315-0158	4160/480V Electrical Distribution	Revision 3
SS-OP-202-CDBI	Crew Training Scenarios	Revision 0

Procedures

Number	Title	Revision
20.300	Loss Of Offsite Power	Revision 6
23.202	High Pressure Injection System	Revision 92
23.208	RHR Complex Service Water System	Revision 85
23.307	Emergency Diesel Generator System	Revision 97
23.308.01	Uninterruptible Power Supply System	Revision 26
23.309	260/130V DC Electrical System (ESF and BOP)	Revision 53
23.321	Engineered Safety Features Auxiliary Electrical Distribution System	Revision 38
24.000.0	Situational Surveillance/LCO action Tracking	Revision 56
29.100.01, Sh 6	Curves, Cautions and Tables	Revision 9

Procedures

Number	Title	Revision
29.ESP.07	Primary Containment Venting	Revision 9
29.ESP.13	Defeat Of HPCI High Torus Water Level Suction Transfer and High Area Temperature Isolation	Revision 3
29.ESP.22	Defeat Of Primary Containment Vent Valve Isolations	Revision 9
35.301.001	Maintenance Procedure, 4160V Switchgear	Revision 32
35.309.003	Division 1/2 130/260 VDC General Maintenance	Revision 27
35.318.014	Medium Voltage Switchgear Breaker and Relay Control	Revision 34
MOP04	Shift Operations	Revision 26

Specifications

Number	Title	Revision
3071-19	Emergency Standby Diesel AC Generators	Revision A
3071-34	4160V Indoor Metalclad Switchgear	Revision B
3071-43	480V Indoor Unit Substations	Revision A
3071-45	Motor Control Centers	Revision A
3071-080	Design and Procurement Specification for Special Wires and Cables	Revision L
3071-128-EP	Electrical Engineering Standard - Cable	Revision I
3071-128-EZ-03	Electrical Design Instruction, Thermal Overload Heater Sizing	Revision C

Surveillances (completed)

Number	Title	Date performed
24.202.01	HPCI Pump Time Response and Operability Test at 1025 psi	3/11/07
24.307.04	EDG No. 14 Loss of Offsite Power Test	4/29/06, 11/27/04
24.307.13	EDG No. 14 ECCS Start and Load Rejection Test	11/11/04, 4/22/06
24.307.17	EDG No. 14 Start and Load Test - Fast Start	4/13/07
24.307.17	EDG No. 14 Start and Load Test - Slow Start	5/15/07, 6/15/07
24.307.33	EDG No. 14 24 Hour Run	3/15/07

Surveillances (completed)

Number	Title	Date performed
24.307.34	DGSW, DFOT and Starting Air Operability Test-EDG 11	4/25/07
24.307.35	DGSW, DFOT and Starting Air Operability Test-EDG 12	5/2/07
24.307.36	DGSW, DFOT and Starting Air Operability Test-EDG 13	5/9/07
24.307.37	DGSW, DFOT and Starting Air Operability Test-EDG 14	5/16/07
42.305.01	Div. I 72B/72C 480V and 64B/64C 4160V Undervoltage Logic Function	
42.309.01	Division 1/2 Weekly 130/260 VDC Battery Check	3/22/07, 3/29/07
42.309.02	Division 1/2 Quarterly 130/260 VDC Battery Check	3/30/07
42.309.05	Division 1 130/260 Battery Capacity Test	4/6/06

Work Requests

Number	Title	Date
000Z001550	Packing Leak on E1150F028A	4/20/00
D752070100	Perform Test on Medium Voltage Breaker	4/25/07

LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
AOV	Air-Operated Valve
CDBI	Component Design Bases Inspection
CARD	Condition Assessment Resolution Document
CFR	Code of Federal Regulations
CST	Condensate Storage Tank
DC	Direct Current
DGSW	Diesel Generator Service Water
DRS	Division of Reactor Safety
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
ESS	Engineered Safety System
GE	General Electric
gpm	Gallons per Minute
°F	Degrees Fahrenheit
HPCI	High Pressure Coolant Injection
IEEE	Institute of Electrical and Electronics Engineers
IMC	Inspection Manual Chapter
IST	Inservice Testing
JPM	Job Performance Measure
LCO	Limiting Conditions for Operations
LPCI	Low Pressure Coolant Injection
MCC	Motor Control Center
MOV	Motor-Operated Valve
NCV	Non-Cited Violation
NPSH	Net Positive Suction Head
$NPSH_a$	Available Net Positive Suction Head
$NPSH_R$	Required Net Positive Suction Head
NRC	Nuclear Regulatory Commission
OA	Other Activities
PARS	Publicly Available Records
PRA	Probabilistic Risk Assessment
RCIC	Reactor Core Isolation Cooling
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RIS	Regulatory Information Summary
SBO	Station Blackout
SDP	Significance Determination Process
SRV	Safety Relief Valve
TDH	Total Developed Head
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
V	Volt
VDC	Volt Direct Current