

November 7, 2006

Mr. Donald K. Cobb
Assistant Vice President
Nuclear Generation
Detroit Edison Company
6400 North Dixie Highway
Newport, MI 48166

SUBJECT: FERMI POWER PLANT
NRC SPECIAL INSPECTION REPORT 05000341/2006015

Dear Mr. Cobb:

On September 26, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed a special inspection at your Fermi Power Plant, Unit 2. The enclosed report documents the inspection findings which were discussed on September 26, 2006, with you and other members of your staff.

On August 17, 2006, Fermi, pursuant to 10 CFR 50.72, made an event notification (EN 42783) to the NRC that all four emergency diesel generators (EDGs) were declared inoperable. The inoperability was a result of undersized control power transformers for each of the emergency diesel generator service water (EDGSW) pumps. The concern was that the EDGSW pump motors would not have adequate voltage at the starter circuit to ensure operability under degraded voltage conditions. As part of an extent of condition review, Fermi also identified similar concerns with the Division 1 EDG room ventilation fans. Further calculation analysis revealed no voltage margin on other potentially risk-significant components.

The circumstances of the developing concerns regarding adequacy of voltage at several safety and risk-significant components were reviewed against the risk and deterministic criteria of Management Directive (MD) 8.3. Deterministically, the event met MD 8.3 criterion b, "Involved a major deficiency in design, construction, or operation having potential generic safety implications." Following further evaluation of potential risk significance, a special inspection was initiated in accordance with Inspection Procedure 93812 and Regional Procedure 1219. The special inspection commenced on August 28, 2006.

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

The report documents two NRC-identified findings of very low safety significance (Green). These findings were determined to involve violations of NRC requirements. However, because of the very low safety significance, and because they are entered into your corrective action

program, the NRC is treating these two findings as Non-Cited Violations (NCVs), in accordance with Section VI.A.1 of the NRC Enforcement Policy. If you contest the subject or severity of an NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector Office at the Fermi 2 facility.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any), will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (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/

Cynthia D. Pederson, Director
Division of Reactor Safety

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

Enclosure: Inspection Report 05000341/20060015
w/Attachments: 1. Supplemental Information
2. Special Inspection Team Charter
3. Timeline

cc w/encl: 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
Emergency Management Division
Supervisor - Electric Operators
State Liaison Officer, State of Michigan
Wayne County Emergency Management Division

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Cynthia D. Pederson, Director
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See Attached Distribution List

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U. S. NUCLEAR REGULATORY COMMISSION

REGION III

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

Report No: 05000341/2006015

Licensee: Detroit Edison Company

Facility: Fermi Power Plant, Unit 2

Location: Newport, Michigan

Dates: August 28 through September 26, 2006

Inspectors: M. Franke, Senior Resident Inspector, Perry
T. Steadham, Resident Inspector, Fermi
A. Dahbur, Reactor Inspector, DRS
F. Tran, Region III Observer

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

Enclosure

SUMMARY OF FINDINGS

IR 05000341/2006015; 08/28/06 - 09/26/06; Fermi Power Plant, Unit 2; Special Inspection for the declaration of inoperability of all four emergency diesel generators on August 17, 2006.

This special inspection examined the facts regarding the licensee's notification to the NRC on August 17, 2006, pursuant to 10 CFR 50.72 of Event Notification (EN) 42783, that all four emergency diesel generators (EDGs) were declared inoperable. The inoperability was a result of undersized control power transformers for each of the emergency diesel generator service water (EDGSW) pumps. The concern was that the EDGSW pump motors would not have adequate voltage at the starter circuit to ensure the starters would pickup under degraded voltage conditions. On August 17, 2006, the licensee implemented compensatory measures to restore operability to the Division 2 EDGs. In the subsequent days, the licensee implemented plant modifications to replace undersized control power transformers and 480 Volt motor control center (MCC) buckets; first on Division 1, followed by Division 2. Additionally, as part of the extent of condition, the licensee also identified similar concerns with the Division 1 EDG room ventilation fans. Further calculation analysis revealed no voltage margin on other potentially risk-significant components.

An NRC special inspection was initiated to review the circumstances involving this event. The inspection identified two Green findings with associated Non-Cited Violations. 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 are described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. Inspector-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green. The inspectors identified a finding of very low safety significance and an associated Non-Cited Violation of Technical Specification (TS) 5.4, "Procedures," for the licensee's failure to maintain surveillance test procedures for the Division 1 Emergency Diesel Generators (EDGs) that were appropriate to the circumstances. Specifically, on August 22, 1986, the NRC issued TS Amendment Number 4 to the operating license to address a design deficiency associated with the Division 1 electrical system. This amendment increased the Division 1 degraded grid relay voltage setpoints to allow for Division 1 operability. However, the licensee failed to increase the minimum voltage acceptance criteria for the Division 1 EDG surveillance test procedures to ensure operability of the affected components under all postulated conditions. As part of their corrective actions, licensee personnel established administrative controls pending procedure, and TS revision to ensure that future testing of the Division 1 EDGs would include the revised minimum required voltage acceptance criteria.

This finding was more than minor because it was associated with the Mitigating Systems cornerstone attribute of procedure quality and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating

events to prevent undesirable consequences. The finding was of very low safety significance because: (1) it was not a design or qualification deficiency; (2) it did not represent an actual loss of safety function of a system; (3) it did not represent an actual loss of safety function of a single train for greater than its TS allowed outage time; (4) it did not represent an actual loss of safety function of one or more non-TS trains of equipment designated as risk significant per 10 CFR 50.65 for greater than 24 hours; and (5) it did not screen as potentially risk significant due to a seismic, fire, flooding, or severe weather initiating event. (Section 40A3.1b.(2))

- Green. The inspectors identified a finding and an associated NCV of 10 CFR Part 50, Appendix "B," Criterion III (Design Control) for the failure to adequately review the suitability of the design of 480 Volt breakers used for all four emergency diesel generator service water (EDGSW) pumps and the engine room supply ventilation fans for both Division 1 emergency diesel generators (EDGs). Licensee personnel failed to properly model the control power transformers (CPTs) when they calculated the minimum available voltage at the starting coils. As a result, all four EDGSW pumps and the Division 1 engine room fans could have failed to start due to inadequate voltage available to their respective starter coils. The licensee's immediate corrective actions included placing this issue into the corrective action program, completion of an extent of condition review, and performance of hardware modifications to restore operability to affected components.

This finding is more than minor because it reduced the reliability of all four EDGs. This finding was also determined to potentially have greater significance because the loss of emergency alternating current electrical power would significantly impact the ability to ensure adequate core cooling following a loss of offsite power event. Because the unavailability of the EDG affected both the mitigating systems and barrier integrity cornerstones, a Phase 2 Significance Determination Process (SDP) analysis was performed. Because the Phase 2 analysis indicated potentially greater than very low safety significance, a Phase 3 SDP analysis was performed by the RIII Senior Reactor Analysts (SRAs). The result of the Phase 3 SDP analysis, after considering contributions from internal events, external events, and large early release frequency, was a change in core damage frequency less than 1.0 E-6 , which is a finding of very low safety significance (Green). The primary cause of this finding was related to the cross-cutting area of Problem Identification and Resolution because licensee personnel failed to identify, in a timely manner, the use of under-sized CPTs despite numerous reasonable opportunities to do so during the design change implementation period from 1998 to 2006 and during investigation activities in response to NRC concerns about the adequacy of CPT sizing in 2005. (Section 40A3.1b.(3))

B. Licensee-Identified Violations

None.

REPORT DETAILS

Summary of Plant Event

On August 17, 2006, the licensee for Fermi, pursuant to 10 CFR 50.72 (Event Notification (EN) 42783), notified the NRC that all four emergency diesel generators (EDG) were declared inoperable. The inoperability was a result of undersized control power transformers (CPT) for each of the emergency diesel generator service water (EDGSW) pumps. The concern was that the EDGSW pump motors would not have adequate voltage at the starters to ensure operability under degraded voltage conditions. The licensee implemented compensatory measures to restore operability to the Division 2 EDGs. The licensee placed the local control switch for both Division 2 EDGSW pumps in "Run" to ensure sufficient voltage would be available at the starters following a loss of offsite power (LOOP), load shed, and restoration of power to the busses.

In the subsequent days, the licensee implemented plant modifications to replace undersized CPTs and 480 Volt motor control center (MCC) buckets; first on Division 1, followed by Division 2. Additionally, as part of the extent of condition review, the licensee also identified similar concerns with the Division 1 EDG room ventilation fans. Further calculation analysis revealed a lack of voltage margin on other potentially risk-significant components. As a result of the event notification, the NRC evaluated the risk and safety significance and concluded that a special inspection was warranted. The charter for the NRC special inspection team is Attachment 2 to this inspection report.

4. OTHER ACTIVITIES (OA)

4OA3 Special Inspection (93812)

.1 Sequence of Events - (Charter Item 1)

a. Inspection Scope

The inspectors reviewed selected corrective action program documents, work orders, and control room logs, and conducted interviews to determine the sequence of events associated with the declaration of inoperability of all four EDGs on August 17, 2006. The inspectors reviewed the licensee's actions associated with the restoration of the affected components to determine whether the corrective actions to restore operability were appropriate and technically adequate. The inspectors reviewed design modification documents to determine whether appropriate post-installation testing was accomplished. The inspectors interviewed engineering and operations department personnel, and reviewed the design modification documents and 10 CFR 50.59 evaluations against the applicable portions of the TS and Updated Final Safety Analysis Report (UFSAR). In addition, the inspectors reviewed licensee actions associated with the NRC 2005 Safety System and Design Performance Capability (SSDPC) inspection, which was documented in IR 05000341/20050016.

b. Findings and Observations

Description and Chronology of the Events

- (1) A timeline of the event is Attachment 3 to this inspection report. A brief summary of this timeline follows:

On July 2, 1986, the licensee requested an amendment to its operating license to revise the Fermi Unit 2 TS degraded grid undervoltage relay setpoints for the Division 1 electrical system. The change included an increase in the time delay and in the voltage setpoint, from 89 percent to 95 percent of nominal voltage, to account for design deficiencies and to allow for Division 1 operability. On August 22, 1986, the NRC approved the amendment to the Fermi Unit 2 operating license and the licensee subsequently revised the undervoltage setpoints.

From August 1998 through May 2006, the licensee implemented design changes to replace existing safety-related electrical MCC buckets with new buckets supplied by a vendor. During this change, some buckets were installed with CPTs that were of insufficient size to ensure adequate voltage at the starter circuit for the associated safety related component operability under degraded grid conditions. From May 1999 to July 1999, the licensee had replaced MCC buckets affecting the EDGs.

In 2003 and 2005, an NRC SSDPC inspection team questioned the adequacy of the undervoltage relay setpoints and the licensee's assumption that degraded grid protection concurrent with a loss-of-coolant accident (LOCA) was not part of the facility's design basis. This issue was documented in an unresolved Item (URI 05000341/2005016-06). The inspectors noted that the resolution of this URI could affect the adequacy of the licensee's corrective actions associated with the August 17, 2006, event.

In November 2005, the NRC SSDPC inspection team also questioned whether the CPTs for the safety-related MCCs were sized appropriately to ensure adequate voltage for safety component operability. On April 25, 2006, a control power fuse associated with an EDG 13 room ventilation fan failed. On August 15, 2006, during a review of the NRC CPT size question and the fuse failure event, the licensee questioned whether the EDG 13 fuse failure could have been a result of increased current or starter delay due to an undersized CPT.

On August 17, 2006, the licensee declared all four EDGs inoperable and performed subsequent corrective actions that included starter circuit design modifications and replacement of inadequately sized CPTs associated with EDGSW pumps and ventilation fans.

(2) Failure to Maintain Appropriate Surveillance Test Procedures for the Division 1 EDGs

Introduction: The inspectors identified a finding of very low safety significance and an associated NCV of TS 5.4, "Procedures," for the licensee's failure to maintain surveillance test procedures for the Division 1 EDGs that were appropriate to the circumstances.

Description: On August 22, 1986, the NRC issued TS Amendment Number 4 to the operating license to address a design deficiency associated with the Division 1 electrical system. The licensee reevaluated the design calculations for the degraded grid relay setpoints and determined that errors were made in the assumptions associated with the allowable lower limits for undervoltage of certain safety-related equipment. One of the changes in Amendment 4 to address the issue was to increase the Division 1 degraded grid relay voltage setpoints from 89 percent of nominal voltage to 95 percent of nominal voltage to allow for Division 1 operability. The change ensured that the lowest voltage at safety-related equipment permitted by the revised setpoints would continue to be at, or above, the lowest voltages at which the safety-related equipment could function satisfactorily.

As a result of Amendment 4, the 4.16 kilovolt bus degraded grid undervoltage setpoints for Division 1 were increased from 3702 Volts (plus or minus 74) to 3952 Volts (plus or minus 79). While the licensee revised the degraded grid undervoltage setpoints, the licensee failed to revise the Division 1 EDG surveillance test procedures to ensure that the minimum EDG voltage was consistent with the new calculations of minimum voltage required for component operability. As such, the Division 1 EDG test procedure acceptance criteria remained at 3740 Volts. This test criteria was 90 percent of nominal voltage and was consistent with the original design basis; however, the test criteria was not appropriate to the circumstances of the revised calculations and was also not consistent with a 3873 Volts minimum degraded grid undervoltage value.

Because the Division 1 EDG surveillance test minimum voltage criteria was below the minimum voltage for operability, the surveillance test did not ensure that the Division 1 EDGs would support the operability of the required components. This resulted in a condition where the EDGs may not have provided sufficient voltage for component operability for all postulated conditions.

On August 25, 2006, the inspectors noted that surveillance test procedures associated with the Division 1 EDGs included a minimum required voltage of 3740 Volts and questioned the licensee about the appropriateness of the surveillance test acceptance criteria. The licensee entered the issue into their corrective action program as Corrective Action Report Document (CARD) 06-25497, "Tech Spec Value for EDG Minimum Voltage is Lower Than Tech Spec Value for Division 1 Degraded Grid Voltage," dated August 25, 2006. As part of their corrective actions, licensee personnel initiated a surveillance test procedure revisions and implemented administrative controls to ensure that a minimum acceptance criteria for future Division 1 EDG tests would include a minimum required voltage of 3873 Volts.

Analysis: The inspectors determined that the licensee's failure to revise the surveillance test procedures for the Division 1 EDGs to reflect the required minimum voltage for component operability was a performance deficiency warranting a significance evaluation. The inspectors concluded that the finding was greater than minor in accordance with Appendix B, "Issue Screening," of IMC 0612, "Power Reactor Inspection Reports," dated September 30, 2005. The finding was associated with the Mitigating Systems cornerstone attribute of procedure quality and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to revise the surveillance test procedures resulted in a condition wherein the Division 1 EDGs' capability to output sufficient voltage to, for safety-related equipment function, was not ensured.

The inspectors completed a significance determination of this issue using Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," of IMC 0609, "Significance Determination Process (SDP)," dated November 22, 2005. The inspectors determined that the finding was of very low safety significance, in accordance with the Phase 1 screening worksheet, because: (1) it was not a design or qualification deficiency; (2) it did not represent an actual loss of safety function of a system; (3) it did not represent an actual loss of safety function of a single train for greater than its TS allowed outage time; (4) it did not represent an actual loss of safety function of one or more non-TS trains of equipment designated as risk significant per 10 CFR 50.65 for greater than 24 hours; and (5) it did not screen as potentially risk significant due to a seismic, fire, flooding, or severe weather initiating event.

Enforcement: Technical Specification 5.4, "Procedures," required the implementation of the applicable procedures recommended in Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operation)," Revision 2, dated February 1978. Regulatory Guide 1.33 Appendix A, Part 8, recommended surveillance test procedures for emergency power systems. Contrary to this requirement, from July 2, 1986, to August 25, 2006, the licensee failed to maintain appropriate surveillance procedures for the Division 1 EDGs in that the required minimum voltage acceptance criteria was below the minimum voltage required for operability of safety-related components. However, because of the very low safety significance of the issue and because the issue has been entered into the licensee's corrective action program (CARD 06-25497), the issue is being treated as an NCV consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/2006015-01).

As part of the licensee's corrective actions, on August 26, 2006, the licensee established administrative controls pending procedure and TS revision to ensure that future testing of the Division 1 EDGs would include a minimum required voltage acceptance criteria of 3873 Volts.

(3) Failure to Control Design Change Leading to Undersized Control Power Transformers

Introduction: The inspectors identified a finding and an associated NCV of 10 CFR Part 50, Appendix "B", Criterion III (Design Control) for the failure to adequately review the suitability of the design of new 480 Volt circuit breakers used for all four EDGSW pumps and the engine room supply ventilation fans for both Division 1 EDGs.

Description: In early 1997, the licensee determined that their existing low voltage (480 Volts Alternating Current and 130/260 Volts Direct Current) MCC breaker cubicles (buckets) were obsolete and in need of replacement due to the difficulty in finding qualified replacement parts. In 1998, the licensee chose the vendor to supply the replacement buckets for all low voltage safety-related MCCs and furnished the associated design specifications for the buckets. In particular, the licensee specified the CPT sizes to be used for each bucket.

In Design Calculation (DC) 5349 and 5350, the licensee evaluated the new buckets for the four EDGSW pumps 5, 6, 7, and 8 (for EDGs 11, 12, 13, and 14, respectively) to ensure that the minimum available voltage at the starting coils under all postulated conditions remained above the coil pick-up voltage rating. While performing these calculations, the licensee incorrectly assumed that the CPTs would supply a constant voltage of 108 Volts based upon a nominal CPT rating of 120 Volts minus 10 percent. However, the actual secondary voltage was equal to $\frac{1}{4}$ th the primary voltage with an additional derate of up to 15 percent to account for CPT dynamic response. Consequently, the licensee overestimated the minimum control power voltage for all four EDGSW pumps by as much as 14.07 Volts. Because the minimum calculated control power voltages for all four pumps was below the maximum specified pick-up voltage for the pump motor starting coils, sufficient pick-up voltage at the motor starters was not ensured under all postulated conditions.

The buckets for EDGSW pumps 5, 6, 8, and 7 were replaced on May 5, 12, 26, and July 27, 1999, respectively. All four buckets contained size 3 motor starters and 150 Volt Amp CPTs. In November 2005, during the NRC biennial SSDPC inspection, the inspectors had questioned the CPT sizing for the safety-related MCCs but the licensee did not enter the question into their corrective action program.

On April 25, 2006, the licensee identified a blown control power fuse for the EDG-13 engine room west supply fan and entered the issue into their corrective action program as CARD 06-22768. The licensee did not determine why the fuse blew and therefore attributed the issue to a random event. The licensee later questioned whether the CPT size could have contributed to the blown fuse and entered the issue into their corrective action program on August 15, 2006, as CARD 06-25253. The concern was that size 3 motor starters should have had a nominal 250 Volt Amp CPT, whereas several buckets with size 3 starters had 150 Volt Amp transformers. With an under-sized CPT, the secondary

voltage drops as the current draw increases due to the load demand of the starting coil. If the secondary voltage dropped below the pick-up voltage of the coil, the coil would draw the full inrush current until the control power fuse blew.

While evaluating CARD 06-25253 on August 17, 2006, the licensee determined that the voltages for all four EDGSW pump motor starters were below the manufacturer's published maximum pick-up voltage. Operations personnel declared all four EDGs inoperable and entered the appropriate TS action statement. Approximately 4 hours later, the licensee developed effective compensatory actions to restore both Division 2 EDGs to operable status but could not restore either of the Division 1 EDGs without a physical modification.

The licensee completed the necessary modifications to both Division 1 EDGSW pump buckets under Engineering Design Package (EDP)-34482 which consisted of replacing the existing 150 Volt Amp CPTs with 250 Volt Amp CPTs and modifying the control power wiring to reduce the voltage drop associated with an unnecessarily long run of cable to the motor starter. A similar modification was performed on the Division 2 EDGs to restore them to fully operable status without the need for compensatory actions.

The licensee performed as-found pick-up voltage tests for all four motor starters and determined that the required voltage on the associated 4160 Volt bus for the coils to pick up was above the degraded voltage setpoints for EDGSW pumps 5 and 6. Although the Division 2 degraded voltage setpoints were above the pick-up voltages for EDGSW pumps 7 and 8, the undervoltage loss of power setpoints were below the as-found pick-up voltages for EDGSW pumps 7 and 8. The inspectors therefore determined that neither Division 1 pump would have started during a design-basis degraded grid condition which could have affected the reliability of the supported EDG.

During the extent of condition review of this issue, the licensee identified four additional safety-related buckets with an inadequately-sized CPT for the Division 1 EDG engine room supply fans. Both EDGs were subsequently declared inoperable and EDP-34492 was issued to install 250 Volt Amp CPTs, which were sufficient to ensure operability. Three additional buckets were found to have inadequately-sized CPTs and several others had less than a 1 Volt margin. At the conclusion of this inspection, the licensee had corrective actions planned to restore additional margin for all buckets.

Analysis: The inspectors determined that the licensee's failure to properly calculate the minimum control voltage in DC-5349 and 5350 was a performance deficiency because it was within the licensee's ability to foresee and prevent because licensee personnel had reviewed the calculations. The inspectors concluded that the finding was greater than minor in accordance with Appendix B, "Issue Screening," of IMC 0612, "Power Reactor Inspection Reports," dated September 30, 2005. Specifically, the finding was associated with the Mitigating Systems cornerstone attribute of equipment performance and affected the cornerstone objective of ensuring the availability, reliability, and

capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to properly perform calculations associated with the MCC design change resulted in the installation of undersized MCC CPTs that affected the reliability of the EDGs. This finding was also determined to potentially have greater significance because the loss of one division of emergency alternating current electrical power would significantly impact the ability to ensure adequate core cooling following a loss of offsite power event.

The inspectors completed a significance determination of this issue using Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," of IMC 0609, "Significance Determination Process (SDP)," dated November 22, 2005. Based on the actual measured pick-up voltages, the inspectors determined that the only equipment with inadequate pick-up voltage was the engine room ventilation fans and the service water pump for EDG 11. Therefore, EDG 11 was assumed to be unavailable for the Phase 1 and Phase 2 SDP analysis. Because the unavailability of the EDG affected both the mitigating systems and barrier integrity cornerstones, a Phase 2 SDP analysis was performed. For the Phase 2 analysis, EDG 11 was assumed to be unavailable for an exposure time of one year. No recovery of the EDG was credited. The result of the Phase 2 SDP analysis was a potential finding of low to moderate safety significance (White). The dominant sequences involved either a LOOP or a loss of Division 1 offsite power followed by a failure of long term containment heat removal. Because the finding was potentially greater than very low safety significance, a Phase 3 SDP analysis was performed by the SRAs.

The inspectors and the SRAs determined that the assumption that EDG 11 was unavailable was conservative because the EDG had functioned properly in all surveillance tests and in response to two actual loss of power events. A better approach to estimate the risk due to inadequately sized CPTs was to consider an increased failure probability for EDG 11. Based on information provided by the licensee, the inspectors determined that if EDG 11 output voltage was below 4097 Volts, the ventilation fans and service water pump for the EDG may not start. The data for simulated loss of power (LOP) and LOCA surveillance tests and actual operating experience in response to loss of power events showed that EDG 11 output voltage was below 4097 Volts on one out of 14 demands. This data was used to estimate the start failure probability of the EDG due to the inadequately sized CPTs. Using this increased failure probability for EDG 11 and increasing the common cause failure probability of Division 1 EDGs, the SRAs calculated a change in core damage frequency (CDF) using the Fermi Standardized Plant Analysis Risk (SPAR) model of $2.2 \text{ E-}7$.

The SRAs also evaluated the finding for a contribution to risk from external events and large early release frequency (LERF). A qualitative evaluation of the contribution from fire risk was performed. The individual plant examination of external events described six dominant fire scenarios. Of those six, only two were determined to be potentially affected by the finding on the Division 1 EDGs. The first scenario involved a control room panel fire. For control room fires,

either offsite power, the Division 2 EDGs, or the combustion gas turbine would remain available. The second scenario involved a fire in the Division 2 switchgear room. For these fires, offsite power to Division 1 buses and the combustion gas turbines would remain available. Due to redundant equipment availability and low likelihood of a severe fire, the SRAs determined that the change in CDF due to fire for this finding was not greater than the contribution from internal events. The SRAs also found that the contribution from seismic risk was negligible due to the low seismically-induced LOOP frequency (estimated at 3.0 E-5) and the remaining mitigation capability of the Division 2 EDGs.

The SRAs determined that the LERF contribution did not change the overall significance of the finding by using the results of the Phase 2 analysis. In accordance with IMC 0609, Appendix H, each of the core damage sequences greater than 1.0 E-8 were evaluated. None of the core damage sequences from the Phase 2 analysis were determined to affect LERF.

The result of the Phase 3 SDP analysis after considering contributions from internal events, external events, and LERF was a change in CDF less than 1.0 E-6, which is a finding of very low safety significance (Green).

The primary cause of this finding was related to the cross-cutting area of Problem Identification and Resolution because licensee personnel failed to identify, in a timely manner, the use of under-sized CPTs despite numerous reasonable opportunities to do so during the design change implementation period from 1998 to 2006 and during investigation activities in response to NRC inspector questions about the adequacy of CPT sizing in 2005.

Enforcement: Appendix B of 10 CFR Part 50, Criterion III (Design Control) required, in part, that the licensee review the suitability of the design of new 480 Volt breakers used to support operability of the safety-related EDGSW pumps and the safety-related engine room supply ventilation fans for both Division 1 EDGs. Contrary to this requirement, the licensee failed to ensure that the voltage available to the motor starting coils for all four EDGSW pumps and the engine room supply ventilation fans for both Division 1 EDGs was adequate to ensure that the coils would pick-up under all postulated conditions when:

- The licensee replaced the MCC buckets for the EDG 11, 12, 14, and 13 service water pumps on May 5, 12, 26, and July 27, 1999, respectively, without a proper design evaluation; and,
- The licensee replaced the MCC buckets for EDG 11 and 12 engine room supply fans on May 5 and 12, 1999, respectively, without a proper design evaluation.

However, because of the very low safety significance of the issue, and because the issue has been entered into the licensee's corrective action program (CARD 06-25253), the issue is being treated as an NCV consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000341/2006015-02).

Immediate corrective actions included entering this issue into their corrective action program (CARD 06-25253), completing an extent of condition review, and performing hardware modifications to restore operability to affected components.

.2 Engineering Calculations - (Charter Item 2)

a. Inspection Scope

The inspectors reviewed the licensee's engineering calculations to evaluate the adequacy of voltage drop calculations as they related to the ability of components to function under design bases conditions. The inspectors focused on those components that were established as having essentially no voltage margin. The inspectors reviewed system drawings and configurations in order to determine the appropriateness of the calculations. The inspectors reviewed engineering documentation and calculations associated with the following systems and components:

- Division 1 EDGSW pumps;
- Division 1 EDG ventilation fans;
- Division 2 EDGSW pumps;
- residual heat removal (RHR) torus spray system; and
- core spray system.

b. Findings and Observations.

(1) Adequacy of Thermal Overload Relay Testing and Setpoints

Introduction: The inspectors identified an URI regarding the adequacy of thermal overload testing and setpoints for some Spectrum MCC buckets. Specifically, several starter circuits were installed in locations that could experience temperatures that were higher than the temperature used to calibrate the thermal overload setpoints.

Description: The inspectors noted that several starter units were installed in areas of the plant that could experience high temperatures during accident conditions. The qualification test documentation for these starter circuits indicated that the associated thermal overload devices were calibrated at 40°Celsius (C). The licensee determined that the maximum ambient temperature that these circuits could experience was about 65°C. The thermal overload devices consisted of an ambient temperature compensated relay with bi-metallic heaters. The licensee concluded that the design sizing of the thermal overload heaters for 140 percent of motor full load current and the functional testing of the MCC buckets at higher temperatures and currents provided assurance that the overload devices would function as required. However, the inspectors determined that the qualification test documentation did not identify whether the characteristics of the thermal overloads were verified at higher temperatures. The inspectors remained concerned that the thermal overload devices could cause undesirable trips of safety-related components during or after a design

basis accident. At the conclusion of the inspection, the licensee was continuing the review of the inspector's concerns. This issue was considered an URI requiring further review (URI 05000341/2006015-03).

(2) Observations on Calculations and Acceptance Criteria

The inspectors reviewed the voltage drop calculations for those components identified as having little to no voltage margin to operability and identified several cases where voltage drop calculations used erroneous or non-conservative input data. The inspectors questioned the appropriateness of the affected calculations due to the very small voltage margins to operability. The licensee performed a revised analysis in these cases to demonstrate component operability.

During a review of the voltage drop calculations for the 'A' and 'B' RHR core spray outboard isolation valves, E2150-F004A and F004B, the inspectors noted that the calculations used non-conservative cable length values in that cable raceway length was used instead of the actual cable length.

The inspectors reviewed calculations associated with RHR torus cooling isolation valve E1150-F024A. The inspectors noted that the licensee had previously evaluated its voltage drop calculation methodology in response to CARD 05-26522, "NRC Concern - DC-5349 Vol. 1, DC-5350 Vol. 1, DC-5351 Vol. 1, and DC-5352 Vol. 1 Methodology Concerns Investigation," dated November 28, 2005. The licensee concluded that small contact resistance in the starter circuit under degraded voltage conditions would produce a voltage drop that may affect circuit operation. However, the inspectors noted that the licensee had issued Technical Service Request (TSR)-34411 to revise the voltage drop calculations and that this revision stated, in part, that the contact resistance associated with limit switches, auxiliary switches, and control switches within the control circuit was minimal when compared to overall total control resistance, and that this contact resistance was bounded within the overall conservative margin associated with the total circuit resistance. The inspectors noted that TSR-34411 was inconsistent with the CARD 05-26522 evaluation conclusion and questioned the licensee on the inconsistency. The licensee then revised the voltage drop calculation for E1150-F024A, which originally showed 95.01 Volts available to the starter where the acceptance criteria was 95.00 Volts minimum. The revised calculation used additional cable lengths that had been omitted in the original calculation and included small contact resistance; however, a lower cable resistance temperature factor was used and the revised starter voltage became 95.20 Volts.

The inspectors reviewed the acceptance criteria for the size 3 starters. The test acceptance criteria for size 3 starters was a pickup voltage of less than 95 Volts. The inspectors noted that the test did not consider the ambient temperature affect on the test value. The vendor's value of 95 Volts was recorded for 87°C. Therefore, the inspectors determined that the test procedure acceptance criteria of 95 Volts, at a lower ambient temperature than 87°C, was not conservative and may not ensure the operability of the size 3 starter at design temperature. The licensee added an action item to the Level 1 CARD 06-25253 to evaluate the procedure test method and its acceptance criteria.

The inspectors reviewed changes to the DC-5349 that resulted from modifications to replace the CPTs for the EDGSW pumps and modifications to the control circuits to eliminate higher voltage drop across the cables. The inspectors noted that the cable resistance for the "AR" relays was incorrectly revised. The control circuit modification added additional cable resistance to the "AR" control circuit. The licensee entered the issue into its corrective action program as CARD 06-25545 and re-calculated the minimum voltage available at the "AR" terminal. The inspector reviewed the revised calculation and found it acceptable. The revised terminal voltages available for all "AR" relays associated with the EDGSW pumps were above the minimum required voltage of 102 Volts.

.3 Licensee Event Investigation Activities - (Charter Item 3)

a. Inspection Scope

The inspectors reviewed the licensee's event investigation activities. The review examined the investigation and troubleshooting plans used after the event to evaluate the extent of condition of the identified deficiencies and determine the corrective actions required to ensure operability of the affected components. The inspectors reviewed the licensee's actions to determine whether the actions were in accordance with applicable licensee procedures and standards.

b. Findings and Observations

No findings of significance were identified.

The inspectors noted that the licensee's initial problem solving efforts were prioritized to those safety-related components that were considered most likely affected by the undersized transformers. The licensee initially focused on systems with size 3 motor starter circuits. On August 17, 2006, when the licensee determined that the minimum voltages for all four EDGSW pump motor starters were below the manufacturer's maximum pickup voltage, the licensee declared all four EDGs inoperable and began corrective actions to restore operability. The licensee put into place compensatory actions and restored the Division 2 EDGs to operable status. The licensee determined that control circuit wiring changes for the Division 1 EDGSW pumps were needed to restore operability for the Division 1 EDGs. The changes included the replacement of 150 Volt Amp CPTs with 250 Volt Amp CPTs and modifications to the control circuit to reduce the amount of voltage drop in the circuit. On August 21, 2006, the licensee had completed modifications to the Division 1 EDGSW pump control circuit, declared the Division 1 EDGs operable. On August 22, 2006, the licensee identified that the Division 1 EDG room ventilation supply fans had undersized transformers. The licensee again declared the Division 1 EDGs inoperable and performed maintenance to install larger 250 Volt Amp CPTs for the ventilation fans to restore operability. The inspectors reviewed the licensee's initial investigation activities to determine whether any safety or risk-significant components were not evaluated by the licensee during the extent of condition review.

On August 24, 2006, the licensee established a charter for a root cause investigation to explore the circumstances related to the event. The root cause investigation was in progress at the conclusion of this inspection.

.4 Independent Review of Equipment - (Charter Item 4)

a. Inspection Scope

The inspectors reviewed design documents, maintenance and surveillance records, corrective action program documents, and pertinent procedures related to equipment that may not have performed as expected. The inspectors reviewed the design modification documents and 10 CFR 50.59 evaluations against the applicable portions of the TS and UFSAR. The inspectors selected samples of affected equipment based on the risk-significance of the equipment and the relative potential that the equipment may not have performed as expected. The inspectors performed a detailed review of components in the following systems:

- Division 1 EDG engine room supply ventilation fans;
- Division 1 EDGSW pumps;
- Division 2 EDGSW pumps;
- RHR torus cooling system;
- RHR torus spray system; and
- standby liquid control pumps.

b. Findings and Observations

No findings of significance were identified.

The inspectors reviewed the modifications for the Division 1 EDG engine room supply ventilation fan MCC breakers and determined that the licensee had replaced the CPT with one of a larger size to restore the operability of the fans. The inspectors also reviewed the modifications to the Division 1 EDGSW pump MCC breakers. The licensee replaced the 150 Volt Amp CPTs with larger sized, 250 Volt Amp CPTs, and modified the control power wiring to the starter coil. Because the licensee did not initially correctly model the CPT response, the large control power voltage drop from the RHR complex to the control room and back again did not cause the calculated voltage at the coil to be less than the minimum required voltage. However, after revising the modeling for the CPTs, the licensee discovered that even after installing the larger size, adequate voltage to the starter coil could not be ensured without reducing the control power cable voltage drop. Consequently, the licensee modified the wiring in the MCC bucket to power the coil essentially directly from the CPT and thus significantly reduced the control cable voltage drop to the coil. When the pumps were run for post-maintenance testing, however, the licensee discovered a circuit path that energized the white trip light in the main control room when the pump was run from the local control panel. This was determined to not affect pump operability.

The inspectors reviewed the maintenance history on the Division 2 EDGSW pumps to determine if any unresolved conditions existed which would have affected the operability of pumps when they were considered to be operable but degraded with compensatory actions in place (local switch placed in "Run"). The inspectors identified an issue where

the wrong acceptance criteria for the pick-up voltage was used for the EDG-13 service water pump when the electrician inadvertently used 102 Volts instead of 95 Volts for the size 3 starter. Consequently, when the measured pick-up voltage was 95.1 Volts, the test was considered satisfactory. The inspectors noted that the newly-calculated degraded voltage was 100.1 Volts with the compensatory measures in place. The licensee entered this issue into their corrective action program as CARD 06-25355 and determined that the pump remained operable.

The inspectors reviewed the maintenance history on the three most risk-significant motor operated valves (MOVs) for a LOOP event as well as all risk-significant MOVs with low margin, less than 2 Volts, between the calculated degraded voltage at the open and close contacts and the maximum allowable pick-up voltage. These MOVs were associated with the RHR system. Additionally, the inspectors reviewed the maintenance history of six other MOVs in various systems to obtain a diverse perspective on the licensee's calculations. The inspectors evaluated if prior maintenance, including design modifications, could adversely impact the licensee's degraded voltage calculations by invalidating any of the design inputs or assumptions for the calculation. Additionally, the inspectors determined if the last recorded as-left pick-up voltages were consistent with the acceptance criteria used in the licensee's operability evaluation. The inspectors reviewed the history of 14 MOVs.

For the MOVs reviewed, the licensee used the manufacturer's maximum specified pick-up voltage as the acceptance criteria used in the degraded voltage calculations. The licensee compared the calculated degraded voltage at the affected coil to the value at which the coil was specified to pick-up. However, the licensee procedures for measuring pick-up voltage in the receipt inspection and the periodic bucket inspections allowed for the as-left pick-up voltage to exceed the acceptance criteria if it was determined that the minimum voltage still exceeded the measured pick-up voltages. The inspectors were concerned that any previous such cases would have been evaluated against the then-current degraded voltage which could have been non-conservative in light of the current issue with undersized CPTs. The inspectors questioned the licensee on the issue and determined that the licensee had not reviewed previous maintenance history to determine if any previously-measured pick-up voltages exceeded the acceptance limit and, if so, if the current basis for operability remained justified. The inspectors discovered three historical instances where the as-left pick-up voltages exceeded the acceptance criteria but remained below the newly-calculated degraded voltage. Upon identification, the licensee entered this issue into their corrective action program as CARD 06-25452 and performed a maintenance review to ensure that the last measured pick-up voltages did not exceed the newly-calculated degraded voltages.

The inspectors performed a detailed CARD review on the three most risk-significant MOVs for a LOOP event and the Division 2 EDG engine room supply ventilation fans to determine if the licensee identified any previous issues related to low control power cable voltage margin, that could be attributed to low margin, or described a condition that could have negatively impacted the assumed circuit resistance. The inspectors reviewed issues such as prior occurrences of blown fuses, blown bulbs, or overheating of electrical components such as fuse clips. The inspectors noted that two of the three most risk-significant MOVs had voltage margins of 0.01 Volts and 0.11 Volts with the third having a margin of 2.5 Volts. The inspectors identified several instances of blown control

power fuses for the Division 2 EDG ventilation fans, but did not identify occurrences of repeat failures. The licensee concluded that those blown fuses were random in nature and not related to the undersized CPTs installed in the respective buckets.

The inspectors reviewed components to evaluate the adequacy of the degraded voltage calculation to ensure that the components would function as designed. The inspectors chose the standby liquid control pump MCC breakers to review in closer detail. The inspectors learned that the licensee had no degraded voltage calculation for the pumps because a degraded voltage was not assumed concurrent with an anticipated transient without scram. However, the inspectors questioned if it was within the licensee's design basis since the SLC pumps are credited in some accident scenarios with pH control for alternate source term considerations. The licensee entered this issue into their corrective action program as CARD 06-25649. Initial corrective actions included performing a degraded voltage calculation and determined that adequate voltage remained available to ensure that the system would operate.

The inspectors reviewed results from the EDG-11 and 12 surveillance tests since February and January of 2000, respectively. The inspectors assessed the minimum observed voltages to determine if the voltage was ever below the minimum required to ensure that the respective service water pump starter relays would pick-up. The calculated voltage required to ensure that the service water pump starter coil would have picked-up was 4097 Volts for EDG-11 and 3957 Volts for EDG-12. For EDG-11, the inspectors identified one instance during a LOOP/LOCA test performed on May 12, 2000, where the minimum recorded voltage was 4088 Volts; however, the following day the voltage was recorded as 4122 Volts, and the previous day's recording was 4157 Volts. On May 5, 2003, the minimum voltage was recorded as 4090 Volts. No instances were recorded where EDG-12 operated below 3957 Volts.

.5 Potential Generic Concerns - (Charter Item 5)

a. Inspection Scope

The inspectors evaluated the circumstances of the event for potential generic safety concerns. Specifically, the inspectors reviewed the circumstances that led up to the event to determine whether a regulatory matter existed that was not sufficiently addressed by current regulations, guidance or programs. The inspectors also examined the circumstances that influenced the event to determine whether those circumstances could have adversely affected other plant systems or could have applied to other plants in the nuclear industry.

b. Findings and Observations

No findings of significance were identified.

No potential generic safety concerns were identified. The inspectors noted that the licensee had developed the designs associated with the MCC bucket replacements in-house, had made specific equipment acquisitions from a vendor based on those designs, and had managed and installed the design change using in-house personnel. The inspectors reviewed the use of the inadequately sized MCC power transformers that

led to the event and determined that this issue was addressed by current regulations, guidance and programs. In addition, the inspectors noted that the use of the under-sized MCC power transformers was contrary to established vendor and industry guidance.

4OA6 Meetings

Exit Meetings

On September 26, 2006, the inspectors presented the inspection results to Mr. D. Cobb and other members of licensee management at the conclusion of the inspection. The inspectors asked the licensee whether any material examined during the inspection should be considered proprietary. No proprietary information was identified.

- ATTACHMENTS:
1. SUPPLEMENTAL INFORMATION
 2. SPECIAL INSPECTION TEAM CHARTER
 3. TIMELINE

KEY POINTS OF CONTACT

Licensee

D. Gipson, Chief Nuclear Officer
D. Cobb, Assistant Vice President, Nuclear Generation
K. Hlavaty, Plant Manager
S. Bartman, Nuclear Production
J. Davis, Manager, Outage Management
R. Gaston, Licensing Manager
S. Hassoun, Principal Engineer, Licensing
H. Higgins, Radiation Protection Manager
J. Korte, Manager, Nuclear Security
J. Plona, Engineering Director

NRC

C. Lipa, Chief, Division of Reactor Projects, Branch 4
R. Michael Morris, Senior Resident Inspector, Fermi

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000341/2006015-01	NCV	Failure to Maintain Adequate Emergency Diesel Generator Surveillance Test Procedures (Section 4OA3.1b.(2))
05000341/2006015-02	NCV	Failure to Control Design Change Leading to Undersized Control Power Transformers (Section 4OA3.1b.(3))

Opened

05000341/2006015-03	URI	Thermal Overload Setpoints (Section 4OA3.2b.(1))
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Discussed

None.

LIST OF DOCUMENTS REVIEWED

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

Work Requests:

WR 2213050429; Perform 42.302.07 Div. I Bush 64B 4160V Undervoltage Relays

Calibration/Functional Test; 4/28/05.WR 000Z062858; Replace Undersized Control

Transformers at 480 V MCC for R3001C006 and Perform Wiring Changes per EDP-34482; dated 8/20/06 dated

WR 000Z062857; Replace Undersized Control Transformers at 480 V MCC for R3001C005 and Perform Wiring Changes per EDP-34482; 8/19/06 dated

WR 000Z973441; Replace MCC 72B-3A - Position 4C-R for E1150F027A; dated 4/11/03

WR 000Z973416; Replace MCC 72B-3A - Position 2A for E1150F028A; dated 4/21/03

WR 000Z973427; Replace MCC 72B-3A - Position 5A for E1150F024A; dated 4/18/03

WR 000Z973635; Replace MCC 72EA-2C - Position 1E for R3001C005; dated 5/5/99

WR 000Z973655; Replace MCC 72EB-2D - Position 1E for R3001C006; dated 5/12/99

WR 000Z973635; Replace MCC 72EC-2C - Position 1E for R3001C007; dated 7/28/99

WR 000Z973635; Replace MCC 72ED-2D - Position 1E for R3001C008; dated 5/26/99

WR R229020100; Inspect/Test MCC 72EC-2C - Position 1E, Space Heater, and Lube Motor; dated 5/22/02

WR G043050100; Inspect/Test MCC 72ED-2D - Position 1E, Space Heater, and Lube Motor; dated 12/06/05

WR 000Z973427; Dedicated Shutdown (DSD) Motor Control Center (MCC) 72B-3A Local Control Panel; dated 01/17/03

WR 000Z973416; E1150-F028A Div 1 RHR Torus Isolation Valve; dated 02/20/03

CARDS:

CARD 00-17110; Need to Update Design Calculation; dated 8/9/00

CARD 03-11374; Blown Fuse Found Following Rotational Check; dated 4/6/03

CARD 03-11847; Determine if Fermi 2 is required to take a LOCA concurrent with a degraded grid condition as part of the plants licensing basis; dated 05/23/03

CARD 06-25649; Provide Control Power Calculation for SBLC Pump Motors; dated 9/1/06 (NRC-Identified)

CARD 06-25452; Control Transformer Extent of Condition Did Not Consider Past Testing Results; dated 8/24/06

CARD 01-18383; Contactor Failed Pick-Up Testing; dated 9/5/01

CARD 06-22640; FME Found in MCC Bucket; dated 4/22/06

CARD 98-17568; Blown Fuse Found - E1150F024A; dated 9/28/98

CARD 06-25355; PM Event R229020100 Has Discrepancies which Should Have Been Addressed; dated 8/19/06 (NRC-Identified)

CARD 06-22768; Blown Control Power Fuse; dated 4/25/06

CARD 06-25253; Undersized Control Transformers; dated 8/15/06

CARD 03-19098; ETAP Program/DC-6186, Volume dated 1; dated 7/28/03

CARD 05-26522; NRC Concern - DC-5349 Volume dated 1, DC-5350 Volume dated 1, DC-5351 Volume dated 1 and DC-5352 Volume. 1 Methodology Concerns Investigation; dated 11/28/05.

CARD 06-25253; Under Sized Control Transformers; dated August 15, 2006

CARD 06-25497; Tech Spec Value for EDG Minimum Voltage Is Lower than Tech Spec Value for Division 1 Degraded Grid Voltage; dated August 25, 2006

CARD 06-25484; Solution Team to Address Control Power Transformer Undersize Issue Lacks Formal Process; dated 08/25/06

CARD 06-25452; NRC Concern - Control Transformer Extent of Condition Did Not Consider Past Testing Results; dated 08/24/06

CARD 05-26685; NRC Inspection Item SSDP-064; dated 12/01/06

CARD 06-23147; Loss of Configuration Control; dated 05/04/06

Receipt Inspection for MCC Bucket Location 72B-3A, Position 5A for E1150F024A; dated 2/25/02

Miscellaneous:

EFA-R16-06-002, Revision 0; Control Power Transformer Capability Within Size 3 480 V Starters; dated 8/17/06

EDP-34482; Control Circuit Changes for EDGSW Pumps for EDG 11 and 12; dated 8/19/06

EDP-34492; Starter CPT Changes for Diesel Room Supply Fans for EDG 11, 12, 13, and 14; dated 8/23/06

Electrical Transient Analysis Program Report Output on 8/22/06

Final Summary for Voltage Drop Calculations - Size 1, 2, and 3 Motor Starters; dated 8/31/06

DC-0919; Revision D; Undervoltage Relay Setpoints; dated 7/29/91

DC-5349; Volume I, Revision F; AC Control Cable Voltage Drop Calculation for QA1, Division 1; dated 11/15/02

TSR-29429; Revision C; Revision to Specification 3071-128 to Provide Installation for the New MCC Compartments; dated 03/11/99

3071-R00-PUR-133, Revision A; Detroit Edison Purchase Specification for Replacement of Existing QA Level I ITE-Gould Motor Control Center Components/Compartments; dated 1/30/98

61721N-2711-09; Schematic Diagram Diesel Generator Service Water Pump B and D R3001C007 and C008 Division 2; Revision R

61721-2201-70; Schematic Diagram Suppression Chamber Spray Bypass Isolation Valve E1150F024A; Revision H

61721-2211-06; Schematic Diagram Core Spray Outboard Isolation Valves A and B E2150F004A and F004B; Revision P

50.59 Screening No. 06-0345; EDP-34482; Revision 0

EDP-34482; Design Calculation to Be Revised DC-5349; Volume 1; dated 08/19/06

Root Cause Analysis (RCA) Team Charter; Under Sized Control Transformers; dated 008/24/06

Fermi 2 Event Notification Worksheet; All Four EDGs Declared Inoperable; dated 08/17/06

LCO Sheet; LCO Number 2006-0485 Division 1 EDGs TS Value for Minimum Voltage Is Lower Than TS Value for Division 1 Degraded Grid Voltage; dated 08/25/06

Purchase Specification Number 3071-R00-PUR-133; Replacement of Existing QA Level 1 ITE-Gould Motor Control Center Components/Compartments; dated 08/02/98

Design Specification DC-5349; AC Control Cable Voltage Drop Calculation for QA1, Division 1; dated 09/24/97

Risk Adjusted Worth for Loads with Low Pickup Margin; dated 08/30/06

LIST OF ACRONYMS USED

°C	Degrees Celcius
EDG	Emergency Diesel Generator
EDGSW	Emergency Diesel Generator Service Water
C	Celsius
CARD	Corrective Action Report Document
CFR	<u>Code of Federal Regulations</u>
CPT	Control Power Transformer
DC	Design Calculation
EDP	Engineering Design Package
kV	Kilovolt
IMC	Inspection Manual Chapter
LOCA	Loss-of-coolant Accident
LOOP	Loss of Offsite Power
LOP	Loss of Power
MCC	Motor Control Center
MOV	Motor Operated Valve
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
RHR	Residual Heat Removal
SDP	Significance Determination Process
SPAR	Fermi Standardized Plant Analysis Risk
SRA	Senior Reactor Analyst
SSDPC	Safety System and Design Performance Capability
TS	Technical Specification
TSR	Technical Service Request
URI	Unresolved Item
UFSAR	Updated Final Safety Analysis Report
WR	Work Request

August 29, 2006

MEMORANDUM TO: Mark Franke, Senior Resident Inspector
Perry

THRU: Mark A. Satorius, Director **/RA/**
Division of Reactor Projects

FROM: Cynthia D. Pederson, Director **/RA/**
Division of Reactor Safety

SUBJECT: SPECIAL INSPECTION CHARTER FOR REPORTABLE EVENT
AT FERMI REGARDING INOPERABLE EMERGENCY DIESEL
GENERATORS AND OTHER 480 VOLT COMPONENTS DUE TO
INADEQUATE VOLTAGE

On Thursday, August 17, 2006, the licensee for Fermi, pursuant to 10 CFR 50.72 (EN 42783), notified the NRC that all four Emergency Diesel Generators (EDGs) were declared inoperable. The inoperability was a result of undersized control power transformers for each of the Emergency Diesel Generator Service Water (DGSW) Pumps. The concern was that the DGSW pump contactors would not have adequate voltage at the starters to ensure the starters would pickup under degraded voltage conditions.

On August 18, 2006, the licensee implemented compensatory measures to restore operability to the Division 2 EDGs. The licensee placed the local control switch for both division 2 DGSW Pumps in "Run" to ensure sufficient voltage would be available at the starters following a LOOP, load shed, and restoration of power to the busses.

In the subsequent days, the licensee implemented plant modifications to replace undersized control power transformers and 480 V MCC buckets; first on Division 1, and followed by Division 2. Additionally, as part of the extent of condition, the licensee also identified similar concerns with the Division 1 EDG room ventilation fans. Further calculation analysis revealed no voltage margin on other potentially risk significant components.

The circumstances of the developing concerns regarding adequacy of voltage at several safety and risk significant components, were reviewed against the risk and deterministic criteria of Management Directive (MD) 8.3. Deterministically, the event met MD 8.3 criterion b, "Involved a major deficiency in design, construction, or operation having potential generic safety implications." A Region III Senior Reactor Analyst (SRA) completed a SPAR model event assessment. The Fermi SPAR model was used to estimate the delta CDP for a 1 year period assuming Division 1 EDGs failed due to common cause. The calculated delta CDP was 3.2 E-5.

CONTACT: Julio Lara, DRS
630-829-9731

Attachment 2

The SRA also considered that the plant experienced a LOOP during the 2003 blackout event and also experienced a loss of power to Division 1 in July 2006. In both events the EDGs functioned properly. Based on the operating experience, the assumption that the Division 1 EDG SW pumps would not function on any start of the EDG is likely conservative. As a result, the delta CDP is a bounding value.

The assessment resulted in a calculated delta CDP of $3.2E-5$, which falls in the overlap region between a Special Inspection and an AIT. Because the estimate is a bounding value, a Special Inspection rather than an AIT was recommended. Based on the deterministic criteria, and delta CDP, and in consideration of Inspection Procedure 71153 and Regional Procedure 1219, a Special Inspection will be conducted to review this reportable event in accordance with IP 93812.

Docket No. 50-341

Enclosure: As stated

cc w/encl: T. Steadham, DRP, Fermi Resident Inspector
A. Dahbur, DRS, Engineering Branch 3
F. Tran, DRP, Reactor Engineer (NSPDP)
M. Murphy, NRR - Projects
D. Jaffe, NRR - Projects
P. Tam, NRR - Projects
C. Pederson, DRS, Division Director
J. Caldwell, Regional Administrator, Region III
G. Grant, Deputy Regional Administrator, Region III
T. Bloomer, Region III EDO Coordinator

TIMELINE

Time	Event Description
July 2, 1986	Licensee submitted request for an operating license amendment to increase TS degraded grid voltage undervoltage setpoints and time delay for Division 1, which was of a different design than Division 2, in order to allow Division 1 operability.
August 22, 1986	NRC approved Amendment 4, which revised the Division 1 degraded voltage undervoltage setpoints. The licensee did not adjust Division 1 EDG test requirements to reflect the higher undervoltage setpoints.
1997	Licensee determined that a design change was needed to replace obsolete safety related MCC buckets due to difficulty in obtaining replacement parts and performing maintenance.
August 1998	Safety-related MCC bucket replacement began. New bucket designs were specified by the licensee and supplied by Spectrum Technologies.
May 1999	MCC bucket replacements affecting the EDGs began.
July 1999	MCC bucket replacements affecting the EDGs was completed.
May 23, 2003	Licensee documented an NRC SSDPC inspection team question regarding the adequacy of the degraded grid undervoltage relay time delay and the assumption that the design basis did not require degraded grid protection to function concurrent with a LOCA (CARD 03-11847).
July 30, 2003	NRC opened URI 05000341/2003007-02, Non-Conservative Acceptance Limit for the Time Delay Relay Did Not Assure the Availability of the Vital Buses
July 27, 2004	NRC closed URI 05000341/2003007-02 based on the inspector's judgment that the licensee's planned corrective actions, as stated in CARD 03-11847 and which had not been implemented at the time of the inspector's follow-up activities, appeared to be adequate.
November 2005	NRC SSDPC inspection team again questioned adequacy of the undervoltage relays setpoints (CARD 05-26685). The NRC team also questioned the adequacy of CPT sizing.
January 13, 2006	NRC opened URI 05000341/2005016-06, Inadequate Time Delay for Degraded Voltage Relays. After reviewing additional information during the 2005 SSDPC inspection, the inspectors concluded that the resolution to CARD 03-11847 was inadequate and that the issue should be reopened as a separate URI.

April 25, 2006	EDG 13 engine room west supply ventilation fan did not start as expected and the licensee discovered that the control power fuse was blown. The licensee's investigation team determined that the fuse should not have blown (CARD 06-22768).
May 4, 2006	Licensee determined that it had not been appropriately updating the design calculations associated with the MCC bucket replacements (CARD 06-23147).
August 15, 2006	Licensee's review of the April 25, 2006, EDG 13 fuse failure and the NRC questions regarding CPT adequacy resulted in subsequent conversations with Spectrum technologies (MCC vendor), General Electric (starter vendor), and Micron Industries (CPT manufacturer), and a determination that various class 1E MCC bucket CPTs were undersized. (CARD 06-25253).
August 17, 2006	Licensee followup investigation into CARD 06-25253 revealed that adequate voltage at the starter coil for operability of the EDGSW pumps may not exist under all postulated conditions and all four EDGs were declared inoperable. The licensee placed compensatory measures into place for both Divisions and declared the Division 2 EDGs operable.
August 21, 2006	Licensee completed Division 1 and 2 EDGSW pump starter circuit modifications that included the installation of larger 250 Volt Amp CPTs. The licensee declared Division 1 EDGs operable and Division 2 operable without the need for compensatory measures.
August 22, 2006	During the extent of condition review of this issue, the licensee identified four additional safety-related buckets with an inadequately-sized CPT for the Division 1 EDG engine room supply fans and installed larger 250 Volt Amp CPTs to restore operability.
August 24, 2006	Licensee chartered a root cause team; NRC inspectors questioned the adequacy of the licensee's extent of condition review with respect to past testing and surveillance data (CARD 06-25452).
August 25, 2006	NRC inspectors questioned the adequacy of the EDG minimum voltage testing requirements (CARD 06-25497).
August 28, 2006	NRC Special Inspection commenced.