February 25, 2008

MEMORANDUM TO: Steven K. West, Director
Division of Reactor Safety
Region III

FROM: Michael J. Case, Director **/RA by HNieh for/**
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

SUBJECT: RESPONSE TO FERMI POWER PLANT UNIT 2 - TASK INTERFACE AGREEMENT (TIA) 2007-003 RE: INADEQUATE DEGRADED VOLTAGE TIME DELAYS (TAC NO. MD6632)

On August 28, 2007 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML072410317), the U.S. Nuclear Regulatory Commission (NRC), Region III (RIII), Division of Reactor Safety requested assistance from the Office of Nuclear Reactor Regulation (NRR) to concur on the RIII staff's analysis of the time delay settings for the second level of undervoltage relay protection at the Fermi Power Plant, Unit 2 (Fermi 2).

The RIII staff analysis is based on a safety system design and performance capability biennial baseline inspection at Fermi 2. In December 2005, the inspectors identified an issue related to the adequacy of the design of the second level of undervoltage, known as "degraded" voltage, protection. The inspectors determined that the time delay settings of the degraded voltage relays for both divisions I and II of the Class 1E electrical distribution system were inadequate. The time delays could impact the emergency core cooling system (ECCS) injection timing requirements of the licensee's Title 10 of the *Code of Federal Regulations* Part 50.46 loss-of-coolant accident analysis during a degraded voltage condition. This could result in the voltage being too low to adequately power the ECCS equipment but high enough to prevent the emergency diesel generators from connecting to the safety-related buses in a timely manner. The inspectors documented this issue in NRC Inspection Report (IR) 05000341/2005016 as Unresolved Item 06 (URI 06).

Based on a review of the issue, the NRR staff agrees with the RIII staff's determination that a safety issue exists; however, NRR staff concludes that the RIII staff's proposed resolution of URI 06 of NRC IR 05000341/2005016 (i.e., issuing a violation to the licensee) constitutes a change in the NRC staff's position previously approved in licensing actions. Therefore, the NRR staff does not concur with the RIII staff's conclusion that a violation be issued to the licensee. The NRR staff also recommends that a plant-specific compliance backfit evaluation be performed in accordance with Regional Procedure RP8.4, "Management of Facility-Specific Backfitting and Information Collection" (ADAMS Accession Number ML052340782). The NRR staff evaluation is enclosed and incorporates comments from the Region III staff to eliminate the word "immediately" in three sentences near the end of the draft evaluation dated January 11, 2008.

Docket No: 50-341

Enclosure: As stated

CONTACTS: Sean E. Peters, NRR/DPR
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STAFF EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ON INADEQUATE DEGRADED VOLTAGE TIME DELAYS

AT THE FERMI NUCLEAR POWER STATION UNIT 2

TASK INTERFACE AGREEMENT (TIA) 2007-003

1.0 INTRODUCTION

This staff evaluation (SE) by the U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Reactor Regulation (NRR) addresses TIA 2007-003. By memorandum dated August 28, 2007 (Agencywide Documents Access Management System (ADAMS) Accession Number ML072410317), NRC Region III (RIII), Division of Reactor Safety, requested NRR concurrence on the RIII staff's analysis of the time delay settings for the second level of undervoltage relay protection at the Fermi Power Plant, Unit 2 (Fermi 2). A draft SE was sent to RIII for comments on January 11, 2008 (ML073510757).

The NRR staff reviewed the RIII assessment and concluded that RIII staff's resolution constitutes a change in the NRC staff's position. Therefore, NRR did not grant the requested concurrence.

2.0 BACKGROUND

On December 2, 2005, RIII staff completed a safety system design and performance capability biennial baseline inspection at Fermi 2. During the inspection, the RIII inspectors identified an issue related to the adequacy of the design of the second level of undervoltage (commonly known as "degraded" voltage) protection. The RIII inspectors determined that the time delay settings of the degraded voltage relays for both divisions I and II of the Class 1E electrical distribution system were inadequate. The time delays could impact the emergency core cooling system (ECCS) injection timing requirements of the licensee's Title 10 of the *Code of Federal Regulations* (10 CFR) 50.46 loss-of-coolant accident (LOCA) analysis during a degraded voltage condition. The licensee's degraded voltage protection scheme could result in the voltage being too low to adequately power the ECCS equipment but high enough to prevent the emergency diesel generators (EDGs) from connecting to the safety-related buses in a timely manner. On January 13, 2006, NRC issued Inspection Report (IR) 05000341/2005016 (ADAMS Accession Number ML060200574), documenting this issue as Unresolved Item (URI) 06.

By memorandum dated August 28, 2007 (ADAMS Accession Number ML072410317), RIII requested concurrence from NRR on their staff's analysis of the time delay settings for the second level of undervoltage relay protection at Fermi 2. To resolve URI 06 of IR 05000341/2005016, the RIII staff's analysis concluded that the NRC staff should issue Fermi 2 a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," because the

ENCLOSURE

licensee is not meeting the design bases of the plant. The NRR staff assessed the RIII staff's analysis and the evaluation and conclusions are documented in the following sections.

3.0 EVALUATION

The NRR staff agrees with the RIII staff's determination that the licensee's degraded voltage protection scheme is inadequate and constitutes a safety issue, as discussed in Section 2.0 of this SE. In order to determine if the RIII staff's conclusion to issue a violation to the licensee would constitute a change in a previously applicable staff position, the NRR staff researched the history of the licensing actions for Fermi 2 and the available docketed correspondence between Fermi 2 and the NRC regarding the subject of undervoltage protection. The NRR staff constructed a timeline of licensing actions and correspondence based on this research and held discussions with the NRC Office of the General Counsel to determine the following: (1) the established NRC staff position regarding the licensee's degraded voltage protection scheme, (2) the adequacy of this established position, (3) the necessity of a backfit to correct this position, and (4) the applicability of invoking the compliance exception of the backfit rule.

Revision 2 of the Standard Review Plan (SRP), NUREG-0800, dated July 1981, Branch Technical Positions (BTPs) of Appendix 8-A (PSB), contained BTPs which represented guidelines intended to supplement the acceptance criteria established in Commission regulations. BTPs were primarily instructions to NRC staff reviewers outlining acceptable approaches to a particular issue and to ensure a uniform treatment of the issue by NRC staff reviewers. The approaches taken in the BTPs were not mandatory but did provide defined acceptable and immediate solutions to some of the technical problems and questions of interpretation arising in the review process. BTP PSB-1, "Adequacy of Station Electric Distribution System Voltages," of Appendix 8-A of the SRP presented guidance for an acceptable approach to design for degraded voltage conditions.

Prior to the formal issuance of BTP PSB-1, the NRC staff communicated its expectations to Fermi 2 which were incorporated into Amendment 22 of Fermi 2's Final Safety Analysis Report (FSAR) as NRC Question and Answer (Q&A) in April 1979. In Amendment 22, the NRC staff stated that Fermi 2's current design was unacceptable because Fermi 2 was relying solely on operator actions to correct a degraded voltage condition with no automatic protection. The NRC staff's position in the Amendment was that the time delay shall be based on the following conditions: the allowable time delay, including margin, shall not exceed the maximum time delay associated with the availability of power that is assumed in the accident analysis; the allowable time duration of a degraded voltage condition at all distribution system voltage levels shall not result in failure of safety systems or components; and the set points for this scheme shall be design dependent but should approximate the following envelope: a time delay setting of between 6 and 10 seconds.

On May 20, 1981, the NRC staff sent to the licensee the draft BTP PSB-1, which provided clarification and update on the NRC staff's position related to the degraded voltage protection. The NRC staff requested the licensee to provide additional information necessary to demonstrate compliance with BTP PSB-1 because the licensee's previous response to the NRC staff's questions did not properly address the questions. Position B.1.b of BTP PSB-1 described a method acceptable to the NRC staff for how the licensee's design should respond to a LOCA that occurs during a degraded voltage condition. Section B.1 of the draft BTP PSB-1 sent to the licensee stated, in part:

> The first time delay should be of a duration that established the existence of a sustained degraded voltage condition (i.e., something longer than a motor starting transient). Following this delay, an alarm in the control room should alert the operator to the degraded condition. *The subsequent occurrence of a safety injection actuation signal (SIAS) should immediately separate the Class 1E distribution system from the offsite power system* [emphasis added]. The second time delay should be of a limited duration such that the permanently connected class 1E loads will not be damaged. Following this delay, if the operator has failed to restore adequate voltages, the Class 1E distribution system should be automatically separated from the offsite power system. Bases and justification must be provided in support of the actual delay chosen.

On June 11, 1981, the licensee sent the NRC staff a letter stating the licensee's position regarding BTP PSB-1. In this letter, the licensee did not address the subsequent SIAS clause of BTP PSB-1 Section B.1.b. From June 23 to 26, 1981, the NRC staff performed an audit at Fermi 2 to review the licensee's calculations regarding degraded voltage protection. In response to the audit, on June 26, 1981, the Fermi 2 staff provided an amended response to BTP PSB-1 which contained voltage and time delay values. The degraded voltage relay time delay for Division 1 was initially 17 seconds ± 3 percent tolerance and 18.5 seconds ± 3 percent tolerance for Division 2. In June 1981, Amendment 36 to Fermi 2's FSAR was issued. The FSAR stated that Fermi 2 had committed to install a second level of undervoltage relaying that addressed the NRC staff's concerns as stated in Amendment 22. The licensee also stated that the time delay setting was chosen to avoid the operation of the relay for motor-starting conditions, and the time delay for the actuation of the degraded grid undervoltage relay was selected to be as short as possible without encountering spurious trips from motor starting.

In July 1981, the NRC staff issued its final safety evaluation report (SER) for Fermi 2 (NUREG-0798) which summarized Fermi 2's degraded voltage protection scheme. The letters dated June 11 and June 26, 1981, which discussed the degraded voltage protection scheme, were also referenced in the SER. The SER stated that the licensee's protection scheme met BTP PSB-1 position 1 requirements and that the NRC staff found it acceptable. The licensee was also issued Technical Specifications (TS) in March 1985 (NUREG-1089). Table 3.3.3-2 on page 3/4 3-28 of the TS listed the degraded voltage relay time delay for Division 1 as 19.7 ± 1.0 seconds and 21.4 ± 1.07 seconds for Division 2. The NRR staff believes that the July 1981 SER and the 1985 TS constitute an agency position that accepted the licensee's degraded voltage protection scheme.

The NRR staff could not determine if in 1981 the NRC staff assumed that either Fermi 2's design met the subsequent SIAS clause of BTP PSB-1, Position B.1.b.1 when approving the time delays or that the time delays did not impact the accident analysis (i.e., the ECCS injection timing requirements would still have been met even if EDGs powered the buses after the relays timed out) when approving the time delays. However, subsequent NRC staff reviews determined that Fermi 2's design does impact the accident analysis. Because the safety buses do not disconnect from offsite power following a SIAS, the time delays for both divisions would impact the plant's ECCS injection during a LOCA that occurs during a degraded voltage condition. Therefore, the NRR staff concludes that Fermi 2's degraded voltage protection scheme does not meet NRC regulations, specifically, 10 CFR Part 50, Appendix A, General Design Criterion (GDC)-17, "Electric power systems." In addition, Fermi 2's current design fails to meet the timing requirements in its accident analysis. Therefore, the NRR staff concluded

that the established agency position regarding the licensee's degraded voltage protection scheme is inadequate.

Considering that the NRC staff approved Fermi 2's degraded voltage protection design in 1981, the proposed design violation to Fermi 2 would constitute a change in the NRC staff's position. 10 CFR 50.109, "Backfitting," defines backfitting as, in part, the modification of or addition to systems, structures, components, or design of a facility; or the design approval for a facility which may result from a new or amended provision in the Commission rules or the imposition of a regulatory staff position interpreting the commission rules that is either new or different from a previously applicable staff position. Since modifications are necessary to bring Fermi 2 into compliance with its license and the rules of the Commission and into conformance with written commitments by the licensee as a result of a change in the NRC staff's position, the NRR staff concludes that resolution of the URI requires a backfit.

The regulation at 10 CFR 50.109 (a)(4)(i) states, in part, that a backfit analysis is not required and the standards in paragraph (a)(3) of this section do not apply where the Commission or staff, as appropriate, finds and declares, with appropriate documented evaluation for its finding that a modification is necessary to bring a facility into compliance with a license or the rules or orders of the Commission, or into conformance with written commitments by the licensee. In Amendment 36 to the Fermi FSAR, the licensee committed to address the NRC staff concerns stated in Amendment 22 to the Fermi FSAR. The NRC staff subsequently submitted a clarification and an update of these concerns in the May 20, 1981 letter, which contained a copy of BTP PSB-1. The licensee's degraded voltage protection design was evaluated in accordance with BTP PSB-1, which provided guidance for complying with 10 CFR Part 50, Appendix A, GDC-17. BTP PSB-1 was superseded by BTP 8-6 of the SRP in 2007; however, the interpretation of BTP PSB-1 remains unchanged from the time that the Fermi 2 license was originally approved. GDC-17 states, in part:

> An onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of *anticipated operational occurrences* [emphasis added] and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of *postulated accidents* [emphasis added].

The relay time delays for both divisions of degraded voltage protection could impact ECCS injection during a LOCA that occurs during a degraded voltage condition if the safety buses do not disconnect from offsite power after an SIAS. Fermi 2's degraded voltage protection scheme does not meet GDC-17, nor does it meet the ECCS injection timing requirements in Fermi 2's accident analysis. Therefore, the NRR staff concludes that it is reasonable to invoke the compliance exception of 10 CFR 50.109 (a)(4)(i) to bring the licensee into compliance with its license and the rules of the Commission and into conformance with the licensee's written commitments.

CONCLUSION

The NRR staff concludes that the RIII staff's proposed resolution of URI 06 of IR 05000341/2005016 constitutes a change in NRC staff position. The issue was identified by RIII inspectors. It is related to the adequacy of the design of the second level of undervoltage (commonly known as "degraded" voltage) protection at Fermi 2. It is the position of the NRR staff that in 1981 the NRC staff assumed that either Fermi 2's design met the subsequent SIAS clause of BTP PSB-1, Position B.1.b.1 when approving the time delays or that the time delays did not impact the accident analysis (i.e., the ECCS injection timing requirements would still have been met even if EDGs powered the buses after the relays timed out). However, subsequent NRC staff reviews determined that Fermi 2's design does impact the accident analysis. Because the safety buses do not disconnect from offsite power following a SIAS, the time delays for both divisions would impact the plant's ECCS injection during a LOCA that occurs during a degraded voltage condition. Therefore, the NRR staff concludes that Fermi 2's degraded voltage protection scheme does not meet NRC regulations, specifically, 10 CFR Part 50, Appendix A, General Design Criterion (GDC)-17, "Electric power systems." In addition, Fermi 2's current design fails to meet the timing requirements in its accident analysis. Considering that the NRC staff approved Fermi 2's degraded voltage protection design in 1981, the proposed design violation to Fermi 2 would constitute a change in the NRC staff's position. Therefore, the NRR staff does not concur on the RIII staff's conclusion to issue a violation to the licensee. The NRR staff does conclude that modifications are necessary to bring Fermi 2 into compliance with its license and the rules of the Commission and into conformance with the written commitments by the licensee. The NRR staff recommends performing a plant-specific compliance backfit evaluation in accordance with Regional Procedure RP8.4, "Management of Facility-Specific Backfitting and Information Collection" (ADAMS Accession Number ML052340782) to resolve the URI.

Principal Contributor: Audrey Klett

Date: February 25, 2008