Fermi 2
6400 North Dixie Hwy., Newport, MI 48166

**Detroit Edison**

10CFR50.92

May 8, 2000
NRC-00-0054

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington D C 20555-0001

Reference: Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

Subject: Proposed Emergency Technical Specification Change (License Amendment)
- Emergency Diesel Generator (EDG) Overvoltage Limit

Pursuant to 10CFR50.90, Detroit Edison hereby proposes to amend the Fermi 2 Plant Operating License NPF-43, Appendix A, Technical Specifications (TS), by modifying Technical Specification Surveillance Requirement (SR) 3.8.1.9. This application proposes to change the maximum voltage following a full load rejection specified in SR 3.8.1.9 from the current value of 4784 volts (V) to 5267 V. This change is required to address an unanticipated short duration overshoot of the current limit encountered during testing conducted on May 5, 2000, following the installation of a new design voltage regulator on Emergency Diesel Generator 13 (EDG 13) during the current refueling outage. The maximum voltage observed during this test was 4830 V, which slightly exceeded the current TS limit of 4784 V. During the test, the voltage exceeded the current TS limit for approximately 6 cycles (0.1 seconds). The higher voltages observed during the load rejection test with the new exciter-voltage regulator were determined to result from inherent design characteristics of the new exciter-regulator and are not the result of any equipment deficiency.

The failure to satisfy the current SR 3.8.1.9 prevents EDG 13 from being declared operable. EDG 13 is one of two Division 2 EDGs. In Modes 4 and 5, TS 3.8.2, AC Sources – Shutdown, requires both EDGs in one Division to be operable. Thus,

Division 2 cannot currently be restored to operable status. Surveillance requirements associated with the Division 1 EDGs will begin to expire (surveillance interval plus 25%) at 0500 hours on May 9, 2000. The first of these are the Loss of Power (LOP) Instrumentation required by TS 3.3.8.1. The TS 3.3.8.1 actions require that the LOP instrumentation be restored to operable status within 72 hours otherwise the associated Division 1 EDGs are to be declared inoperable. Additionally, performance of the LOP surveillance requirements renders the associated EDGs inoperable. Thus, to satisfy the requirement of TS 3.8.2 to maintain both EDGs in one Division operable, the LOP instrumentation surveillance tests cannot be accomplished before EDG 13 is restored to operable status.

Although, it appears that there would be no impact of this situation from a compliance standpoint until 0500 hours on May 12, 2000, there are critical path outage activities that cannot be started until both Division 2 EDGs can be declared operable allowing Division 1 components to be removed from service. The limiting activity is the commencement of Division 1 Emergency Equipment Cooling Water (EECW) System temperature control valve modification which must begin no later than 1600 hours on May 9, 2000. After that point there will be an hour for hour delay in critical path outage activities until the Division 2 EDGs can be declared operable.

Enclosure 1 provides a description and evaluation of the proposed TS change. Enclosure 2 provides an analysis of the issue of significant hazards consideration using the standards of 10CFR50.92. Enclosure 3 provides the marked up pages of the existing TS to show the proposed change and a typed version of the affected TS pages with the proposed changes incorporated.

Detroit Edison is requesting that this license amendment request be processed as an emergency Technical Specification change in accordance with 10CFR50.91(a)(5) to permit continued progression of refueling outage activities toward resumption of operation. As discussed above, the critical path outage schedule will be impacted if EDG 13 cannot be restored to operable status during the day shift on May 9, 2000.

Higher than expected voltages observed during SR 3.8.1.9 EDG 13 full load rejection tests were not expected prior to conducting the test. During the design of the modification to install the new regulator, computer simulations were performed to assess performance of the exciter regulator under conditions where problems might have been encountered, such as during the EDG loading sequence. Based on past performance with this type of exciter regulator at other plants, problems were not anticipated during full load rejection. In addition, the test is conducted at the plant using the grid as a load. Consequently, the starting voltage for the full load rejection was approximately 4265 V rather than the 4160 V nominal value which is assumed in the bases for the current SR 3.8.1.9 limit.

Detroit Edison has reviewed the proposed TS changes against the criteria of 10CFR51.22 for environmental considerations. The proposed changes do not involve a significant hazards consideration, nor significantly change the types or significantly increase the amounts of effluents that may be released offsite, nor significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, Detroit Edison concludes that the proposed TS change meets the criteria provided in 10CFR51.22(c)(9) for a categorical exclusion from the requirements for an Environmental Impact Statement or an Environmental Assessment.

The Fermi 2 Onsite Review Organization and Nuclear Safety Review Group have reviewed and concurred with the proposed change. In accordance with 10CFR50.91, Detroit Edison is providing a copy of the letter to the State of Michigan. Should you have any questions or require additional information, please contact Mr. Norman K. Peterson of my staff at (734) 586-4258.

Sincerely,

W. T. O'Connor
Assistant Vice President,
Nuclear Assessment

Enclosures

cc: A. J. Kugler
M. A. Ring
NRC Resident Office
Regional Administrator, Region III
Supervisor, Electric Operators,
Michigan Public Service Commission

I, WILLIAM T. O'CONNOR, do hereby affirm that the foregoing statements are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

WILLIAM T. O'CONNOR
Assistant Vice President, Nuclear Assessment

On this Eighth day of May, 2000 before me personally appeared William T. O'Connor, being first duly sworn and says that he executed the foregoing as his free act and deed.

Notary Public

NORMAN K. PETERSON
Notary Public, Monroe County, MI
My Commission Expires July 24, 2002

**ENCLOSURE 1 TO**
**NRC-00-0054**

**FERMI 2 NRC DOCKET NO. 50-341**
**OPERATING LICENSE NO. NPF-43**

**REQUEST TO REVISE TECHNICAL SPECIFICATIONS:**

**EMERGENCY DIESEL GENERATOR (EDG) OVERVOLTAGE LIMIT**

**DESCRIPTION AND EVALUATION OF THE PROPOSED CHANGE**

## DESCRIPTION AND EVALUATION OF THE PROPOSED CHANGE

### DESCRIPTION:

The proposed change involves revising the maximum full load rejection voltage specified in Technical Specification (TS) Surveillance Requirement (SR) 3.8.1.9. SR 3.8.1.9 requires the following:

> " Verify each EDG does not trip and voltage is maintained ≤ 4784 V during and following a load rejection of ≥ 2850 kW."

The bases for SR 3.8.1.9 states the following:

> "This Surveillance demonstrates the EDG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The EDG full load rejection may occur because of a system fault or inadvertent breaker tripping. This Surveillance ensures proper engine generator load response under the simulated test conditions. This test simulates the loss of the total connected load that the EDG experiences following a full load rejection and verifies that the EDG does not trip upon loss of the load. These acceptance criteria provide EDG damage protection. While the EDG is not expected to experience this transient during an event, and continues to be available, this response ensures that the EDG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated."

It is proposed to increase the maximum full load rejection limit specified in SR 3.8.1.9 from its current value of 4784V to 5267V. This change is required to resolve an unanticipated test result observed during post modification testing for the replacement exciter-voltage regulator installed on Emergency Diesel Generator (EDG) 13 at Fermi 2 during the current refueling outage. The maximum voltage observed during this test was 4830V, which slightly exceeded the current TS limit of 4784V. During the test, the voltage exceeded the current TS limit for approximately 6 cycles (0.1 seconds). The higher voltages observed during the load rejection test with the new exciter-voltage regulator were determined to result from inherent design characteristics of the new exciter-regulator and are not the result of any equipment deficiency.

The standby ac power system for Fermi 2 consists of four diesel-generator units. These units are Colt Industries, Fairbanks- Morse, 38TD8-1/8, 12-cylinder, opposed piston, 3967 hp, 900 revolution per minute (rpm) diesels, each driving a 4160-Volt (V) AC, 3250-kilowatt (kW) salient pole permanent magnet generator, using a solid-state excitation system. The total unit is rated at 2850 kW continuous. Each generator is designed to operate as an isolated source or, for testing purposes, in parallel with a 4160-V, three-phase, 60-Hz, electrical system. The generators and excitation systems are designed so that, for the sequential starting of the loads, bus voltage shall not dip below an acceptable limit determined by test or systems analysis. The existing exciter-voltage regulator in use at Fermi 2 is the Portec System static exciter-voltage regulator.

Replacement parts are no longer readily available for the Portec exciter-voltage regulation system. Non-availability of parts and obsolescence has resulted in increased maintenance activities and system outages. One exciter-voltage regulator was replaced with a new model during refueling outage 7 (RF07) and the remaining three EDGs will have their exciter-voltage regulator replaced during subsequent maintenance or refueling outages. The replacement is a Basler SB Series exciter-voltage regulator.

The functional operation of the existing Portec exciter-voltage regulator and the replacement Basler exciter-voltage regulator are essentially the same. Both systems develop no-load excitation current based on transformer action and provide for variations to the excitation current based on the generator output run through current transformers. Control devices, actions, and results are the same for both systems. The existing control room and local controls and indications are being utilized for the replacement Basler exciter-voltage regulator. Exciter shutdown, reset, bypass, and field flash logic is similar to the existing exciter-voltage regulator.

During testing it was noted that the full load reject voltage value was higher than with the existing Portec exciter-voltage regulator. This was due to differences in the way the exciter-voltage regulators responded to a load reject. The existing Portec system provides voltage regulation via operation of Silicon Controlled Rectifiers (SCR) which effectively short the output of the transformer section during a part of their operating cycle. During the full load reject transient this SCR "shorting" action collapses the field, removing energy for any excitation. The new Basler system reacts to the load reject transient by injecting control current into saturable reactors which decreases or removes input to the rectifier and field, but does not collapse the field to remove stored energy. This difference in operation results in a higher full load reject voltage for the Basler exciter-voltage regulator. The observed full load reject voltage was approximately 46 V above the TS SR 3.8.1.9 limit and lasted for approximately six cycles (0.1 seconds).

It should also be noted that during surveillance testing the EDG is synchronized with the Detroit Edison grid with higher generator terminal voltages, generally exceeding 4200 V, whereas under the accident conditions, that the full load rejection test is simulating, the EDG would be operating on the bus by itself, maintaining approximately 4160 V.

This Surveillance demonstrates the EDG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. This test simulates the loss of the total connected load that the EDG experiences following a full load rejection and verifies that the EDG does not trip upon loss of the load. The acceptance criteria provides EDG damage protection. While the EDG is not expected to experience this transient during an event, and continues to be available, this response ensures that the EDG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

**EVALUATION OF THE PROPOSED CHANGE:**

During full load rejection testing on Emergency Diesel Generator (EDG) 13, following the installation of a new design voltage regulator, observed generator terminal voltages were observed to briefly exceed the maximum Technical Specification (TS) Surveillance Requirement (SR) voltage of 4784 V by approximately 46 V. TS SR 3.8.1.9, requires verification that each EDG does not trip and voltage is maintained $\leq$ 4784 V during and following a load rejection of $\geq$ 2850 kW.

Detroit Edison proposes to increase the maximum voltage following a full load rejection specified in SR 3.8.1.9 from the current value of 4784 V to 5267 V. This SR will be changed to state, "Verify each EDG does not trip and voltage is maintained $\leq$ 5267 V during and following a load rejection of $\geq$ 2850 kW."

SR 3.8.1.9 demonstrates the EDG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The EDG full load rejection may occur because of a system fault or inadvertent breaker tripping. The SR ensures proper engine generator load response under the simulated test conditions. This test simulates the loss of the total connected load that the EDG experiences following a full load rejection and verifies that the EDG does not trip upon loss of the load. The acceptance criteria provides EDG damage protection. While the EDG is not expected to experience this transient during an event, and continues to be available, this response ensures that the EDG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

Detroit Edison reviewed pertinent regulatory guidance and industry standards to determine the basis for the EDG overvoltage limits during a full load rejection condition. The following guidance documents were reviewed: Regulatory Guidance 1.108, Revision 1, dated August 1977, "Periodic Testing of Diesel Generator Units Used As Onsite Electric Power Systems at Nuclear Power Plants," Regulatory Guidance 1.9, Revision 2, dated December 1979, "Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants," and the Institute of Electrical and Electronics Engineers (IEEE) Standard 387-1977, "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations." The IEEE standard established qualitative criteria for load rejection tests in Section 6.4.5 which states, "Load rejection tests shall demonstrate the capability of rejecting the maximum rated load without exceeding speeds or voltages which will cause tripping, mechanical damage, or harmful overstresses." With no numerical overvoltage criteria established in the guidance documents, the overvoltage limit was assigned based on overvolatage limits provided in the Standard Technical Specifications (STS) which were in effect during initial licensing of the Fermi 2 plant. The STS specified typical values which were 115% of the nominal bus voltage, i.e. 4784 V. This value was adopted for Fermi 2 without modification and presented no problem in being satisfied until the installation of the new exciter-voltage regulator. However, based on review of the regulatory guidance and industry standards, the effective acceptance criteria for this value appears to be that the

overvoltage resulting from full load rejection would not result in equipment damage preventing subsequent use of the affected diesel generator.

Detroit Edison is proposing a new limit of 5267 V. This voltage represents 115% of 4580 V. 4580 V was selected based on the upper steady state voltage permitted in SRs 3.8.1.7, 3.8.1.10, 3.8.1.11, 3.8.1.14, and 3.8.1.17, following starting and/or loading of an EDG. This approach is consistent with that used in previous STS.

Detroit Edison evaluated the components potentially impacted by the overvoltage condition on a full load rejection test and determined that the potential overvoltage would not cause damage to the associated equipment. The part of the voltage transient where the observed voltage exceeded 4784V was short in duration (approximately 6 cycles, or 0.1 seconds) and the maximum observed value of 4830V is within equipment capabilities. The EDG vendor has provided documentation stating that the generator was tested at 9,320 V and is capable of withstanding at least 6000 V (65% of the originally tested value) during field operation. The vendor documents dielectric testing for the exciter transformer section at 12 kV. Cables are rated for continuous operation at 5kV and are submitted to overvoltage testing at 6kV for one minute. In addition, the overvoltage protection for the system, which is not bypassed during the load rejection test, did not actuate during the test. The setpoint for the overvoltage protection relay is set at 154 V at 150 cycles at the potential transformer which equates to 5334 V for the 150 cycle duration. As such, the maximum voltage permitted by the proposed change is bounded by the respective equipment capabilities.

The proposed change was reviewed for potential impacts on core damage frequency (CDF) in the Fermi 2 Probabalistic Safety Assessment (PSA). Because the proposed change would result in no equipment specified operating limits being exceeded, there would be no impact on the reliability or functionality of equipment assumed to operate in the PSA model. Therefore, the proposed change will have no impact on CDF or on overall plant risk.

## ENVIRONMENTAL IMPACT:

Detroit Edison has reviewed the proposed Technical Specification change against the criteria of 10CFR51.22 for environmental considerations. The proposed changes do not involve a significant hazards consideration, nor significantly change the types or significantly increase the amounts of effluents that may be released offsite, nor significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, Detroit Edison concludes the proposed TS do meet the criteria given in 10CFR51.22(c)(9) for a categorical exclusion from an environmental review.

**ENCLOSURE 2 TO**
**NRC-00-0054**

**FERMI 2 NRC DOCKET NO. 50-341**
**OPERATING LICENSE NO. NPF-43**

**REQUEST TO REVISE TECHNICAL SPECIFICATIONS:**

**EMERGENCY DIESEL GENERATOR (EDG) OVERVOLTAGE LIMIT**

**10CFR50.92 SIGNIFICANT HAZARDS CONSIDERATION**

## 10CFR50.92 SIGNIFICANT HAZARDS CONSIDERATION

## BASIS FOR SIGNIFICANT HAZARDS DETERMINATION

In accordance with 10CFR50.92, Detroit Edison has made a determination that the proposed amendment involves no significant hazards consideration. The proposed Technical Specification changes described above do not involve a significant hazards consideration for the following reasons:

1. The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

   The proposed change revises Technical Specification (TS) Surveillance Requirement 3.8.1.9 to provide a new voltage limit of 5267 V for a full load rejection test of the Emergency Diesel Generators (EDGs). This increase in the voltage requirement has been verified not to result in component damage. Safety-related functions will not be affected by this change, and EDG operability and availability for accident mitigation will remain unchanged. Therefore, the EDGs will still be capable of performing required safety functions, and there will be no increase in the consequences of an accident.

   The EDGs provide a safety-related source of alternating current power to Engineered Safety Features (ESF) and safe shutdown systems for reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA), coincident with a loss of offsite power. The initial conditions of a DBA and transient analysis in the UFSAR, Chapter 6 (ESF) and Chapter 15 (Accident Analysis), assume ESF systems are available. None of the accidents evaluated in the accident analyses are initiated by the EDG System or associated subsystems. The credible failure of the EDG(s) is bounded by the evaluated accidents in the UFSAR Section 15.2.6 (Loss of AC Power), Section 15.6.5 (Loss of Coolant Accident Inside Containment), and Section 15.15 (Loss of One (Redundant) Direct Current System).

   Since the EDGs are not postulated to be the source of any DBA, based on only providing accident mitigation functions, the proposed Technical Specification change does not involve an increase in the probability or consequences of an accident previously evaluated.

2. The proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

   As discussed above, the EDGs only provide accident mitigation functions and are not postulated to create an accident. Allowing test voltages of 5267 V during a full-load rejection test has been verified not to damage connected EDG generating, control, and distribution components. Other components that are connected to the EDG before the surveillance testing or accident conditions are not affected because their disconnection creates the full load rejection before the voltage overshoot occurs. Therefore, the proposed

change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. The change does not involve a significant reduction in the margin of safety.

Increasing the EDG maximum voltage limit for surveillance testing does not involve a significant reduction in the margin of safety. The proposed change does not impact the ability of the EDGs to auto-start and reach the rated voltage and frequency within 10 seconds, and sequentially load to mitigate the consequences of postulated accidents. The time for the EDGs to reach steady state operation is periodically monitored and the trend evaluated to identify degradation of voltage regulator performance. Successful completion of post modification tests, consistent with the surveillance requirements of TS, will verify the TS operability requirements, and demonstrate that no safety function or design feature of operation of an EDG is altered. The proposed TS change does not adversely affect the TS measures established to maintain reliability, availability, and performance of the EDGs. Thus, it is assured that the EDG System will continue to remain as a reliable standby ac power source to ESF systems to effect a safe shutdown should normal offsite power not be available. Therefore, the proposed TS change does not involve a significant reduction in the margin of safety.

**ENCLOSURE 3 TO**
**NRC-00-0054**

**FERMI 2 NRC DOCKET NO. 50-341**
**OPERATING LICENSE NO. NPF-43**

**REQUEST TO REVISE TECHNICAL SPECIFICATIONS:**

**EMERGENCY DIESEL GENERATOR (EDG) OVERVOLTAGE LIMIT**

Attached is a mark-up of the existing Technical Specifications (TSs), indicating the proposed changes (Part 1) and a typed version of the TSs incorporating the proposed changes with a list of included pages (part 2).

**ENCLOSURE 3 - PART 1 TO**
**NRC-00-0054**

**PROPOSED TECHNICAL SPECIFICATION MARKED UP PAGES**

**INCLUDED PAGE:**

**3.8-5**

SURVEILLANCE REQUIREMENTS (continued)

| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.8.1.9 | Verify each EDG does not trip and voltage is maintained ≤ ~~4784~~ 5267 V during and following a load rejection of ≥ 2850 kW. | 18 months |
| SR 3.8.1.10 | ----------NOTE----------<br>All EDG starts may be preceded by an engine prelube period.<br>----------<br>Verify on simulated loss of offsite power signal:<br>a. De-energization of emergency buses;<br>b. Load shedding from emergency buses; and<br>c. EDG auto-starts and:<br>1. energizes permanently connected loads in ≤ 10 seconds,<br>2. energizes auto-connected shutdown loads through load sequencer,<br>3. maintains steady state voltage ≥ 3740 V and ≤ 4580 V,<br>4. maintains steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and<br>5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes. | 18 months |

(continued)

**ENCLOSURE 3 - PART 2 TO**
**NRC-00-0054**

**PROPOSED TECHNICAL SPECIFICATION REVISED PAGES**

**INCLUDED PAGE:**

**3.8-5**

SURVEILLANCE REQUIREMENTS (continued)

| | SURVEILLANCE | FREQUENCY |
|---|---|---|
| SR 3.8.1.9 | Verify each EDG does not trip and voltage is maintained ≤ 5267 V during and following a load rejection of ≥ 2850 kW. | 18 months |
| SR 3.8.1.10 | ----------NOTE----------<br>All EDG starts may be preceded by an engine prelube period.<br>----------<br><br>Verify on simulated loss of offsite power signal:<br><br>a. De-energization of emergency buses;<br><br>b. Load shedding from emergency buses; and<br><br>c. EDG auto-starts and:<br><br>1. energizes permanently connected loads in ≤ 10 seconds,<br><br>2. energizes auto-connected shutdown loads through load sequencer,<br><br>3. maintains steady state voltage ≥ 3740 V and ≤ 4580 V,<br><br>4. maintains steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and<br><br>5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes. | 18 months |

(continued)