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DTE

December 16, 2022
NRC-22-0026

10 CFR 50.90

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Fermi 2 Power Plant
NRC Docket No. 50-341
NRC License No. NPF-43

Subject: License Amendment Request to Revise Technical Specification 3.8.1, "AC Sources – Operating," Emergency Diesel Generator Voltage and Frequency Surveillance Requirements

In accordance with the provisions of 10 CFR 50.90, DTE Electric Company (DTE) is submitting a request for an amendment to the Technical Specifications (TS) for Fermi 2. The proposed amendment would modify the Fermi 2 TS to revise the Emergency Diesel Generator (EDG) steady state frequency and voltage values in the Surveillance Requirements (SRs) for TS 3.8.1, "AC Sources – Operating." Specifically, the proposed TS changes would lower the upper bound of the SR steady state voltage, lower the upper bound of the SR steady state frequency, and raise the lower bound of the SR steady state frequency. The associated TS 3.8.1 Bases would also be revised to reflect the changes to the SRs.

The proposed amendment is being submitted per the guidance in NRC Administrative Letter 98-10 as a correction to a TS that was found to be non-conservative. The justification for the TS change is that the proposed frequency and voltage values result in a narrower range of acceptable values that is more conservative based on plant-specific analyses.

Enclosure 1 provides a description and assessment of the proposed change. Enclosure 2 provides the existing TS pages marked-up to show the proposed change. Enclosure 3 provides revised (clean) TS pages. Enclosure 4 provides existing TS Bases pages marked-up to show the proposed change. Changes to the existing TS Bases, consistent with the technical and regulatory analyses, will be implemented under the Technical Specification Bases Control Program. Enclosure 4 is provided for information only.

DTE requests approval of the proposed license amendment by December 16, 2023, with the amendment being implemented within 90 days after approval.

No new commitments are being made in this submittal.

In accordance with 10 CFR 50.91, a copy of this application, with enclosures, is being provided to the designated Michigan State Official.

Should you have any questions or require additional information, please contact Mr. Eric Frank, Manager – Nuclear Licensing, at (734) 586-4772.

I declare under penalty of perjury that the foregoing is true and correct.

Sincerely,

Peter Dietrich
Senior Vice President and Chief Nuclear Officer

Enclosures:

1. Evaluation of the Proposed License Amendment
2. Marked-up Pages of Existing Fermi 2 TS
3. Clean Pages of Fermi 2 TS with Changes Incorporated
4. Marked-up Pages of Existing Fermi 2 TS Bases (For Information Only)

cc: NRC Project Manager
NRC Resident Office
NRC Regional Administrator, Region III
Michigan Department of Environment, Great Lakes, and Energy

Enclosure 1 to
NRC-22-0026

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

License Amendment Request to Revise Technical Specification 3.8.1 Emergency Diesel Generator Voltage and Frequency Surveillance Requirements

Evaluation of the Proposed License Amendment

Evaluation of the Proposed License Amendment

Contents

Acronym List

AC	Alternating Current
AOO	Abnormal Operational Occurrence
CCHVAC	Control Center HVAC
CFR	Code of Federal Regulations
CSS	Core Spray System
DBA	Design Basis Accident
DTE	DTE Electric Company
DVAL	Degraded Voltage Analytical Limit
EDG	Emergency Diesel Generator
EECW	Emergency Equipment Cooling Water
ESF	Engineered Safety Feature
ETAP	Electrical Transient and Analysis Program
GDC	General Design Criterion
GL	Generic Letter
Hz	Hertz
kV	Kilovolt(s)
LCO	Limiting Condition for Operation
LOCA	Loss of Coolant Accident
LOP	Loss of Power
MOV	Motor Operated Valve
NEMA	National Electrical Manufacturers Association
NIAS	Non-Interruptible Air Supply
NRC	Nuclear Regulatory Commission
RG	Regulatory Guide
RHR	Residual Heat Removal
SGTS	Standby Gas Treatment System
SR	Surveillance Requirement
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
V	Volt(s)
VAR	Volt-Ampere Reactive

1.0 SUMMARY DESCRIPTION

In accordance with the provisions of 10 Code of Federal Regulation (CFR) 50.90, "Application for amendment of license, construction permit, or early site permit," DTE Electric Company (DTE) is submitting a request for an amendment to the Technical Specifications (TS) for Fermi 2 (Operating License NPF-43).

The proposed amendment would modify the Fermi 2 TS 3.8.1, "AC Sources – Operating," by decreasing the maximum steady state voltage and revising the steady state frequency range for emergency diesel generator (EDG) testing specified in Surveillance Requirements (SRs) 3.8.1.2, 3.8.1.7, 3.8.1.10, 3.8.1.11, 3.8.1.14, and 3.8.1.17.

The maximum steady state voltage criterion for EDG testing in SRs 3.8.1.2, 3.8.1.7.b, 3.8.1.10.c.3, 3.8.1.11.b, 3.8.1.14.b, and 3.8.1.17.c.3 would change from less than or equal to (≤) 4580 Volts (V) for all EDGs to ≤ 4314 V for Division I EDGs and ≤ 4400 V for Division II EDGs. The TS minimum steady state voltage of 3950 V is adequate and does not require modification.

The steady state frequency criterion for EDG testing in SRs 3.8.1.2, 3.8.1.7.b, 3.8.1.10.c.4, 3.8.1.11.b, 3.8.1.14.b, and 3.8.1.17.c.4 would change from a range of greater than or equal to (≥) 58.8 Hertz (Hz) and ≤ 61.2 Hz to a range of ≥ 59.5 Hz and ≤ 60.5 Hz. The associated TS Bases 3.8.1 would also be revised to reflect the voltage and frequency criteria.

A decreased maximum steady state voltage is needed in SRs to ensure terminal voltages remain within the maximum acceptable voltage for safety-related induction motors in accordance with the guidance in National Electrical Manufacturers Association (NEMA) standard MG-1 "Motors and Generators" (Reference 6.1). No changes are required to the steady state minimum voltage.

The reduced steady state frequency range proposed for SRs was chosen so that the maximum frequency value is consistent with the performance of the EDG speed control equipment and the plant-specific EDG loading analysis. Minimum frequency value is selected such that the motor speed of the ESF loads served by the EDGs would not decrease from current values based on the change thus minimizing the impact on ESF motor speeds and Design Functions of flow/pressure/MOV stroke time.

2.0 DETAILED DESCRIPTION

The onsite standby power source at Fermi 2 consists of four EDGs separated into two independent divisions; Division I includes EDG 11 and EDG 12, and Division II includes EDG 13 and EDG 14. The EDG units are designed to provide alternating current (AC) at 4160 V and 60 Hz. The EDGs are rated at 2850 kW continuous. The TS 3.8.1, "AC Sources – Operating," Limiting Condition for Operation (LCO) requires two EDGs per division to be operable. This LCO includes SRs to verify that EDG voltage and frequency are in a specified range of acceptable values under various test conditions. Original tolerances assigned in Standard Technical Specifications of +/- 10% voltage (4160 VAC nominal) and +/- 2% frequency (60 Hz nominal) did not adequately reflect plant specific Design Calculation values and as shown in Reference 6.12 and 6.13.

During DTE design basis electrical calculation revisions, TS 3.8.1 was identified as non-conservative. The calculations demonstrate that the steady state maximum voltage in the TS 3.8.1 SRs would result in terminal voltages above the industry standard maximum voltage of 110% rated voltage for 460 V and 4000V motors. Therefore, the maximum steady state voltage specified in the SRs should be reduced from its current value of 4580 V. It was also determined that the steady state frequency range for EDG operability in the SRs should be reduced based on the performance of the EDG speed control equipment and the frequency load factor in the EDG loading analysis. Therefore, the steady state frequency range should be revised. These findings are documented in the Fermi 2 Corrective Action Program.

Fermi 2 created a new Design Calculation DC-6538 VOL 1 DCD 1, "EDG VOLTAGE AND FREQUENCY TOLERANCES", to develop Technical Specification Allowable Values and procedural setting values for the safety-related Emergency Diesel Generator (EDG) voltage and frequency. This was done to support Reference 6.12 and 6.13 methods to correct the non-conservative steady state EDG voltage and frequency tolerances identified in LCO 2013-0293. Approach 1 of References 6.12 and 6.13 (correction of Technical Specification EDG voltage and frequency steady state tolerances) was the method chosen to correct this issue.

This DC-6538 VOL 1 DCD 1, "EDG VOLTAGE AND FREQUENCY TOLERANCES", shows that the TS minimum steady state voltage of 3950 V is adequate and does not require modification.

TS 3.8.1 contains SRs with minimum voltage and frequency values of 3950 V and 58.8 Hz for transient conditions (i.e., transient values to achieve during Load Sequencing). These transient values are adequate and are not revised in this amendment. References 6.12 and 6.13 clearly defined steady state operation of the EDGs as starting after the Load Sequence period where transient voltages and frequency have different allowable ranges as governed by Regulatory Guide 1.9. (Reference 6.2)

This DC-6538 VOL 1 DCD 1, "EDG VOLTAGE AND FREQUENCY TOLERANCES", applies to SRs 3.8.1.2, 3.8.1.7, 3.8.1.10, 3.8.1.11, 3.8.1.14, and 3.8.1.17. The maximum steady state voltage criterion for EDG testing in SRs 3.8.1.2, 3.8.1.7.b, 3.8.1.10.c.3, 3.8.1.11.b, 3.8.1.14.b, and 3.8.1.17.c.3 would change from ≤ 4580 V for all EDGs to ≤ 4314 V for Division I EDGs and ≤ 4400 V for Division II EDGs. The steady state frequency criterion for EDG testing in SRs 3.8.1.2, 3.8.1.7.b, 3.8.1.10.c.4, 3.8.1.11.b, 3.8.1.14.b, and 3.8.1.17.c.4 would change from a range of ≥ 58.8 Hz and ≤ 61.2 Hz to a range of ≥ 59.5 Hz and ≤ 60.5 Hz. The associated TS Bases 3.8.1 would also be revised to reflect the voltage and frequency criteria.

The proposed changes to the SRs are indicated below, with additions shown in underline and deletions shown in strike-through.

SR 3.8.1.2 Verify each EDG starts and achieves:
- a) steady state voltage ≥ 3950 V and ≤ ~~4580 V~~ 4314 V for Division I EDGs; and
- b) steady state voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
- c) steady state frequency ≥ 59.5 ~~58.8~~ Hz and ≤ 60.5 ~~61.2~~ Hz for both Division I and Division II EDGs.

SR 3.8.1.7 Verify each EDG starts from standby condition and achieves:
- a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and
- b. For steady state:
  i. voltage ≥ 3950 V and ≤ ~~4580 V~~ 4314 V for Division I EDGs; and
  ii. voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
  iii. frequency ≥ 59.5 ~~58.8~~ Hz and ≤ 60.5 ~~61.2~~ Hz for both Division I and Division II EDGs.

SR 3.8.1.10 Verify on simulated loss of offsite power signal:
- a. De-energization of emergency buses;
- b. Load shedding from emergency buses; and
- c. EDG auto-starts and:
  1. energizes permanently connected loads in ≤ 10 seconds,
  2. energizes auto-connected shutdown loads through load sequencer,
  3. maintains steady state voltage:
     ≥ 3950 V and ≤ ~~4580 V~~ 4314 V for Division I EDGs; and
     ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
  4. maintains steady state frequency ≥ 59.5 ~~58.8~~ Hz and ≤ 60.5 ~~61.2~~ Hz for both Division I and Division II EDGs; and
  5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.

SR 3.8.1.11 Verify on an actual or simulated Emergency Core Cooling System (ECCS) initiation signal each EDG auto-starts and:

a. In ≤ 10 seconds after auto-start and during tests, achieves voltage ≥ 3950 V and frequency ≥ 58.8 Hz;
b. Achieves steady state:
   i. voltage ≥ 3950 V and ≤ ~~4580 V~~ 4314 V for Division I EDGs; and
   ii. voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
   iii. frequency ≥ 59.5 ~~58.8~~ Hz and ≤ 60.5 ~~61.2~~ Hz for both Division I and Division II EDGs.
c. Operates for ≥ 5 minutes.

SR 3.8.1.14 Verify each EDG starts and:

a. In ≤ 10 seconds, achieves voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and
b. for steady state:
   i. voltage ≥ 3950 V and ≤ ~~4580 V~~ 4314 V for Division I EDGs; and
   ii. voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
   iii. frequency ≥ 59.5 ~~58.8~~ Hz and ≤ 60.5 ~~61.2~~ Hz for both Division I and Division II EDGs.

SR 3.8.1.17 Verify, on simulated loss of offsite power signal in conjunction with an actual or simulated ECCS initiation signal:

a. De-energization of emergency buses;
b. Load shedding from emergency buses; and
c. EDG auto-starts and:
   1. energizes permanently connected loads in ≤ 10 seconds,
   2. energizes auto-connected emergency loads through load sequencer,
   3. achieves steady state voltage:
      ≥ 3950 V and ≤ 4580 V 4314 V for Division I EDGs, and
      ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
   4. achieves steady state frequency:
      ≥ 59.5 58.8 Hz and ≤ 60.5 61.2 Hz for both Div I and Div II EDGs; and
   5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.

The proposed TS changes are shown in Enclosure 2 as marked-up pages. Revised (clean) TS pages are shown in Enclosure 3. Proposed TS Bases changes are shown in Enclosure 4 as marked-up pages. Changes to the existing TS Bases, consistent with the technical and regulatory analyses, will be implemented under the Technical Specification Bases Control Program and are provided for information only.

3.0 TECHNICAL EVALUATION

3.1 Background

The onsite standby power source at Fermi 2 consists of four EDGs separated into two independent divisions; Division I includes EDG 11 and EDG 12, and Division II includes EDG 13 and EDG 14. Either divisional pair of diesel generator units is capable of supplying loads needed to safely shutdown the reactor and maintain it in a safe shutdown condition after a Design Basis Accident (DBA).

All EDGs start automatically on a Loss of Coolant Accident (LOCA) signal or on an Engineered Safety Feature (ESF) bus degraded voltage or undervoltage signal. After an EDG has started, it automatically ties to its respective bus after offsite power is tripped as a consequence of ESF bus undervoltage or degraded voltage, independent of or coincident with a LOCA signal. The EDGs also start and operate in the standby mode without tying to the ESF bus on a LOCA signal alone. Following the trip of offsite power, load shed relays strip nonpermanent loads from the ESF bus. When the EDG is tied to the ESF bus, loads are then sequentially connected to its respective ESF bus by the automatic load sequencer. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the EDG.

In the event of a loss of normal power, the ESF electrical loads are automatically connected to the EDGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a DBA such as a LOCA should one occur after or coincident with the loss of normal power.

Certain required plant loads are returned to service in a predetermined sequence in order to prevent overloading of the EDGs in the process. Within about a minute after the EDG breaker closure, all automatic and permanently connected loads needed to recover the unit or maintain it in a safe condition are returned to service (i.e., available to start according to designed start signals). This aligns with Reference 6.12 and 6.13 definitions of the transient period. After this Load Sequencing period the EDG Steady State period begins.

Each EDG must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective ESF bus on detection of bus undervoltage. Each EDG must also be capable of accepting required loads within the assumed loading sequence intervals, and must continue to operate until offsite power can be restored to the ESF buses. These capabilities are required to be met from a variety of initial conditions, such as EDG in standby with the engine hot and EDG in standby with the engine at ambient condition. Additional EDG capabilities must be demonstrated to meet required surveillances, e.g., capability of the EDG to revert to standby status upon restoration of offsite power.

The EDGs are designed to permit inspection and testing of all important areas and features, especially those that have a standby function. Periodic component tests are supplemented by extensive functional tests during system outages and refueling outages (under simulated accident conditions). The SRs for demonstrating EDG operability are based on the recommendations of

Regulatory Guide (RG) 1.9 (Reference 6.2) as addressed in the Fermi 2 Updated Final Safety Analysis Report (UFSAR).

3.2 Technical Analysis and Justification

The Fermi 2 Electric Power System sources consist of the offsite power sources and the onsite 4.16 kV standby power source (EDGs 11, 12, 13, and 14). The design of the AC electrical power system provides independence and redundancy to ensure an available source of power to the ESF systems. The Class 1E distribution system is divided into redundant load groups (Division 1 and Division 2), so loss of any one group does not prevent the minimum safety functions from being performed. Each load group is connected to an independent offsite power supply and two EDGs.

All EDGs start automatically on a LOCA signal (i.e., low reactor water level signal or high drywell pressure signal) or on an ESF bus degraded voltage or undervoltage signal. Following the trip of offsite power, load shed relays strip nonpermanent loads from the ESF bus. When the EDG is tied to the ESF bus, loads are then sequentially connected to their respective ESF bus by the automatic load sequencer. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading the EDG.

TS 3.8.1, "AC Sources – Operating," includes several SRs for demonstrating EDG operability and ability to provide sufficient voltage for safe reactor shutdown and to mitigate the consequences of accidents. The current requirements for an EDG steady state maximum voltage of 4580 V and an EDG steady state frequency of $\geq$ 58.8 Hz and $\leq$ 61.2 Hz are consistent with the values specified in SRs in the Standard Technical Specifications in NUREG-1433 (Reference 6.4). The basis for the current voltage requirement is that it is equal to 100 $\pm$10% of nominal 4.16 kV bus voltage, which is consistent with the basis given in the Standard Technical Specification Bases in NUREG-1433 (Reference 6.5) that it is the maximum operating voltage for 4000 V motors. The basis for the current frequency requirement is that it is equal to 100 $\pm$2% of the nominal frequency of 60 Hz based on RG 1.9 (Reference 6.2).

Based on an evaluation of EDG loading it has been determined that the current EDG steady state maximum voltage and frequency ranges in TS 3.8.1 SRs are not conservative. This condition has been dispositioned in accordance with NRC Administrative Letter 98-10 (Reference 6.6). Administrative controls were initiated at the time of discovery per Corrective Action document, CARD 2013-24841 to institute Operability Limits for the maximum steady state voltage and frequency range acceptance criteria for future EDG testing.

Fermi 2 has been operating since 2013 under LCO 2013-0293 to conform to EDG voltage and frequency values that are aligned with Design Calculation DC-6538 VOL 1 DCD 1, "EDG VOLTAGE AND FREQUENCY TOLERANCES". The values used to comply with LCO 2013-0293 are:

Division I: EDG 11 and 12:
Generator Voltage:
Operability Limit (DC-6447 and DC-6538)
> 4050V and < 4300V
(> 117V to < 124V on meter)

Generator Frequency:
Operability Limit (DC-6447 and DC-6538)
> 59.6 Hz and < 60.4 Hz

EDG 11 was surveillance tested per 24.307.01, 11 times since LCO 2013-0293 has been in effect with tighter criteria than the proposed changes and has never failed these tighter criteria for EDG 11 isochronous starts.

EDG 12 was surveillance tested per 24.307.02, 14 times since LCO 2013-0293 has been in effect with the above tighter criteria than the proposed changes and has never failed these tighter criteria for EDG 12 isochronous starts.

Division II: EDG 13 and 14:
Generator Voltage:
Operability Limit (DC-6447 and DC-6538)
> 4050V and < 4400V
(117 to 127V on meter)

Generator Frequency:
Operability Limit (DC-6447 and DC-6538)
> 59.6 Hz and < 60.4 Hz

EDG 13 was surveillance tested per 24.307.03, 7 times since LCO 2013-0293 has been in effect with the above tighter criteria than the proposed changes and has never failed these tighter criteria for EDG 13 isochronous starts.

EDG 14 was surveillance tested per 24.307.04, 10 times since LCO 2013-0293 has been in effect with the above tighter criteria than the proposed changes and has never failed these tighter criteria for EDG 14 isochronous starts.

This license amendment request proposes to revise the EDG steady state maximum voltage acceptance criterion in TS 3.8.1 SRs from ≤ 4580 V for all EDGs to ≤ 4314 V for Division I EDGs and ≤ 4400 V for Division II EDGs. Additionally, this license amendment request proposes to revise the EDG steady state frequency acceptance criterion in TS 3.8.1 SRs from the range of ≥ 58.8 Hz and ≤ 61.2 Hz to the range of ≥ 59.5 Hz and ≤ 60.5 Hz. This complies with Reference 6.12 and 6.13, Approach 1 for compliance with the Topical Report corrective measures. These values are supported in DC-6538 VOL 1 DCD 1, "EDG VOLTAGE AND FREQUENCY TOLERANCES".

Technical evaluation of Fermi 2 in accordance with WCAP-17308-NP-A

The U.S. Nuclear Regulatory Commission (NRC) has raised the issue during several Design Basis Inspections (DBIs) as to whether the impacts of the allowable tolerances in DG frequency and voltage have been evaluated with respect to ECCS performance. Benchmarking the industry, individual plants have taken different approaches in responding to the NRC.

The approaches to address this issue have included the following:

1. Revise the technical specifications to reduce the allowable DG frequency and voltage tolerance
2. Revise the safety analyses based on ECCS flow rates that include the impact of the Technical Specification DG frequency and voltage tolerances; and
3. Revise the in-service test (IST) pump acceptance criteria to account for allowable Technical Specification DG tolerances in frequency and voltage.

Fermi 2 has chosen to revise the Technical Specifications to reduce allowable DG frequency and voltage tolerance to meet WCAP-17308-NP-A, Topical Report Approach 1.

Raising minimum EDG steady state allowable frequency from ≥ 58.8 Hz to ≥ 59.5 Hz will ensure that ESF motor speed will not be impacted adversely (lowered) based on EDG frequency variations. As stated in the NRC SER for WCAP-17308-NP-A, "The flow rate of the safety related pumps and fans is determined by the pump or fan speed, which in turn is a function of the DG frequency and voltage. Historically, the DG frequency and voltage tolerances associated with the governor and voltage regulator were not considered in the development of the flow rates for pumps and fans associated with the safety related systems. The primary effect of reduced frequency and voltage on the rotating equipment safety functions is to decrease the speed of safety-related motors that are powered by the DG, which affects, for example, pump performance, motor-operated valve (MOV) stroke times, and cooling fan performance. A higher than normal frequency will result in higher speed of rotating equipment and potential increase in the pressure in the safety systems."

WCAP Compliance is accomplished by implementing Approach 1. Approaches 2 and 3 are not necessary; Fermi revised "the safety analysis based on ECCS flow rates that include the impact of the Technical Specification DG voltage and frequency tolerances". This is based on not changing EDG allowable minimum frequency to a value that would promote lowering ESF motor speed as a result of the change.

The following shows the site-specific analyses that show the changes and justifications:

EDG steady state voltage range impact evaluation is implemented as described below and meets the referenced portions of WCAP-17308-NP-A.

1. EDG maximum voltage limit (Division I)
    a. The maximum steady state voltage limit for Division I is determined to be 4314V based on system minimum loading and taking into account the 2.5% boost for the no load tap setting for the safety related 4160V/480V transformers in Division I. This ensures that all 4160V loads and 480V loads stay below 4400V and 506V respectively per specification in NEMA standard MG-1. (reference DC-6447, Vol 1, Rev F, "Auxiliary Power System Analysis")
2. EDG maximum voltage limit (Division II)
    a. The maximum steady state voltage limit for Division II is determined to be 4400V based on system minimum loading and taking into account the operation of the automatic voltage regulators installed for each of the safety related 4160V/480V transformers in Division II. This ensures that all 4160V loads and 480V loads stay below 4400V and 506V respectively per specification in NEMA standard MG-1. (reference DC-6447, Vol 1, Rev F, "Auxiliary Power System Analysis")
3. EDG minimum voltage limit
    a. The minimum steady state voltage limit for both Division 1 and Division II remains unchanged at 3950V. This value is well above the degraded voltage analytical limit for Division I of 3873V and Division II of 3628V. These analytical limits are determined for the maximum LOCA load after the completion of the automatic sequence starts of motors following a trip from 100% power on each division. This limit ensures that all safety loads have adequate terminal voltage to perform their safety function. (Reference DC-6447, Vol 1, Rev F, "Auxiliary Power System Analysis", section 3.5)

EDG steady state frequency range impact evaluation for electrical and EDG performance.

Fermi 2 changes to EDG steady state allowable frequency were as follows:

- Lowering maximum EDG steady state allowable frequency from ≤ 61.2 Hz to ≤ 60.5 Hz to restore EDG loading capacity to within continuous limits.
- Raising minimum EDG steady state allowable frequency from ≥ 58.8 Hz to ≥ 59.5 Hz to ensure that ESF motor speed will not be impacted adversely (lowered) based on EDG Frequency variations.
- The Proposed Technical Specification EDG minimum frequency change would not impact WCAP Approaches 2 and 3 mechanical calculations because speed of the ESF motors assumed based on EDG Frequency in the various GDCs for the safety analysis is not lowered.

4.0 REGULATORY ANALYSIS

4.1 Applicable Regulatory Requirements/Criteria

Changes described in this license amendment request comply with and continue to meet the following regulations.

Appendix A to 10 CFR 50, "General Design Criteria for Nuclear Power Plants," includes criteria related to electric power systems.

Directly Impacted Design Criteria:

General Design Criterion (GDC) 17, "Electric Power System," states that 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. As described in UFSAR Sections 3.1.2.2.8, 8.1, 8.3.1.2.2.2, the Fermi 2 onsite power system, which includes the EDGs, complies with GDC 17. The proposed changes do not impact the Design Function nor the redundancy or separation of the On-site Electrical power systems. Changes are to EDG Steady State (e.g., beyond the Load Sequence time) EDG Voltage and Frequency allowable values. The proposed changes tighten the allowable values and have been evaluated by Design Calculations associated with 4160 VAC/ 480 VAC supply to ESF loads using ETAP (DC 6447) and by EDG Voltage and Frequency Tolerances (DC-6538) for Technical Specification 3.8.1 analysis. This eliminates the disconnect between Standard Technical Specification values currently in Fermi 2 Technical Specifications which results in non-conservative Technical Specification 3.8.1 values.

GDC 18, "Inspection and Testing of Electric Power System," states that electric power systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features. As described in UFSAR Sections 3.1.2.2.8 and 8.1, the Fermi 2 electrical power systems, including the EDGs, can be tested in compliance with GDC 18. The proposed changes do not impact the Design Function nor the redundancy or separation for testing of the On-site Electrical power systems. Changes are to EDG steady state (e.g., beyond the Load Sequence time) EDG voltage and frequency allowable values. The proposed changes tighten the allowable values and have been evaluated by Design Calculations associated with 4160 VAC/ 480 VAC supply to ESF loads using ETAP (DC 6447) and by EDG voltage and frequency tolerances (DC-6538) for Technical Specification 3.8.1 analysis. This eliminates the disconnect between Standard Technical Specification values currently in Fermi 2 Technical Specifications which results in non-conservative Technical Specification 3.8.1 values.

10 CFR 50.36, "Technical Specifications," requires in paragraph (c)(2)(ii)(C) that TS LCOs must be established for a structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier. The TS 3.8.1, "AC Sources – Operating," LCO that is the subject of this proposed amendment is included in the TS in accordance with 10 CFR 50.36(c)(2)(ii)(C).

10 CFR 50.36, "Technical Specifications," requires in paragraph (c)(3) that TS surveillance requirements be included in the TS to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met. The SRs that are the subject of this proposed amendment are included in the TS in accordance with 10 CFR 50.36(c)(3).

RG 1.9, Revision 2 (Reference 6.2), describes a method acceptable to the NRC staff for complying with requirements that diesel generator units intended for use as onsite power sources be selected with sufficient capacity and qualified for service. As described in UFSAR Appendix A Section A.1.9, the Fermi 2 design conforms to the positions of RG 1.9, Revision 2, except as noted in Section A.1.9. The proposed changes do not impact the R.G 1.9 steady state compliance of the On-site Electrical power systems. Changes are to EDG steady state (e.g., beyond the Load Sequence time) EDG voltage and frequency allowable values. The proposed changes tighten the allowable values and have been evaluated by design calculations associated with 4160 VAC/ 480 VAC supply to ESF loads using ETAP (DC 6447) and by EDG voltage and frequency tolerances (DC-6538) for Technical Specification 3.8.1 analysis. This eliminates the disconnect between Standard Technical Specification values currently in Fermi 2 Technical Specifications which results in non-conservative Technical Specification 3.8.1 values.

Indirectly Impacted Design Criteria (From Reference 6.12 and 6.13):

GDC 19, "Main Control Room," envelope is protected from impacts of Accidents to allow control of plant from this location." The proposed change is not a direct impact except for evaluation of changes to control bands on CCHVAC fans and chillers, and radiation monitors. No changes to GDC 19 compliance but EDG control bands are impacted conservatively so CCHVAC power impact is negligible based on no lowering of ESF motor speed based on voltage changes and frequency minimum value rising.

GDC 34, "Residual Heat Removal," required to remove residual heat from the core so that fuel limits are not exceeded. The proposed change is not a direct impact except for evaluation of changes to control bands on RHR/ EECW motors and MOVs. No changes to GDC 34 compliance but EDG control bands are impacted conservatively so RHR/ EECW power impact is negligible based on no lowering of ESF motor speed based on voltage changes and frequency minimum value rising.

GDC 35, "Emergency Core Cooling," required to remove heat from the reactor to prevent fuel damage and the onset of Zirconium-Water Clad reactions. The proposed change is not a direct impact except for evaluation of changes to control bands on RHR/ CSS motors and MOVs and ECCS support systems (EECW/ NIAS). No changes to GDC 35 compliance but EDG control bands are impacted conservatively so RHR/CSS/EECW/NIAS power impact is negligible based on no lowering of ESF motor speed based on voltage changes and frequency minimum value rising.

GDC 37, “Testing of Emergency Core Cooling System,” required to be testable for pressure and function for structure and leak tightness, operability and performance, and system operability under expected conditions for accident performance. The proposed change is not a direct impact except for evaluation of changes to EDG power control bands on ECCS performance and testing for expected accident performance (LOP/ LOP-LOCA). GDC 37 testing is on offsite power (LPCI P&V, CSS Testing) with the LOP/LOP-LOCA on the EDG only. The tighter tolerances on steady state EDG Voltage and frequency for this specific change is measured after Load Sequencing so no impact is expected to ECCS testing.

GDC 38, “Containment Heat Removal,” required to remove heat from the containment and maintain pressure and temperature at acceptably low levels. The proposed change is not a direct impact except for evaluation of changes to EDG power control bands on RHR performance. No changes to GDC 38 compliance but EDG control bands are impacted conservatively so RHR/ EECW/ NIAS power impact is negligible based on no lowering of ESF motor speed based on voltage changes and frequency minimum value rising.

GDC 41, “Containment Atmospheric Cleanup,” required to remove fission products, Hydrogen/Oxygen from containment to assure Containment Integrity is maintained and also provide suitable redundancy for SGTS assuming single failure. The proposed change is not a direct impact except for evaluation of changes to EDG power control bands on SGTS performance. No changes to GDC 41 compliance but EDG control bands are impacted conservatively so SGTS/ EECW/ NIAS power impact is negligible based on no lowering of ESF motor speed based on voltage changes and frequency minimum value rising.

GDC 44, “Cooling Water,” required system to transfer heat from SSCs to UHS to provide cooling for SSCs and also provide suitable redundancy for EECW/ EESW assuming single failure. The proposed change is not a direct impact except for evaluation of changes to EDG power control bands on EECW/ EESW performance. No changes to GDC 44 compliance but EDG control bands are impacted conservatively so EECW/ EESW/ NIAS power impact is negligible based on no lowering of ESF motor speed based on voltage changes and frequency minimum value rising.

GDC 60, “Control of Releases of Radioactive Materials to the Environment,” to the environment required means to control release of radioactive liquids, gases, and solids from normal operation and AOOs. The proposed change is not a direct impact except for evaluation of changes to EDG power control bands on SGTS performance. No changes to GDC 60 compliance but EDG control bands are impacted conservatively so SGTS/ EECW/ NIAS power impact is negligible based on no lowering of ESF motor speed based on voltage changes and frequency minimum value rising.

4.2 Precedent

An industry effort has been completed to address non-conservative TS for steady state EDG voltage and frequency and described in WCAP-17308-NP-A (Reference 6.12) This approach has been accepted by the US Nuclear Regulatory Commission in a SER dated April 17, 2017 (Reference 6.13) Several plants have submitted license amendment requests and received NRC approval to modify their TS to address this issue. Some of these plants include:

- Davis-Besse Nuclear Power Station – April 2016 (Reference 6.7)
- Diablo Canyon Power Plant – July 2015 (Reference 6.8)
- River Bend Station – July 2015 (Reference 6.9)
- Prairie Island Nuclear Generating Plant – May 2015 (Reference 6.10)
- Wolf Creek Generating Station – April 2013 (Reference 6.11)

4.3 No Significant Hazards Consideration

DTE requests an amendment to the TS for Fermi 2 (Renewed Operating License NPF-43). The proposed amendment would revise EDG surveillance test acceptance criteria to address non-conservative values identified by a review of design basis electrical calculations. The proposed voltage and frequency acceptance criteria would ensure availability of the onsite standby power source (i.e. the EDGs) to mitigate design basis accidents and transients, and to maintain the unit in a safe shutdown condition. The proposed decreased maximum steady state voltage of ≤ 4314 V for Division I EDGs and ≤ 4400 V for Division II EDGs was chosen based on plant-specific analysis to ensure terminal voltages remain within the maximum acceptable voltage for safety-related induction motors. The proposed more restrictive steady state frequency range of ≥ 59.5 Hz and ≤ 60.5 Hz was chosen based on plant-specific analysis to ensure the frequency is consistent with the performance of EDG speed control equipment and with the frequency load factor in the plant-specific EDG loading analysis. DTE has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, “Issuance of amendment,” as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The EDGs are not initiators for accidents evaluated in the UFSAR. The proposed Tech Spec Changes do not alter the capability of the EDGs or their supporting systems to start, load and perform their intended functions as described in the UFSAR. The proposed Tech Spec changes do not impact the initiators of analyzed event, nor do they adversely impact the mitigation of accidents since the proposed change would provide more restrictive acceptance criteria for certain EDG TS surveillance tests.

   The proposed acceptance criteria changes would help to ensure the EDGs are capable of carrying the electrical loading assumed in the safety analyses that credit operation of the

EDGs, would not affect the capability of other structures, systems, and components to perform their Design Function, and would not increase the likelihood of a malfunction. This is based on the full analysis of the impact of the changes for EDG voltage and frequency tolerances (DC-6538) and full analysis of the impact of the changes in EDG voltage and frequency tolerances on ESF loads in ETAP (DC-6447). These analyses confirmed that the proposed changes do not adversely impact ESF motor performance (Synchronous slip impacts due to voltage tolerance changes, or motor speed and power reduction, based on minimum and maximum frequency tolerance changes). The regulatory review section provides the GDC Design Function review elements that support this conclusion.

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

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The proposed change would provide more restrictive acceptance criteria for existing EDG TS surveillance tests that demonstrate the capability of the EDGs to perform their Design Function. The proposed change does not involve a physical alteration of the plant; no new or different kind of equipment will be installed. The proposed change does not create any new failure mechanisms, malfunctions, or accident initiators not considered in the design and licensing bases.

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

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No.

   The proposed change would provide more restrictive acceptance criteria for EDG TS surveillance tests. The conduct of the surveillance tests on safety-related plant equipment is a means of assuring that the equipment is capable of maintaining the margin of safety established in the safety analyses. The proposed amendment does not affect EDG performance as described in the design basis analyses. The EDG will remain capable of attaining and maintaining required voltage and frequency for accepting and supporting plant safety loads should an EDG receive a start signal. The proposed change does not change limits established in the accident analysis.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

4.4 Conclusion

Based on the above, DTE concludes that the proposed change presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.0 ENVIRONMENTAL CONSIDERATION

The proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

6.0 REFERENCES

6.1 NEMA Standard MG-1, "Motors and Generators," dated 1974

6.2 NRC Regulatory Guide 1.9, Revision 2, "Selection, Design, and Qualification of Diesel Generator Units Used as Standby (Onsite) Electrical Power Systems at Nuclear Power Plants," dated December 1979 (ML12305A253)

6.3 NRC Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," dated June 28, 1989

6.4 NUREG-1433, Revision 4, "Standard Technical Specifications, General Electric BWR/4 Plants, Volume 1, Specifications," dated April 2012 (ML12104A192)

6.5 NUREG-1433, Revision 4, "Standard Technical Specifications, General Electric BWR/4 Plants, Volume 2, Bases," dated April 2012 (ML12104A193)

6.6 NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety," dated December 29, 1998

6.7 Letter from NRC to FirstEnergy Nuclear Operating Company, "Davis-Besse Nuclear Power Station, Unit No. 1 – Issuance of Amendment Revising Emergency Diesel Generator Minimum Voltage and Frequency Acceptance Criteria," dated April 27, 2016 (ML16083A481)

6.8 Letter from NRC to Pacific Gas and Electric Company, "Diablo Canyon Power Plant, Unit Nos. 1 and 2 – Issuance of Amendments Regarding Revision to Technical Specification (TS) 3.8.1, 'AC Sources – Operating'," dated July 1, 2015 (ML15162A882)

6.9 Letter from NRC to Entergy Operations, Inc., "River Bend Station, Unit 1 – Issuance of Amendment Regarding Application for Change to Technical Specification 3.8.1, 'AC Sources – Operating'," dated July 30, 2015 (ML15187A127)

6.10 Letter from NRC to Northern States Power Company, "Prairie Island Nuclear Generating Plant, Units 1 and 2 – Issuance of License Amendments Regarding Revision to Technical Specification 3.8.1, 'AC Sources – Operating'," dated May 21, 2015 (ML15086A046)

6.11 Letter from NRC to Wolf Creek Nuclear Operating Corporation, "Wolf Creek Generating Station – Issuance of Amendment Re: Revise Technical Specification 3.8.1, 'AC Sources – Operating'," dated April 11, 2013 (ML13077A147)

6.12 WCAP-17308-NP-A, dated July 2017 "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances"

6.13 Final Safety Evaluation by the Office of Nuclear Reactor Regulation Topical Report WCAP-17308-NP, Revision 0, dated April 17, 2017 "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances" Pressurized Water Reactor Owners Group (Project NO. 694)"

Enclosure 2 to
NRC-22-0026

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

License Amendment Request to Revise Technical Specification 3.8.1 Emergency Diesel Generator Voltage and Frequency Surveillance Requirements

Marked-up Pages of Existing Fermi 2 TS

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.8.1.1 Verify correct breaker alignment and ...vailability for each	In accordance with the Surveillance Frequency Control Program
...--NOTES---------- ...ts may be preceded by an ...be period and followed by a warmup period prior to loading. 2. A modified EDG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. ---------- ~~Verify each EDG starts and achieves steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.~~	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.3 ----------NOTES---------- 1. EDG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients below the load limit do not invalidate this test. 3. This Surveillance shall be conducted on only one EDG at a time. ---------- Verify each EDG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 2500 kW.	In accordance with the Surveillance Frequency Control Program

Verify each EDG starts and achieves:
a. steady state voltage ≥ 3950 V and ≤ 4314 V for Division I EDGs; and
b. steady state voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
c. steady state frequency ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs.

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.4	Verify each day tank contains ≥ one hour supply of fuel oil.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	In accordance with the Surveillance Frequency Control Program
	l transfer system ically transfer fuel oil to the day tanks.	In accordance with the Surveillance Frequency Control Program
	NOTE---------- All EDG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. ---------- Verify each EDG starts from standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. ~~Steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.~~	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.8	Verify each EDG rejects a load greater than or equal to its associated single largest post-accident load, and following load rejection, the frequency is ≤ 66.75 Hz.	In accordance with the Surveillance Frequency Control Program

b. For steady state:
i. voltage: ≥ 3950 V and ≤ 4314 V for Division I EDGs; and
ii. voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
iii. frequency ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs.

(continued)

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.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.10	----------NOTE---------- All EDG starts may be preceded by an engine prelube period. ---------- Verify on simulated loss of offsite power signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; maintains steady state voltage: ≥ 3950 V and ≤ 4314 V for Division I EDGs and ≥ 3950 V and ≤ 4400 V for Division II EDGs; and and: rmanently connected loads in ≤ 10 seconds, 2. energizes auto-connected shutdown loads through load sequencer, maintains steady state frequency: ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs; and 3. ~~maintains steady state voltage ≥ 3950 V and ≤ 4580 V,~~ 4. ~~maintains steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and~~ 5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTE---------- e preceded by an l. ----------	
	or simulated Emergency (ECCS) initiation starts and:	In accordance with the Surveillance Frequency Control Program
	a. In ≤ 10 seconds after auto-start and during tests, achieves voltage ≥ 3950 V and frequency ≥ 58.8 Hz;	
	b. ~~Achieves steady state voltage ≥ 3950 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz; and~~	
	c. Operates for ≥ 5 minutes.	
SR 3.8.1.12	Verify each EDG's automatic trips are bypassed on an actual or simulated emergency start signal except: a. Engine overspeed; b. Generator differential current; c. Low lube oil pressure; d. Crankcase overpressure; and e. Failure to start.	In accordance with the Surveillance Frequency Control Program

Achieves steady state:
i. voltage ≥ 3950 V and ≤ 4314 V for Division I EDGs; and
ii. voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
iii. frequency ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs; and

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.8.1.13 ----------NOTE---------- Momentary transients outside the load range do not invalidate this test. ---------- Verify each EDG operates for ≥ 24 hours: a. For all but the final ≥ 2 hours loaded ≥ 2500 kW and ≤ 2600 kW; and b. For the final ≥ 2 hours of the test loaded ≥ 2800 kW and ≤ 2900 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.14 ----------NOTES---------- 1. This SR shall be performed within 5 minutes of shutting down the EDG after it has operated ≥ 2 hours loaded ≥ 2500 kW or until temperatures have stabilized. 2. All EDG starts may be preceded by an engine prelube period. ---------- Verify each EDG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and ~~b. Steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.~~	In accordance with the Surveillance Frequency Control Program

b. for steady state:
i. voltage: ≥ 3950 V and ≤ 4314 V for Division I EDGs; and
ii. voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and
iii. frequency ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs.

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.17	----------NOTE---------- All EDG starts may be preceded by an engine prelube period. ---------- Verify, on simulated loss of offsite power signal in conjunction with an actual or simulated ECCS initiation signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; and c. EDG auto-starts and: ermanently connected 10 seconds, uto-connected emergency loads through load sequencer, 3. ~~achieves steady state voltage ≥ 3950 V and ≤ 4580 V,~~ 4. ~~achieves steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and~~ supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.18	----------NOTE---------- All EDG starts may be preceded by an engine prelube period. ---------- Verify, when started simultaneously each EDG achieves, in ≤ 10 seconds, frequency ≥ 58.8 Hz.	In accordance with the Surveillance Frequency Control Program

achieves steady state voltage:
≥ 3950 V and ≤ 4314 V for Division I EDGs, and
≥ 3950 V and ≤ 4400 V for Division II EDGs; and

achieves steady state frequency:
≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs; and

Enclosure 3 to
NRC-22-0026

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

License Amendment Request to Revise Technical Specification 3.8.1 Emergency Diesel Generator Voltage and Frequency Surveillance Requirements

Clean Pages of Fermi 2 TS with Changes Incorporated

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each offsite circuit.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.2	----------NOTES---------- 1. All EDG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. 2. A modified EDG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. ---------- Verify each EDG starts and achieves: a. steady state voltage ≥ 3950 V and ≤ 4314 V for Division I EDGs; and b. steady state voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and c. steady state frequency ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.3	----------NOTES---------- 1. EDG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients below the load limit do not invalidate this test. 3. This Surveillance shall be conducted on only one EDG at a time. ---------- Verify each EDG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 2500 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.4	Verify each day tank contains ≥ one hour supply of fuel oil.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify each fuel oil transfer system operates to automatically transfer fuel oil from storage tanks to the day tanks.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.7	----------NOTE---------- All EDG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. ---------- Verify each EDG starts from standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. For steady state: i. voltage ≥ 3950 V and ≤ 4314 V for Division I EDGs; and ii. voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and iii. frequency ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.8	Verify each EDG rejects a load greater than or equal to its associated single largest post-accident load, and following load rejection, the frequency is ≤ 66.75 Hz.	In accordance with the Surveillance Frequency Control Program
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.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.10	----------NOTE---------- All EDG starts may be preceded by an engine prelube period. ---------- Verify on simulated loss of offsite power signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; and c. EDG auto-starts and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected shutdown loads through load sequencer, 3. maintains steady state voltage: ≥ 3950 V and ≤ 4314 V for Division I EDGs; and ≥ 3950 V and ≤ 4400 V for Division II EDGs; and 4. maintains steady state frequency: ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs; and 5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTE---------- All EDG starts may be preceded by an engine prelube period. ---------- Verify on an actual or simulated Emergency Core Cooling System (ECCS) initiation signal each EDG auto-starts and: a. In ≤ 10 seconds after auto-start and during tests, achieves voltage ≥ 3950 V and frequency ≥ 58.8 Hz; b. Achieves steady state: i. voltage ≥ 3950 V and ≤ 4314 V for Division I EDGs; and ii. voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and iii. frequency ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs; and c. Operates for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.12	Verify each EDG's automatic trips are bypassed on an actual or simulated emergency start signal except: a. Engine overspeed; b. Generator differential current; c. Low lube oil pressure; d. Crankcase overpressure; and e. Failure to start.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.13	----------NOTE---------- Momentary transients outside the load range do not invalidate this test. ---------- Verify each EDG operates for ≥ 24 hours: a. For all but the final ≥ 2 hours loaded ≥ 2500 kW and ≤ 2600 kW; and b. For the final ≥ 2 hours of the test loaded ≥ 2800 kW and ≤ 2900 kW.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.14	----------NOTES---------- 1. This Surveillance shall be performed within 5 minutes of shutting down the EDG after the EDG has operated ≥ 2 hours loaded ≥ 2500 kW or until operating temperatures have stabilized. Momentary transients below the load limit do not invalidate this test. 2. All EDG starts may be preceded by an engine prelube period. ---------- Verify each EDG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. For steady state: i. voltage ≥ 3950 V and ≤ 4314 V for Division I EDGs; and ii. voltage ≥ 3950 V and ≤ 4400 V for Division II EDGs; and iii. frequency ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs .	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.15	Verify each EDG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to standby status.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	Verify interval between each sequenced load block is within ± 10% of design interval for each load sequencer timer.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.17	----------NOTE---------- All EDG starts may be preceded by an engine prelube period. ---------- Verify, on simulated loss of offsite power signal in conjunction with an actual or simulated ECCS initiation signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; and c. EDG auto-starts and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected emergency loads through load sequencer, 3. achieves steady state voltage ≥ 3950 V and ≤ 4314 V for Division I EDGs and ≥ 3950 V and ≤ 4400 V for Division II EDGs; and 4. achieves steady state frequency ≥ 59.5 Hz and ≤ 60.5 Hz for both Division I and Division II EDGs; and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.18	----------NOTE---------- All EDG starts may be preceded by an engine prelube period. ---------- Verify, when started simultaneously each EDG achieves, in ≤ 10 seconds, frequency ≥ 58.8 Hz.	In accordance with the Surveillance Frequency Control Program

Enclosure 4 to
NRC-22-0026

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

License Amendment Request to Revise Technical Specification 3.8.1 Emergency Diesel Generator Voltage and Frequency Surveillance Requirements

Marked-up Pages of Existing Fermi 2 TS Bases (For Information Only)

BASES

ACTIONS (continued)

Required Action G.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

The AC sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function, in accordance with 10 CFR 50, GDC 18 (Ref. 9). Periodic component tests are supplemented by extensive functional tests during refueling outages (under simulated accident conditions). The SRs for demonstrating the OPERABILITY of the EDGs are based on the recommendations of Regulatory Guide 1.9 (Ref. 3), Regulatory Guide 1.108 (Ref. 10), and Regulatory Guide 1.137 (Ref. 11), as addressed in the UFSAR.

Where the SRs discussed herein specify voltage and frequency tolerances, the following summary is applicable. The minimum steady state output voltage of 3950 V corresponds to the most limiting voltage needed to supply Division I buses under degraded voltage with LOCA conditions.

There is no change on this page; it is included for information only since the first sentence on the next page refers to the preceding text on this page.

BASES

SURVEILLANCE REQUIREMENTS (continued)

This value is also bounding for Division II and ensures that adequate voltage is available to the equipment supported by Division I and II of the EDGs. ~~The specified maximum steady state output voltage of 4580 V is equal to the maximum operating voltage specified for 4000 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 4000 V motors is no more than the maximum rated operating voltages. The specified minimum and maximum frequencies of the EDG are 58.8 Hz and 61.2 Hz, respectively. These values are equal to ± 2% of the 60 Hz nominal frequency and are derived from the recommendations found in Regulatory Guide 1.9 (Ref. 3).~~

The specified maximum steady state output voltages of 4314 V for Division I EDGs and 4400 V for Division II EDGs are equal to the maximum operating voltage in plant-specific analyses. This ensures that for a lightly loaded distribution system, the voltage at the terminal of the 460 V motors is no more than 110% of rated voltage. The specified minimum and maximum frequencies of the EDG are 59.5 Hz and 60.5 Hz, respectively. These values are equal to the frequency limits in the plant-specific analyses to meet recommendations found in Regulatory Guide 1.9 (Ref. 3).

SR 3.8.1.1

The SR ensures correct breaker alignment for each required offsite circuit to ensure that distribution buses and loads are connected to their preferred power source, and that appropriate independence of offsite circuits is maintained. The SR also verifies the indicated availability of three-phase AC electrical power from each required offsite circuit to the onsite distribution network. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.2 and SR 3.8.1.7

These SRs help to ensure the availability of the standby electrical power supply to mitigate DBAs and transients and maintain the unit in a safe shutdown condition.

To minimize the mechanical stress and wear on moving parts that do not get lubricated when the engine is not running, these SRs have been modified by a Note (Note 1 for SR 3.8.1.2 and the Note for SR 3.8.1.7) to indicate that all EDG starts for these Surveillances may be preceded by an engine prelube period and followed by a warmup prior to loading.