Joseph H. Plona
Site Vice President

6400 N. Dixie Highway, Newport, MI 48166
Tel: 734.586.5910 Fax: 734.586.4172

DTE Energy

10 CFR 50.90

July 23, 2010
NRC-10-0006

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

References:
1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) Detroit Edison's Letter to NRC, "Proposed License Amendment to Revise the Degraded Voltage Function Requirements of Technical Specification Table 3.3.8.1-1 to Reflect Undervoltage Backfit Modification," NRC-09-0022, dated June 10, 2009

3) Detroit Edison's Letter to NRC, "Response to Request for Additional Information Regarding the Proposed License Amendment to Revise the Degraded Voltage Function Requirement of Technical Specification Table 3.3.8.1-1 to Reflect Undervoltage Backfit Modification," NRC-09-0054, dated September 16, 2009

4) NRC Letter to Detroit Edison, "Request for Additional Information – Degraded Voltage Function -Technical Specifications (TS) Table 3.3.8.1-1 - Fermi 2 (TAC No. ME1477)," dated February 24, 2010

Subject: Response to Request for Additional Information Regarding the Proposed License Amendment to Revise the Degraded Voltage Function Requirements of Technical Specification Table 3.3.8.1-1 to Reflect Undervoltage Backfit Modification

In Reference 2, Detroit Edison proposed a license amendment to the Fermi 2 Operating License to revise Technical Specification Table 3.3.8.1-1 to reflect changes resulting from a degraded voltage logic design modification developed to address an NRC backfit issue. The NRC reviewed the proposed license amendment and requested additional information that was provided in Reference 3. In Reference 4, the NRC requested

A001
NRR

additional information regarding the responses provided in Reference 3. The additional information requested by the NRC staff is provided in Enclosure 1.

To address issues identified in the Component Design Bases Inspection (CDBI) earlier this year, there has been a reconstitution effort of the electrical design bases calculations necessary to support the backfit modification. This has resulted in a change to the time delay proposed in Reference 2 for the logic associated with Function 2 in TS Table 3.3.8.1-1 for the concurrent condition of degraded voltage with a Loss of Coolant Accident (LOCA). In addition, it is now necessary to also revise the TS maximum and minimum allowable values for the 4.16 kV Emergency Bus Undervoltage (Degraded Voltage) and revise the minimum Emergency Diesel Generator (EDG) output voltage acceptance criterion 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. These additional proposed TS changes will be required in conjunction with the installation of the backfit modification. The details of this additional change are discussed in Enclosure 1.

Enclosure 2 provides a revised No Significant Hazards consideration using the standards of 10 CFR 50.92. Detroit Edison has concluded that the change proposed in this submittal does not result in a significant hazards consideration. Enclosure 3 provides marked up pages of the existing TS to show the proposed change. Enclosure 4 provides typed version of the affected TS pages with the proposed change incorporated. Enclosure 5 provides a marked up copy of the TS Bases pages affected by this change. Enclosure 5 is provided for information only. Enclosure 6 provides the requested catalog information for the ABB 27N relay and Enclosure 7 provides the requested LOCA Voltage Transient Profiles. Additionally, a compact disc (CD) is also provided with updated version of drawings provided earlier with Reference 3 and the setpoint calculations performed to determine the proposed TS values.

Detroit Edison has reviewed the proposed change against the criteria of 10 CFR 51.22 and has concluded that it still meets the criteria provided in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirements for an Environmental Impact Statement or an Environmental Assessment.

Detroit Edison requests NRC approval of this proposed license amendment by October 20, 2010 with an implementation upon startup from the fourteenth refueling outage (RF14) tentatively scheduled to start on October 25, 2010. As discussed in Reference 2, NRC approval of this proposed amendment is necessary to fulfill Detroit Edison's commitment to NRC for implementing the backfit modification in RF14.

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

Should you have any questions or require additional information, please contact Mr. Rodney W. Johnson of my staff at (734) 586-5076.

Sincerely,

List of Enclosures:
1) Response to Request for Additional Information Questions.
2) Revised No Significant Hazards Consideration and Environmental Considerations
3) Revised Marked-Up TS Pages
4) Revised Clean TS Pages
5) Marked-Up TS Bases Pages
6) ABB Bulletin 41-233S
7) LOCA Voltage Transient Profiles

A Compact Disc (CD) is also provided with the following revised drawings and setpoint calculations.

- Drawings: EDP-35621 Index Items B005, B006, and B009 through B012 (all Revision A)
- Setpoint Calculations: DC-0919, Volume I DCD-1, Revision 0

cc: NRC Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 4, Region III
Regional Administrator, Region III
Supervisor, Electric Operators,
Michigan Public Service Commission

I, Joseph H. Plona, 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.

Joseph H. Plona
Site Vice President, Nuclear Generation

On this 23rd day of July, 2010 before me personally appeared Joseph H. Plona, being first duly sworn and says that he executed the foregoing as his free act and deed.

Notary Public

STACY OAKES
NOTARY PUBLIC, STATE OF MI
COUNTY OF MONROE
MY COMMISSION EXPIRES Jul 28, 2012
ACTING IN COUNTY OF MONROE

Enclosure 1 to
NRC-10-0006

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

Response to Request for Additional Information (RAI)
Regarding the Proposed License Amendment to Revise
The Degraded Voltage Function Requirements of
Technical Specification Table 3.3.8.1-1
to Reflect Undervoltage Backfit Modification

Response to Request for Additional Information

Introduction

In Reference 2, Detroit Edison proposed a license amendment to revise the Fermi 2 Technical Specification (TS) Table 3.3.8.1-1 to reflect changes resulting from a degraded voltage logic design modification developed to address an NRC backfit issue. Reference 2 proposed to add new logic for concurrent degraded voltage with LOCA condition utilizing a time delay between 7.6 seconds to 8.4 seconds. A design modification was prepared that will implement the design change to address the backfit issue upon NRC approval of the proposed TS change.

Responses to Request for Additional Information were provided in Reference 3 with discussions based on utilizing the same proposed time delay for degraded voltage with LOCA between 7.6 and 8.4 seconds.

Subsequent to submitting Reference 3, the NRC performed a Component Design Bases Inspection (CDBI) at Fermi 2 (ADAMS Accession No. ML101180295) and identified issues related to electrical design bases calculations.

To address the CDBI issues, a reconstitution of electrical design bases calculations necessary to support the backfit modification has been performed. The calculations address current design basis configuration and updated design of the proposed backfit modification. The reconstituted calculations would officially become the plant's design basis of record after the backfit modification has been implemented.

As a result of the reconstituted calculations, it was necessary to revise the proposed time delay provided in Reference 2 for the new logic associated with Function 2 in TS Table 3.3.8.1-1 for the concurrent condition of degraded voltage and LOCA. Additionally, it was necessary to revise the TS maximum and minimum allowable values for 4160 Volt Emergency Bus Undervoltage (Degraded Voltage) and revise the minimum voltage acceptance criterion 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 in TS 3.8.1, "AC Sources – Operating," for the Emergency Diesel Generator (EDG) output voltage.

The responses provided below reflect information from the reconstituted electrical design bases calculations.

Detroit Edison's Response to Follow-Up NRC Request for Additional Information (RAI):

1. **The licensee in its letter dated September 16, 2009, in response to RAI #1, stated that the minimum offsite voltage on the Division I, 120 kV system for which large motors can start and all safety related equipment can operate continuously with Load Tap Changer (LTC) operation on Transformer SS64 is 93.3%. The minimum offsite voltage on the Division II, 345 kV system for which large motors can start and safety related equipment can operate continuously is 98.4%.**

(a) Explain the grid contingencies that were considered to ensure the switchyard voltages remain above the voltages identified, i.e., 93.3% at 120 kV and 98.4% at 345 kV at switchyard buses.

Response:

Grid contingencies that were used in the Annual Grid Study for Fermi 2 Nuclear Plant are as follows:

a) The loss of Fermi 2 with and without a fault
b) The loss of any generating unit on the Transmission Owner's grid that could affect Fermi 2
c) The loss of any major transmission circuit or intertie on the Transmission Owner's grid that could affect Fermi 2
d) The loss of any large load due to failures of transmission system elements that could affect Fermi 2
e) Power Transfers that could affect Fermi 2

These contingencies are also monitored on a real time basis (approximately every 10 minutes) by the transmission system owner. A Nuclear Plant Operating Agreement is in place that requires notifying the plant if any of these contingencies would result in voltages lower than 93.3% on Division 1 and 98.4% on Division 2. Upon notification from the transmission system owner that a single transmission system component failure could result in a degraded grid condition, action is taken to perform an emergent risk management assessment in accordance with plant procedures. Mitigating actions may be required to address the condition based on the risk management assessment. If the contingency is a loss of Fermi 2 generator that results in post trip voltages below 93.3% on Division 1 or 98.4% on Division 2, the affected offsite circuit(s) are declared inoperable and TS Required Actions are followed.

(b) Provide supporting data or analysis to show that the degraded voltage relay settings are adequate when the switchyard voltages are just above the minimum voltages identified above, to protect all Class 1E equipment.

Response:

The analysis associated with the backfit modification has been developed as part of design calculation reconstitution following the 2010 NRC CDBI. This design reconstitution involves changes with respect to the information provided in Reference 3.

The transient analysis demonstrates that the Class 1E power distribution system at Fermi 2 and the backfit modification design is adequate to support a Loss-of-Coolant-Accident (LOCA) concurrent with a degraded grid given the following assumptions:

- For Division I, the 120kV system voltage is equal to the UFSAR minimum switchyard voltage of 93.3% minus the largest expected voltage change due to a loss of the Fermi 2 generator. Inaccuracies of the SS64 Load Tap Changer (LTC) are also taken into consideration.
- For Division II, the 345kV system voltage is at the minimum UFSAR switchyard voltage of 98.4% minus the largest expected voltage change due to a loss of the Fermi 2 generator.

The analysis demonstrates that the electrical system will perform as follows during this scenario:

- The system will not separate from the grid due to either the loss of voltage or degraded voltage relay actuation.
- All 4 kV and 480 V safety related continuous duty motors required to start on a LOCA signal will successfully start within the required time frames.
- All safety related Motor Operated Valves (MOVs) will start within the required time frames.
- No running safety related continuous duty motors will stall as a result of the voltage transient.
- No safety related thermal protective devices for LOCA autostart loads will spuriously trip as a result of excessive load currents or inrush durations due to the transient.
- No safety related 120V Motor Control Center (MCC) motor starters/contactors will drop out as a result of the transient.

The following is a description of the various aspects of the analysis:

Degraded Voltage Relay (DVR) Setpoint and Tolerances

The relay settings and ranges are based on the results of the steady state voltage analysis at minimum voltage analytical limits, transient analysis for motor starting associated with a LOCA, and motor starting transient analysis for the largest motor in a non-LOCA condition. The selection of DVR voltage and timing setpoints includes consideration of instrument tolerances and relay drift. The analysis also accounts for switchyard voltage drop scenarios. The results of the setpoint analysis are used in the transient analysis to verify DVR reset during LOCA transient and during start of the largest motor during non-LOCA conditions.

Auxiliary Power System Remaining Connected to the Grid

The analysis demonstrates that the Fermi 2 auxiliary power system (safety related ESF buses) remains connected to the grid for a LOCA with offsite voltages at the UFSAR identified minimums. The analysis indicates that the degraded voltage relays will pick up as a result of the LOCA transient; however, the voltage will recover and the DVR will reset prior to the associated time delay relay timing out. The LOCA transient voltage drop is not low enough to actuate the Loss of Voltage (LOP) relays.

Safety Related Continuous Duty Motors Have Adequate Starting Voltage

The analysis demonstrates that continuous duty motors that are required to start during a LOCA condition do successfully start. Several motor acceleration times are increased due to low transient voltages. There are no adverse effects on the motors due to this condition.

Safety Related MOVs Have Adequate Starting Voltage

The analysis demonstrates sufficient voltage exists for the MOVs to transition from a locked rotor current condition to running current condition within the required stroke times. MOVs were found to have adequate voltage to start. However, several MOV motors stall and remain in an inrush state longer than they would with full voltage due to a lower terminal voltage. Assessment of this condition on the MOV thermal protective devices indicates that it will have no impact on MOV functions.

Required Safety Related Loads Start in Sufficient Time to Support Accident Analysis

The low voltages during the LOCA transient result in delayed start times for several MOVs and in longer than normal acceleration times for several motors. The impact of these delays were evaluated against the accident analysis and no adverse impact was identified.

With respect to the protective function of the DVR relay settings, the ability of safety related equipment to operate is evaluated based on the analytical limit of the degraded voltage setpoints. That is, the ability of safety related 480V motors to start and run, safety related AC MOV's to operate, and low voltage control circuits to remain energized or change state is based on 4160V essential bus voltages at the proposed minimum allowable values of the degraded voltage relay setpoint.

A motor start evaluation was performed for safety related 480V motors with essential 4160V buses at the proposed DVR minimum allowable value. The results of this analysis demonstrate that the 480V safety related electrical equipment can successfully start when the 4160V system has degraded to just above the DVR trip setpoint.

An analysis of safety related low voltage AC control circuits was performed to determine the required MCC voltages to ensure that the loads do not drop out during the transient conditions. The worst case voltages during the LOCA transient were verified to be above these required MCC voltages.

The analysis of safety related AC MOV operation uses MCC source voltages corresponding to worst case load flow calculations with the essential 4160V buses at degraded voltage levels. This analysis demonstrates that required MOV torque/thrust is developed at these MCC source voltages and associated MOV terminal voltages.

Safety Related Continuous Duty Motors Do Not Stall

The results of the analysis indicate that safety related continuous duty motors that must remain energized during starting of other motors do not stall. Minimum motor voltage requirements to avoid stalling were determined and compared to the minimum motor terminal voltages during the LOCA transient to ensure the motors will not stall. The result of this comparison demonstrates that required motors do not stall.

Safety Related Motor Starters/Contactors Do not Drop Out on Transients

An analysis of the ability of low voltage AC circuits and components has been performed to verify that required control components do not drop out during the minimum transient voltages. The results show that the safety related control components are capable of remaining energized through the motor start transient without dropping out.

Safety Related Protective Devices Do Not Actuate During Transient

The analysis demonstrates that continuous duty motors and MOV motors that started in response to the LOCA transient do not trip as a result of a thermal protective device. For safety related continuous duty LOCA autostart motors, the protective device trip time for the motor in a locked rotor condition is determined and is compared to the time the motor is in a locked rotor condition. For safety related MOV motors that receive a start signal during the LOCA large motor starting transient, the protective device trip time at motor locked rotor amps (LRA) is compared to the time the motor is in a LRA condition. The conclusion of the analysis indicates that, for continuous duty motors and MOV motors, the protective device trip times exceed the time at locked rotor. Therefore, it is concluded that the motors will not trip due to delays during starting.

(c) The degraded voltage relay (DVR) for Division I is set at approximately 96.9% and has a time delay of approximately 8.4 seconds for the loss-of-coolant-accident (LOCA) case and 46.2 seconds for non LOCA case. The loss of voltage relay (LVR) for Division I is set at approximately 74.4%. The DVR and LVR protect safety related equipment. For the non LOCA event, there can be potential for the safety related equipment to be subjected to approximately 75% bus voltage for up to 46 seconds (multiple grid issues, DVR timing out and LVR not actuated). Explain under this condition, how will the safety related equipment remain adequately protected.

Response:

Due to the reconstitution of the electrical design calculations, the 8.4 seconds mentioned in the question is now proposed as 7.31 seconds as shown in the response to question 4. Additionally, the Division I degraded voltage relay (DVR) maximum allowable value is proposed to be reduced from 96.9% (4031.0 volts) to 3944.8 volts. This is also discussed in the response to question 4.

Large motor-starting transients can cause voltage dips on the electrical power system. Energized motors that are operating normally will slow down in response to the voltage dip. The running motors must be able to reaccelerate once the transient is complete. Fermi 2 motors are NEMA design B type. For standard NEMA design B motors, the speed-torque characteristics (200% breakdown torque at full voltage for 200 Hp and below and 175% breakdown torque above 200 Hp) will prevent a stall, provided the motor terminal voltage does not drop below about 71% of motor nameplate voltage based on the shaft load not exceeding 100% rated load as stated in IEEE 399-1997. It is not anticipated that the load torque will exceed 100%; therefore, the safety related equipment will remain adequately protected.

The probability of this scenario is highly unlikely. All assessments within the annual grid stability study address the adequacy of providing service to Fermi 2 critical system auxiliary loads based on the most severe operational constraints. These constraints simulated the highest possible auxiliary loads, under the design range of the most severe grid conditions and assuming worst case relay operations within the possible ranges of relay operation parameters. Collateral analysis results also reflected these conditions. Simulation of relay operations correlates to the degraded undervoltage relay high trip and reset settings, as this is the most conservative condition for relay actuations.

The grid study voltage analysis was performed for various stress levels on the grid. There are three cases of interest to discuss. The first case of particular interest is 100% load with generator outages and the second case is 100% load with Fermi 2 in an outage. These two cases represent the largest amount of power flow into the immediate transmission system with key area generators offline, and demonstrate some of the lowest normal system voltages in the study area. The third case represents the design basis low voltage boundary case and results in the lowest system voltages of any of the analyses. The analysis had voltage monitors placed on the Fermi 2 system service buses SS64 and SS65 (both 4.16 kV buses) and the grid transmission buses. These two system service buses feed critical Fermi 2 safety loads. The voltage performance at these two buses was determined to be the critical item to monitor in this study. The grid study program was executed to record the needed voltages for the simulation. This allowed an analysis of voltage performance of these two buses. The pre-fault voltage, the minimum voltage seen during the fault itself, and the steady state recovery (at 10 seconds) voltage were noted for each simulation. The recovery voltage and time for degraded voltage relay (DVR) and Loss of Voltage relay (LOP) reset was reviewed and determined to be acceptable within the grid study.

2. **The licensee in its letter dated September 16, 2009, in response to RAI #1, stated that the existing ABB 27D relays will be replaced with ABB 27N relays and additional time delay relays to achieve the LOCA degraded voltage time delay logic.**

   Confirm that new ABB 27N relays will provide Technical Specifications (TS) Table 3.3.8.1-1 Function 2a and Function 2b of the previous 27D relays, and that Function 2c will be provided by new time-delay (TD) relays. Also, provide catalog information for these relays, including logic drawings showing function of these new relays.

   Response:

   The ABB 27N relays that replace the existing ABB 27D relays will provide the Technical Specifications (TS) Table 3.3.8.1-1 Function 2a. In the existing configuration, the time delay identified in TS Table 3.3.8.1-1 Function 2b is the combination of the delay from the ABB 27D relays and that for an Agastat time delay relay connected in series with the 27D relay output contacts. No change to the current TS Table 3.3.8.1-1 Function 2b was proposed in Reference 3.

   The configuration of the degraded voltage control scheme included in the backfit modification has been revised from that described in References 2 and 3. The following changes are made to simplify the relay scheme:

   For Division I:
   a) The time delay for the ABB 27N degraded voltage relays is revised from a nominal two seconds to a nominal 6.7 seconds
   b) The time delay for the existing Agastat relay for the Non-LOCA time delay is revised from 42 seconds (nominal) to 37.3 seconds (nominal)

   The nominal 6.7 second time delay setting provides the delay for degraded voltage with LOCA. The combination of the nominal 6.7 second time delay and 37.3 second time delay provide the nominal 44 second time delay for degraded voltage without LOCA, which is unchanged from the existing plant design.

   Similarly, for Division II:
   c) The time delay for the ABB 27N degraded voltage relays is revised from a nominal two seconds to a nominal 6.7 seconds
   d) The time delay for the existing Agastat relay for the Non-LOCA time delay is revised from 19.4 seconds (nominal) to 14.7 seconds (nominal)

   The nominal 6.7 second time delay setting provides the delay for degraded voltage with LOCA. The combination of the nominal 6.7 second time delay and 14.7 second time delay provide the nominal 21.4 second time delay for degraded voltage without LOCA, which is unchanged from the existing plant design.

In this manner, the need for the additional Agastat time delay relay to provide the LOCA related time delay is avoided. The total time delay for Table 3.3.8.1-1 Function 2b is unchanged. There is no impact to the functional operation of the relaying scheme for degraded voltage condition with or without a concurrent LOCA as a result of changes made in this submittal.

As such, the 6.7 second nominal time delay for the ABB 27N relays provides proposed Technical Specification Table 3.3.8.1-1 Function 2c and the combined time delay of the ABB 27N relays with the Agastat time delay relay connected in series provides Technical Specification Table 3.3.8.1-1 Function 2b.

A copy of ABB bulletin 41-233S is provided in Enclosure 6, showing AC and DC connections at the relay. 125Vdc control power for the relay is provided from the existing circuit at the respective switchgear and is fed from the respective divisional batteries, as in the existing configuration. Potential transformer (PT) sensing input connections to the degraded voltage relays are also unchanged from the existing configuration, with the exception of specific terminal point designations for the ABB 27N relay. Copies of logic drawings were previously provided with Reference 3. This submittal provides updated version of several drawings. Specifically, EDP Index Items 35621.B005, B006, and B009 through B012 have been updated and are provided on a compact disc (CD).

The following delineates changes made in this submittal versus information provided in Reference 3. These changes were necessary due to the reconstitution effort of the electrical design calculations for the safety related ESF buses.

- The proposed minimum and maximum TS values for the time delay for degraded voltage with LOCA is changed from 7.6 and 8.4 seconds to 6.16 and 7.31 seconds.

- The reset value for the new ABB 27N relays is adjusted from 101% to (setpoint / 99.5%).

- Reference 3 included the following statement in response to question 3a for Division I: "The reset value associated with the new relay allows a worst case reset of 101% of the maximum setpoint value (102% of 95%) or 97.87% of Division I bus voltage." This statement is revised to: "The reset value associated with the new relay allows a worst case reset of (setpoint / 99.5%) of the maximum allowable value of 3944.8 V for Division I bus voltage."

- Reference 3 included the following statement in the response to question 1 under the subtitle 'Time Delay for Degraded Voltage with LOCA': "the minimum time delay associated with the lower value for the proposed Technical Specification change is greater than seven seconds." This statement is revised to: "the minimum time delay associated with the lower value for the proposed Technical Specification change is greater than 5.5 seconds."

3. **The licensee in its letter dated September 16, 2009, in response to RAI #1, in the discussion under the heading "Time Delay for Degraded Voltage (Without LOCA)", has considered start of two Residual Heat Removal (RHR) pumps, with two Core Spray pumps starting five seconds later, in each Division.**

   Clarify the purpose of starting of two RHR pumps, and two Core Spray pumps in each division in a non-LOCA scenario.

   Response:

   The evaluation included in existing design calculations calculates worst case starting analysis based on the loads of the safety buses and also based on the loads of the non safety buses. There are no automatic starting inputs for the RHR pump motors or the Core Spray pump motors for normal (non-LOCA) operation. Additionally, it is not expected that two RHR pumps or two Core Spray pumps will be simultaneously started by manual means. However, the motor starting evaluation performed provides a conservative profile for loads on the essential buses. The combined horsepower for the two RHR pump motors is larger than any single load fed from the respective transformer windings of the offsite supply, and the combined load of these two motors starting simultaneously at peak loading constitutes the largest starting load for the respective buses.

   The design supporting the backfit modification has been revised in response to NRC CDBI results. As part of these design changes, the analysis supporting the selection of degraded voltage relay and time delay settings for the non-LOCA condition has been revised. The resulting analysis reflects starting the 3000 horsepower Heater Feed pump motor, which is the largest load fed from the same winding of transformer SS64 or SS65 that feeds the Class 1E Division I and II buses respectively. This analysis demonstrates that grid separation does not occur due to the motor starting transient with the offsite supply at UFSAR minimum voltages.

4. **The licensee in its letter dated September 16, 2009, in response to RAI #1, stated that the time delay for a degraded voltage with LOCA is established in pending changes to calculation DC-0919, Volume I for the new degraded voltage time delay. The time delay is selected based on the following:**

   a) The maximum time delay which provides load shed and Emergency Diesel Generator (EDG) breaker closure (with RHR pump motor start) at or less than 10 seconds, consistent with the accident analysis.

   b) The minimum time delay that allows sequential starting of LOCA loads without separating from the offsite power supply.

Provide summary/excerpts from the dynamic analysis, which provides the worst case voltage transient profile at the safety-related buses (those provided with degraded voltage relays) following LOCA. Preferably superimpose the characteristics of degraded voltage relays on the bus voltage transient profile to confirm that degraded voltage relays can ride through the voltage dips experienced during starting of large LOCA loads.

Response:

The design bases calculation reconstitution effort to address 2010 CDBI issues has produced revisions to the analytical model motor transient analysis voltage and timing results.

The reconstitution of design calculation transient analysis includes proposed changes to allowable voltage range for the 4160 volt Emergency Bus Undervoltage (Degraded Voltage) and Degraded Voltage Time Delay (with LOCA). The analysis demonstrates that for the loads in the LOCA start profile, the voltage recovers for both Divisions. This analysis also considers the starting of the 480 volt loads that receive an Auto start signal in conjunction with the RHR pump motors and Core Spray pump motors as part of the LOCA transient. The reconstituted transient analysis reflects a step voltage change associated with the trip of the of Fermi 2 main turbine generator in conjunction with the LOCA. This step voltage change is based on the annual grid study performed by the grid owner. The revised design calculation analysis that considers these items supports the modification planned for the upcoming refuel outage and demonstrates that the electrical equipment and safety loads are capable of performing their intended functions to meet the requirements of the accident analysis mentioned below.

The operational sequence of emergency core cooling systems for a design-basis accident (UFSAR Table 6.3-7) incorporates a start signal to the RHR pumps and EDGs on a LOCA signal. The Emergency Diesel Generators (EDGs) start and are ready to load thirteen seconds or less after the initial LOCA signal. If a load shed occurs in response to a degraded voltage relay trip, the time period from the initiation of the LOCA signal until EDG breaker closure (and RHR pump restart) can be up to thirteen seconds and remain within the accident analysis. In addition, as stated in the UFSAR, the accident analysis associated with loss of alternating current power (UFSAR Section 15.2.6) indicates that the estimated time for the EDG breakers to close is thirteen seconds after the loss of offsite power. The reconstitution of the design calculation transient analysis indicates that this accident analysis is met.

The analytical model transient analysis results require a revision to the degraded voltage bus undervoltage allowable values in the current TS Table 3.3.8.1-1 and to the time delay associated with the concurrent degraded voltage with LOCA condition as proposed in Reference 2.

The design calculation reconstitution effort has divided the initial single design calculation (DC-0919 Volume I) into two separate design calculations. The first is a setpoint design calculation. The second is a transient motor starting design calculation. The analytical results of these two design calculations have resulted in impacts to the existing degraded voltage relay (DVR) setpoint range along with the proposed degraded voltage with LOCA time delay range. The purpose of the setpoint design calculation is to evaluate the degraded voltage and undervoltage relay setpoints and associated time delay relay setpoints. The setpoint design calculation now uses the transient motor starting design calculation as an input. The purpose of the transient motor starting design calculation is to evaluate the performance of the safety related electrical system during a worst case LOCA electrical transient concurrent with a degraded grid condition.

Based on the results of the design bases calculation reconstitution effort, Detroit Edison is requesting NRC approval of a proposed revision to the Fermi 2 Technical Specification (TS) 3.3.8.1, "Loss of Power (LOP) Instrumentation." The first proposed change is for the degraded voltage range and the second proposed change is a revision to the proposed change related to the time delay with LOCA requested in Reference 2.

The existing Fermi 2 TS 3.3.8.1, "Loss of Power (LOP) Instrumentation," Function 2 of Table 3.3.8.1-1, 4.16 kV Emergency Bus Undervoltage (Degraded Voltage) item a. Bus Undervoltage allowable value footnote (c) is:

Division I: ≥ 3873.0 V and ≤ 4031.0 V
Division II: ≥ 3628.0 V and ≤ 3776.0 V

The proposed change to Fermi 2 TS 3.3.8.1, "Loss of Power (LOP) Instrumentation," Function 2 of Table 3.3.8.1-1, 4.16 kV Emergency Bus Undervoltage (Degraded Voltage) item a. Bus Undervoltage allowable value footnote (c) is:

Division I: ≥ 3904.4 V and ≤ 3944.8 V
Division II: ≥ 3659.4 V and ≤ 3699.8 V

The benefit of reducing the upper range value of the DVR is that the required reset level is lowered. This provides for greater assurance of maintaining the preferred offsite grid source during transient conditions. This reduction further strengthens the commitment to meet Branch Technical Position PSB-1 by ensuring all efforts have been exhausted to prevent spurious grid separation. The benefit of raising the lower range value of the DVR is in providing margin between the analytical limit and the allowable limit in the Technical Specification.

In Reference 2, Detroit Edison proposed to add Fermi 2 TS 3.3.8.1, "Loss of Power (LOP) Instrumentation," Function 2 of Table 3.3.8.1-1, 4.16 kV Emergency Bus Undervoltage (Degraded Voltage) item c. Time Delay (with LOCA) allowable value footnote (e) with the following values:

Division I: ≥ 7.6 sec and ≤ 8.4 sec
Division II: ≥ 7.6 sec and ≤ 8.4 sec

The reconstitution effort transient analysis has resulted in the revision of the minimum and maximum time delay (with LOCA) as proposed in Reference 2.

The proposed change to Fermi 2 TS 3.3.8.1, "Loss of Power (LOP) Instrumentation," Function 2 of Table 3.3.8.1-1, 4.16 kV Emergency Bus Undervoltage (Degraded Voltage) item c. Time Delay (with LOCA) allowable value footnote (e) is:

Division I: ≥ 6.16 sec and ≤ 7.31 sec
Division II: ≥ 6.16 sec and ≤ 7.31 sec

The 4 required channels per bus and surveillance requirements SR 3.3.8.1.1, SR 3.3.8.1.2 and SR 3.3.8.1.3 are not changed from the proposal in Reference 2.

In addition to the requested changes to TS Table 3.3.8.1-1, it has been determined based on the reconstituted electrical design bases calculations that a revision to TS 3.8.1, "AC Sources – Operating," is also required. The proposed revision would change the minimum voltage acceptance criterion for Emergency Diesel Generator (EDG) 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 from 3873 to 3950 volts.

On March 17, 2008, the NRC issued license amendment no. 178 to the Fermi 2 operating license. Amendment 178 revised the minimum EDG output voltage in the surveillance requirements for TS 3.8.1 from 3740 to 3873 volts to resolve a non-conservative TS value.

During the electrical design calculation reconstitution effort related to the backfit modification for degraded voltage with LOCA, it was determined that a boost of 1.5% was required for the system service transformer SS64 load tap changer that feeds Division I 4160 volt ESF buses 64B and 64C from offsite power. This resulted in the need to decrease Division I 4160/480 volt ESF transformer 72C tap setting boost from 5% to 2.5%. To account for the decrease in the tap setting for transformer 72C when it is fed by onsite sources, an increase in the minimum EDG output voltage from 3873 to 3950 volts is necessary. This value ensures that adequate voltage is available to safety related equipment supported by Division I of the EDGs. This change is being conservatively proposed for both Divisions I and II of the onsite standby EDGs for consistency between divisions.

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 proposed revision to the EDG SRs acceptance criterion ensures that loads supplied by the

EDGs are provided with adequate voltage from onsite power sources to perform their intended safety related functions.

Operability Determination for the existing plant configuration is addressed in Engineering Functional Analysis EFA-R14-10-004 Rev. A, which provides reasonable assurance that, for the present plant configuration, voltage recovers for both Divisions, to acceptable levels under the loads in the LOCA start profile. Division I voltage recovery requires the operation of the SS64 LTC.

The transient analysis within the reconstitution effort that supports the backfit modification has been performed for the identified post-contingency grid and site voltage changes that are part of Engineering Functional Analysis EFA-R14-10-004 Rev. A. The reconstituted design analysis using revised reset voltage values for the ABB 27N degraded voltage relays that are to be installed in conjunction with the backfit modification have produced conclusive results that demonstrate the degraded voltage relays reset and unwanted grid separation does not occur for the time delay with LOCA at the minimum operable post contingency voltage. The reconstituted design analysis also provides results that verify the 480 volt motors can successfully perform their required safety design function both during transients and when operating at the low end tolerance of the DVR setpoint.

The analysis results confirm that degraded voltage relays can ride through the voltage dips experienced during starting of large LOCA loads. Enclosure 7 contains the bus voltage LOCA transient profiles with the degraded voltage relay settings superimposed for Division I 4160 VAC Buses 64B and 64C and for Division II 4160 VAC buses 65E and 65F.

5. **The licensee in its letter dated September 16, 2009, in response to RAI #3b, stated that in case of degraded voltage relay tripping with 7.6 seconds to 8.4 seconds of LOCA signal, the loads will be resequenced and the RHR pump motor can re-start a minimum of one second after tripping while the motor is running.**

   Confirm that one second is adequate for RHR pump motor to decrease its residual voltage to less than 25% of its rated voltage (typically considered safe for restarting purpose). Also, explain the function of degraded voltage and loss of voltage relaying after the safety-related loads are shifted from offsite source to EDG.

   Response:

   Due to the reconstitution of the electrical design calculations, the 7.6 seconds to 8.4 seconds range mentioned in the question is now proposed as 6.16 seconds to 7.31 seconds as discussed in the response to question 4.

   As stated in the response to question 4, the time period from the initiation of the LOCA signal until EDG breaker closure following a load shed can be up to thirteen seconds and remain within the accident analysis. The RHR pump motor starts on a LOCA signal. Upon load shedding, the motor would be re-sequenced and start within 13 seconds.

Per NEMA MG-1-2006, section 21.34.1, reclosing is recommended after a period equal to or greater than 150% of the open circuit time constant (in seconds) of the largest motor, which is consistent with a decay below 25% residual voltage. Based on this recommendation and open circuit time constant information from the RHR pump motor vendor, General Electric, the most limiting minimum time delay to allow for residual motor voltage decay is determined to be 4.41 seconds for the 2250 horsepower RHR pump motor. A change to increase the time delay following load shed initiation to provide this delay is included in the planned modification. This is accomplished by adjusting the setting for an existing Agastat time delay relay in the EDG output breaker close control circuit for each EDG, which is connected in series with load shed relaying.

As stated in the response to question 4, the analysis of the voltage transient associated with LOCA at the UFSAR minimum offsite voltage has been re-constituted and the degraded voltage and time delay setpoint analysis in the calculation have been revised. The results of these analyses are incorporated in the backfit modification and the identified voltage and time delay ranges are incorporated in the proposed Technical Specifications changes. The maximum time delay (analytical limit) prior to load shed for a trip due to degraded voltage with a LOCA signal present is 7.97 seconds. The total time delay from initiation of a LOCA signal until EDG breaker closure and RHR pump motor start on the EDGs remains within the time assumed in the accident analysis.

The degraded voltage and loss of voltage relaying output is blocked after loads are transferred to the respective EDG. Relay output to load shedding relays is reinstated upon closure of the offsite power breaker to the respective essential 4160V bus and opening of the EDG output breaker for the associated EDG.

6. **Function 2.c, Time Delay with LOCA, has been added to TS Table 3.3.8.1-1 with allowable values between 7.6 seconds and 8.4 seconds. Furthermore, the licensee stated in the September 16, 2009, letter that existing ABB 27D relays have been replaced by ABB 27N relays.**

   Provide calculations including the uncertainties used in the selection of the nominal trip setpoint, allowable value, as-found tolerance, and as-left tolerance for all the functions in TS Table 3.3.8.1-1 affected by the replacement of the existing ABB 27D relays by ABB 27N relays and the addition of the new relay for Function 2.c.

   Response:

   Due to the reconstitution of the electrical design calculations, the 7.6 seconds to 8.4 seconds range mentioned in the question is now proposed as 6.16 seconds to 7.31 seconds as discussed in the response to question 4.

Setpoint evaluations are documented in calculation DC-0919 Volume I DCD 1, which is provided on a separate CD. These evaluations include the identification of uncertainties used in the selection of setpoint values. Setpoints for each existing and proposed function in Technical Specifications Table 3.3.8.1-1 are addressed within this calculation. As stated in the response to question 2, the time delay for TS Table 3.3.8.1-1 Function 2b is the combination of the delay from the ABB 27N relays and that for an Agastat time delay relay connected in series with the 27N relay output contacts. The shorter time delay for proposed TS Table 3.3.8.1-1 Function 2c consists of the delay setting of the ABB 27N degraded voltage relay.

7. **Describe the measures to be taken to ensure that the associated instrument channel is capable of performing its specified safety functions in accordance with applicable design requirements and associated analyses. Include in your discussion information on the controls you employ to ensure that the as-left trip setting after completion of periodic surveillance is consistent with your setpoint methodology. Also, discuss the plant corrective action processes (including plant procedures) for restoring channels to operable status when channels are determined to be "inoperable" or "operable but degraded." If the controls are located in a document other than the TS, e.g., plant test procedure, describe how it is ensured that the controls will be implemented.**

Response:

Each associated instrument channel is functionally tested on a monthly basis per site procedures. Additionally, each channel is calibrated and functionally tested once per 18 months per site procedures.

The setpoints and acceptance criteria used in calibration/functional surveillances are directly obtained from design calculations that are used to derive the values in the Technical Specifications. The tolerances are selected such that the as-left acceptance criteria ensure that the relays meet Technical Specifications.

During calibration/functional testing of these relays, if Technical Specification setpoints are not met, the respective surveillance procedure requires that a Condition Assessment Resolution Document (CARD) is initiated and the Shift Manager is notified. If the setpoint is found out of tolerance, the procedure requires the relays to be adjusted to within the identified as-left tolerances. Additionally, following completion of the calibration/functional surveillances, the completed surveillance information is routed to the Component Engineer for review. The as-found/as-left data is recorded and maintained by the Component Engineer for evaluation of drift trends. The data is evaluated against established tolerance limits. If a relay has exhibited a significant change in drift (i.e. it is greater than the tolerance limits), a tracking/trending CARD is generated to monitor the next performance. If the relay has drifted beyond the tolerance limits at the next calibration/functional surveillance, a work order (WO) is completed to replace the relay, including calibration and functional testing. If relay testing results are outside Technical Specification requirements and the relay cannot be calibrated within these requirements, the Limiting Condition for Operation (LCO) Required Action entered to perform the testing cannot be exited until the relay is replaced, calibrated and satisfactorily tested.

Additional Details of the Backfit Modification:

The following is a summary of additional modifications planned to be performed during the upcoming refueling outage (RF14) as part of backfit modification. These changes are necessary due to the reconstitution effort of the electrical design calculations for the safety related ESF buses.

- Increase system service transformer SS64 Load Tap Changer setting from 120.0V to 121.8V (1.5% boost). This transformer feeds the Division I ESF buses.
- Decrease Division I 4160/480 volt ESF transformer 72C tap setting boost from 5% to 2.5%.
- Decrease the maximum torque switch setting for Core Spray Division I Inboard Isolation Motor Operated Valve (MOV) and RHR Division I Containment Spray Inboard Isolation MOV.
- Increase thermal overload (TOL) relay heater sizes for Reactor Building Closed Cooling Water Division II Supply Isolation MOV, Reactor Water Clean Up (RWCU) Inboard Containment Isolation MOV, and RWCU Division II Containment Isolation MOV.
- Increase the relay settings for Division I 480 volt ESF bus 72C and Division II 480 volt ESF bus 72F degraded voltage relays in the 480 volt MCC 72CF transfer scheme.
- Add a parallel power feed cable from 480V bus 72C to MCC 72CF.
- Increase the size of the power feed cables to the Reactor Recirculation Pump A and B Discharge MOVs in the primary containment.

Enclosure 2 to
NRC-10-0006

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

Response to Request for Additional Information (RAI)
Regarding the Proposed License Amendment to Revise
The Degraded Voltage Function Requirements of
Technical Specification Table 3.3.8.1-1
to Reflect Undervoltage Backfit Modification

Revised No Significant Hazards Consideration and Environmental Considerations

The following is a revised No Significant Hazards Consideration for the Proposed License Amendment to Revise the Degraded Voltage Function Requirements of Technical Specification Table 3.3.8.1-1 and Revise the minimum Emergency Diesel Generator (EDG) output voltage acceptance criterion 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 in TS 3.8.1 to reflect the degraded voltage backfit modification.

5.1 No Significant Hazards Consideration

In accordance with 10 CFR 50.92, Detroit Edison has made a determination that the proposed amendment involves no significant hazards consideration. The proposed change to Technical Specification Table 3.3.8.1-1, Function 2 (Degraded Voltage) to identify an additional time delay logic for Loss of Coolant Accident (LOCA) concurrent with degraded voltage conditions, the revision of the voltage range for degraded bus undervoltage and the revision of the minimum Emergency Diesel Generator output voltage acceptance criterion in the surveillance requirements of TS 3.8.1 does 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.

   Providing the additional logic ensures the timely transfer of plant safety system loads to the Emergency Diesel Generators in the event a sustained degraded bus voltage is present with a Loss of Coolant Accident (LOCA) signal. This ensures that under these degraded bus voltage conditions, Emergency Core Cooling System (ECCS) equipment is powered from the emergency diesel generators in a timely manner. This change is needed to bring Fermi 2 into full compliance with 10 CFR Part 50, Appendix A, General Design Criterion-17, "Electric Power Systems," and to meet the requirements of NUREG-0800 Rev. 2, Branch Technical Position (BTP) Power Systems Branch (PSB)-1. The time delay supports the time assumed in the accident analysis for water injection into the reactor vessel under LOCA conditions.

   The proposed TS change to the maximum and minimum allowable voltages for the 4160 volt Emergency Bus Undervoltage (Degraded Voltage) affects the separation of an Emergency Bus that is experiencing degraded voltage from the offsite power system and the transfer to an emergency diesel generator. While the allowed voltage range is narrower, the function remains the same. The narrower voltage range has been analyzed and is needed to ensure spurious trips are avoided. The proposed change does not affect any accident initiators or precursors. As a result, the probability of any accident previously evaluated is not significantly increased.

   The consequences of any accident previously evaluated are not increased since the 4160 volt Emergency Bus Undervoltage (Degraded Voltage) relays will continue to meet their required function to transfer the 4160 volt Emergency Buses to the emergency diesel generators in the event of a degraded voltage condition on the offsite power supply. This transfer ensures that the electrical equipment is capable of performing its intended function to meet the requirements of the accident analyses.

The increase in the minimum EDG output voltage acceptance criterion value in TS 3.8.1 surveillance requirements does not adversely affect any of the parameters in the accident analyses. The change increases the minimum allowed EDG output voltage acceptance criterion to ensure that sufficient voltage is available to operate the required Emergency Safety Feature (ESF) equipment under accident conditions. The increase in the minimum allowed EDG output voltage in the TS surveillance requirements ensures that adequate voltage is available to support the assumptions made in the Design Bases Accident (DBA) analyses. DBA analyses assume that onsite standby emergency power will provide an adequate power source to operate safe shutdown equipment and to mitigate consequences of design bases accidents. This conservative change of the acceptance criterion enhances the testing requirements of the onsite emergency diesel generators and ensures the reliability of this power source. Changing the acceptance criterion does not affect the probability of evaluated accidents and it provides better assurance of EDG reliability in mitigating consequences of accidents.

Therefore, the proposed change does not involve a significant 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.

The proposed change does not affect any of the current degraded voltage logic schemes or any other equipment provided to mitigate accidents. It utilizes existing logic systems to isolate safety buses from the grid and re-power those safety buses using the onsite emergency power system. The change utilizes a narrower voltage range and a shorter time delay to ensure that in the case of a sustained degraded voltage condition concurrent with a LOCA signal, the safety electrical power buses will be transferred from the offsite power system to the onsite power system in a timely manner to ensure water is injected into the reactor vessel in the time assumed and evaluated in the accident analysis.

No new or different accidents result from the proposed change. The proposed TS change to the maximum and minimum allowable voltages for the 4160 volt Emergency Bus Undervoltage (Degraded Voltage) does not affect existing accident precursors or modes of operation nor does it introduce new ones. The relays will continue to detect degraded voltage conditions and transfer the Emergency Buses to their respective emergency diesel generators in time to ensure adequate voltage is available for proper safety equipment performance, and to prevent equipment damage. The function of the relays remains the same.

The change in the value of the minimum EDG output voltage acceptance criterion supports the assumptions in the accident analyses that sufficient voltage will be available to operate ESF equipment on the Class 1E buses when these buses are powered from the onsite emergency diesel generators. The maximum EDG output voltage of 4580 volts is not affected by this change. The change in the minimum EDG output voltage from 3873 to 3950 volts ensures the reliability of the onsite emergency power source.

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

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

The proposed change implements a new design for a reduced time delay to isolate safety buses from offsite power if a Loss of Coolant Accident were to occur concurrent with a sustained degraded voltage condition and uses a narrower voltage range for degraded bus undervoltage. This ensures that emergency core cooling system pumps inject water into the reactor vessel within the time assumed and evaluated in the accident analysis, consistent with the requirements of BTP PSB-1 Section B.1.b. and 10 CFR Part 50, Appendix A, General Design Criterion-17, "Electric Power Systems."

The proposed TS change to the maximum and minimum allowable voltages for the 4160 volt Emergency Bus Undervoltage (Degraded Voltage) will allow all safety loads to have sufficient voltage to perform their intended safety functions while ensuring spurious trips are avoided. Thus, the results of the accident analyses will not be affected as the input assumptions are protected.

The proposed TS change for the maximum allowable values for the 4160 volt Emergency Bus Undervoltage (Degraded Voltage) provides a greater margin between the predicted worst case transient voltages and the maximum reset value of the degraded voltage relays. This change increases the probability that the offsite power source remains available and connected to the auxiliary power system during postulated transients. The analytical limit voltage for the safety related 4160 volt buses is unchanged and the proposed TS changes for the minimum allowable values for the 4160 volt Emergency Bus Undervoltage (Degraded Voltage) still ensures that this limit is protected. This is consistent with the requirements of 10 CFR Part 50, Appendix A, General Design Criterion-17, "Electric Power Systems."

The proposed change in the minimum EDG output voltage acceptance criterion in TS 3.8.1 surveillance requirements does not affect the surveillance frequency or different testing requirements, only the acceptance criterion. The change provides a better assurance that the onsite power source is able to satisfy the design requirements assumed in the accident analyses to mitigate the consequences of design bases accidents.

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

Based on the above, Detroit Edison has determined that the proposed license amendment does not involve a significant hazards consideration.

5.2 Applicable Regulatory Requirements

10 CFR Part 50, Appendix A, General Design Criterion-17, "Electric Power Systems." 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 and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents. The NRR staff concluded that Fermi's degraded voltage protection scheme did not meet these requirements, and that the current design fails to meet the timing requirements in its accident analysis.

Revision 2 of the Standard Review Plan, NUREG-0800, dated July 1981, Branch Technical Positions (BTPs) of Appendix 8-A (PSB), contained BTP PSB-1, "Adequacy of Station Electric Distribution System Voltages," which presented guidance for an acceptable approach to design for degraded voltage conditions. Position B.1.b of BTP PSB-1 described a method acceptable to the NRC staff for how a design should respond to a LOCA that occurs during a degraded voltage condition. Specifically, after a sustained degraded voltage condition is sensed, the subsequent occurrence of a safety injection actuation signal should immediately separate the Class 1E distribution system from the offsite power system.

General Design Criterion No. 18, "Inspection and Testing of Electrical Power Systems," states, in part: "Electrical power systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features..."

Regulatory Guide 1.9, Revision 1 "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants," Section B, "Discussion," states, in part, "A diesel generator unit selected for use in an onsite electric power system should have the capability to (1) start and accelerate a number of large motor loads in rapid succession and be able to sustain the loss of all or any part of such loads and maintain voltage and frequency within acceptable limits, and (2) supply power continuously to the equipment needed to maintain the plant in a safe condition if an extended loss of offsite power occurs."

This proposed TS change does not affect the Fermi 2 compliance with these regulatory requirements as discussed in the Fermi 2 Updated Final Safety Analysis Report (UFSAR).

6.0 Environmental Considerations

Detroit Edison has reviewed the proposed change against the criteria of 10 CFR 51.22 for environmental considerations. The proposed change does not involve a significant hazards consideration, nor does it significantly change the types or significantly increase the amounts of effluents that may be released offsite. The proposed change does not significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, Detroit Edison concludes that the proposed change meets the criteria provided in 10 CFR 51.22(c)(9) for a categorical exclusion from the requirements for an Environmental Impact Statement or an Environmental Assessment.

Enclosure 3 to
NRC-10-0006

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

Response to Request for Additional Information (RAI) Regarding the Proposed License Amendment to Revise The Degraded Voltage Function Requirements of Technical Specification Table 3.3.8.1-1 to Reflect Undervoltage Backfit Modification

MARKED-UP TS PAGES

Affected Pages:

3.3-73
3.8-3
3.8-4
3.8-5
3.8-6
3.8-7
3.8-9

Table 3.3.8.1-1 (page 1 of 1)
Loss of Power Instrumentation

FUNCTION	REQUIRED CHANNELS PER BUS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. 4.16 kV Emergency Bus Undervoltage (Loss of Voltage)			
a. Bus Undervoltage	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(a)
b. Time Delay	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(b)
2. 4.16 kV Emergency Bus Undervoltage (Degraded Voltage)			
a. Bus Undervoltage	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(c)
b. Time Delay	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(d)
c. Time Delay (with LOCA)	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(e)

(a) Division I: ≥ 2972.3 V and ≤ 3093.7 V
Division II: ≥ 3016.4 V and ≤ 3139.6 V

(b) Division I: ≥ 1.9 sec and ≤ 2.1 sec
Division II: ≥ 1.9 sec and ≤ 2.1 sec

(c) Division I: ~~≥ 3873.0 V and ≤ 4031.0 V~~ ≥ 3904.4 V and ≤ 3944.8 V
Division II: ~~≥ 3628.0 V and ≤ 3776.0 V~~ ≥ 3659.4 V and ≤ 3699.8 V

(d) Division I: ≥ 41.8 sec and ≤ 46.2 sec
Division II: ≥ 20.33 sec and ≤ 22.47 sec

(e) Division I: ≥ 6.16 sec and ≤ 7.31 sec
Division II: ≥ 6.16 sec and ≤ 7.31 sec

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each offsite circuit.	7 days
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 steady state voltage ≥ ~~3873~~ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	31 days
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.	31 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each day tank contains ≥ 210 gal of fuel oil.	31 days
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	31 days
SR 3.8.1.6	Verify each fuel oil transfer system operates to automatically transfer fuel oil from storage tanks to the day tanks.	31 days
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 ≥ ~~3873~~ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ ~~3873~~ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	184 days
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.	18 months

(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.	18 months
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 ≥ 3873 V and ≤ 4580 V, 3950 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.	18 months

(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 ≥ 3873 V and frequency ≥ 58.8 Hz; b. Achieves steady state voltage ≥ 3873 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz; and c. Operates for ≥ 5 minutes.	18 months
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.	18 months

(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.	18 months
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 ≥ ~~3873~~ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ ~~3873~~ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	18 months

(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 ≥ ~~3875~~ 3950 V and ≤ 4580 V, 4. achieves steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	18 months
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.	10 years

Enclosure 4 to
NRC-10-0006

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

Response to Request for Additional Information (RAI) Regarding the Proposed License Amendment to Revise The Degraded Voltage Function Requirements of Technical Specification Table 3.3.8.1-1 to Reflect Undervoltage Backfit Modification

CLEAN TS PAGES

New Pages:

3.3-73
3.8-3
3.8-4
3.8-5
3.8-6
3.8-7
3.8-9

Table 3.3.8.1-1 (page 1 of 1)
Loss of Power Instrumentation

FUNCTION	REQUIRED CHANNELS PER BUS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. 4.16 kV Emergency Bus Undervoltage (Loss of Voltage)			
a. Bus Undervoltage	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(a)
b. Time Delay	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(b)
2. 4.16 kV Emergency Bus Undervoltage (Degraded Voltage)			
a. Bus Undervoltage	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(c)
b. Time Delay	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(d)
c. Time Delay (with LOCA)	4	SR 3.3.8.1.1 SR 3.3.8.1.2 SR 3.3.8.1.3	(e)

(a) Division I: ≥ 2972.3 V and ≤ 3093.7 V
Division II: ≥ 3016.4 V and ≤ 3139.6 V

(b) Division I: ≥ 1.9 sec and ≤ 2.1 sec
Division II: ≥ 1.9 sec and ≤ 2.1 sec

(c) Division I: ≥ 3904.4 V and ≤ 3944.8 V
Division II: ≥ 3659.4 V and ≤ 3699.8 V

(d) Division I: ≥ 41.8 sec and ≤ 46.2 sec
Division II: ≥ 20.33 sec and ≤ 22.47 sec

(e) Division I: ≥ 6.16 sec and ≤ 7.31 sec
Division II: ≥ 6.16 sec and ≤ 7.31 sec

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each offsite circuit.	7 days
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 steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	31 days
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.	31 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each day tank contains ≥ 210 gal of fuel oil.	31 days
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	31 days
SR 3.8.1.6	Verify each fuel oil transfer system operates to automatically transfer fuel oil from storage tanks to the day tanks.	31 days
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. Steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	 184 days
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.	18 months

(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.	18 months
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 ≤ 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.	18 months

(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 voltage ≥ 3950 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz; and c. Operates for ≥ 5 minutes.	18 months
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.	18 months

(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.	 18 months
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. Steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	 18 months

(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 ≤ 4580 V, 4. achieves steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	18 months
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.	10 years

Enclosure 5 to
NRC-10-0006

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

Response to Request for Additional Information (RAI)
Regarding the Proposed License Amendment to Revise
The Degraded Voltage Function Requirements of
Technical Specification Table 3.3.8.1-1
to Reflect Undervoltage Backfit Modification

MARKED-UP TS BASES PAGES
(For Information Only)

Affected pages:

B 3.3.8.1-5
B 3.8.1-8

No CHANGE THIS PAGE

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

1. 4.16 kV Emergency Bus Undervoltage (Loss of Voltage)

Loss of voltage on a 4.16 kV emergency bus indicates that offsite power may be completely lost to the respective emergency bus and is unable to supply sufficient power for proper operation of the applicable equipment. Therefore, the power supply to the bus is transferred from offsite power to EDG power when the voltage on the bus drops below the Loss of Voltage Function Allowable Values (loss of voltage with a short time delay). This ensures that adequate power will be available to the required equipment.

The Bus Undervoltage Allowable Values are low enough to prevent inadvertent power supply transfer, but high enough to ensure that power is available to the required equipment. The Time Delay Allowable Values are long enough to provide time for the offsite power supply to recover to normal voltages, but short enough to ensure that power is available to the required equipment.

Four channels of 4.16 kV Emergency Bus Undervoltage (Loss of Voltage) Function per associated emergency bus are only required to be OPERABLE when the associated EDG is required to be OPERABLE to ensure that no single instrument failure can preclude the EDG function. Refer to LCO 3.8.1, "AC Sources — Operating," and 3.8.2, "AC Sources — Shutdown," for Applicability Bases for the EDGs.

2. 4.16 kV Emergency Bus Undervoltage (Degraded Voltage)

A reduced voltage condition on a 4.16 kV emergency bus indicates that, while offsite power may not be completely lost to the respective emergency bus, available power may be insufficient for starting large ECCS motors without risking damage to the motors that could disable the ECCS function. Therefore, power supply to the bus is transferred from offsite power to onsite EDG power when the voltage on the bus drops below the Degraded Voltage Function Allowable Values (degraded voltage with a time delay). This ensures that adequate power will be available to the required equipment.

The Bus Undervoltage Allowable Values are low enough to prevent inadvertent power supply transfer, but high enough to ensure that sufficient power is available to the required equipment. The Time Delay Allowable Values are long enough

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

to provide time for the offsite power supply to recover to normal voltages, but short enough to ensure that sufficient power is available to the required equipment. ← INSERT

Four channels of 4.16 kV Emergency Bus Undervoltage (Degraded Voltage) Function per associated bus are only required to be OPERABLE when the associated EDG is required to be OPERABLE to ensure that no single instrument failure can preclude the EDG function. Refer to LCO 3.8.1 and LCO 3.8.2 for Applicability Bases for the EDGs.

ACTIONS

A Note has been provided to modify the ACTIONS related to LOP instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable LOP instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable LOP instrumentation channel.

A.1

With one or more channels of a Function inoperable, the Function may not be capable of performing the intended function (if LOP trip capability is lost, Condition B is also required to be entered). Therefore, 72 hours are allowed to restore the inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition B must be entered and its Required Action taken.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 72 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration of channels.

Insert

An additional time delay logic for degraded voltage (with LOCA) ensures a more rapid transfer of power from the offsite power system to the onsite power system if a LOCA condition is sensed during sustained degraded voltage. This additional logic ensures that the timing requirements in the accident analysis will be met under degraded voltage conditions.

BASES

ACTIONS (continued)

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition F for a period that should not exceed 12 hours. In Condition F, individual redundancy is lost in both the offsite electrical power system and the onsite AC electrical power system. Since power system redundancy is provided by two diverse sources of power, however, the reliability of the power systems in this Condition may appear higher than that in Condition E (loss of both required offsite circuits). This difference in reliability is offset by the susceptibility of this power system configuration to a single bus or switching failure. The 12 hour Completion Time takes into account the capacity and capability of the remaining AC sources, reasonable time for repairs, and the low probability of a DBA occurring during this period.

G.1 and G.2

If the inoperable AC electrical power sources cannot be restored to OPERABLE status within the associated Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are 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. 8). 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. 9), and Regulatory Guide 1.137 (Ref. 10), 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 ~~3875~~ 3950 V corresponds to ~~the Division I emergency bus degraded voltage minimum limit.~~ the most limiting voltage needed to supply Division I 480 V ESF Bus 72C under degraded voltage with LOCA conditions.

No change 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).

SR 3.8.1.1

This SR ensures proper circuit continuity for the offsite AC electrical power supply to the onsite distribution network and availability of offsite AC electrical power. The breaker alignment verifies that each breaker is in its correct position to ensure that distribution buses and loads are connected to their preferred power source and that appropriate independence of offsite circuits is maintained. The 7 day Frequency is adequate since breaker position is not likely to change without the operator being aware of it and because its status is displayed in the control room.

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.

Enclosure 6 to
NRC-10-0006

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

Response to Request for Additional Information (RAI)
Regarding the Proposed License Amendment to Revise
The Degraded Voltage Function Requirements of
Technical Specification Table 3.3.8.1-1
to Reflect Undervoltage Backfit Modification

ABB Bulletin 41-233S

ABB

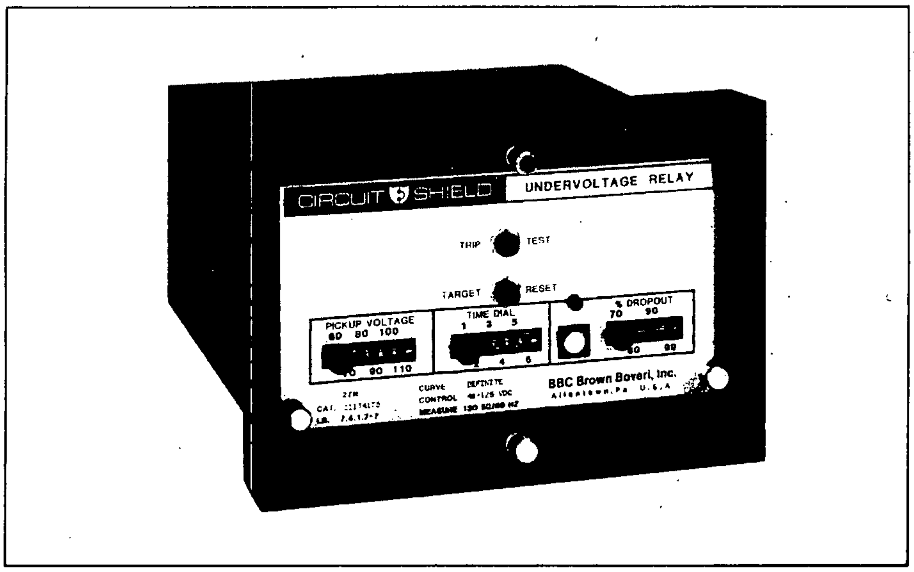
ABB Power T&D Company Inc.
Relay Division
Coral Springs, FL
Allentown, PA

September 1995
Supersedes Descriptive Bulletin 41-233S, pages 1-2, dated September 1990
Mailed to: E, D, C/41-200B

Highly Accurate
Device Number: 27 Undervoltage
Device Number: 59 Overvoltage

CIRCUIT SHIELD ®

Type 27N and 59N Undervoltage and Overvoltage Relay



Features

- Definite time or high speed
- Highly stable, accurate and repeatable characteristics
- Low burden
- UL recognized
- Seismic capability to 6g ZPA
- Transient immunity
- Drawout construction
- 2 year warranty

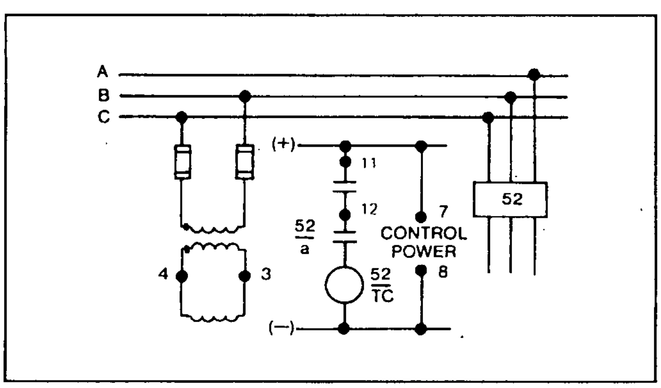
Application

The Type 27N and Type 59N Voltage Relays provide a wide range of protective functions, including undervoltage protection of motors, overvoltage protection, and automatic bus transfer. The Type 27N and Type 59N relays are primarily designed for those applications where exceptional accuracy, exceptional repeatability, and long term stability are important. In addition, inherently high seismic and transient immunity allow the use of these relays in generating stations or substations where the performance of electromechanical or other types of static relays is marginal.

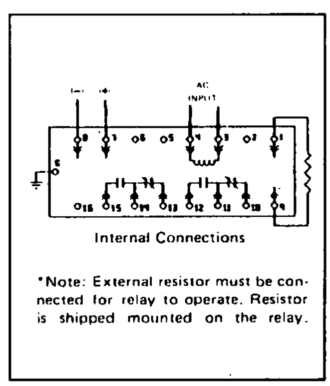
Both types have a dual nominal frequency rating of 50 or 60 Hz.

The unique design of the output circuit does not require seal-in contacts, allowing simplification of bus-transfer schemes. Operation indicators, however, are provided as standard features on all types.

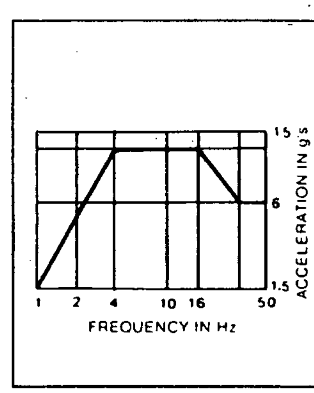
Harmonic distortion in the AC waveform can have a noticeable effect on the relay operating point and on measuring instruments used to set the relay. An internal harmonic filter module is available for those applications where waveform distortion is a factor.



Typical Circuit Shield Voltage Relay Application



Internal Connections



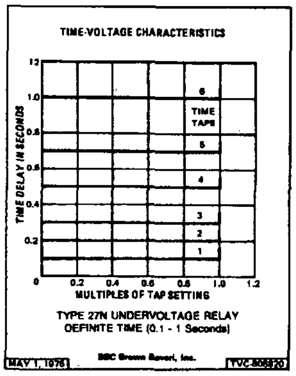
Typical Seismic Test Results

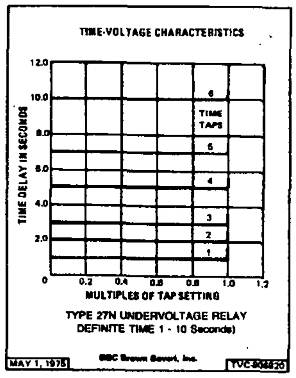
Specifications

Input Circuit Rating:	Type 27N 150 Vac Maximum Continuous Type 59N 160 Vac Maximum Continuous
Burden:	Less than 0.5 VA at 120 Vac
Frequency:	50/60 Hz.
Output Circuit:	Each contact at 125 Vdc: 30A Tripping Duty 5A Continuous 1A Break, Resistive 0.3A Break, Inductive.
Control Power:	Rated at 48/125, 250 Vdc at 0.05 ampere maximum.
Temperature:	ANSI range −20°C to +55°C Must operate −30°C to +70°C
Tolerances: (Without harmonic filter module, after 10 minute warm-up.)	Pickup and dropout settings with respect to printed dial markings (factory calibration) = ±2%. Pickup and dropout settings, repeatability at constant temperature and constant control voltage = ±0.1%. (See Note) Pickup and dropout settings, repeatability over DC control power range of 100-140 volts = ±0.1%. (See Note) Pickup and dropout settings, repeatability over temperature range: (See Note) −20°C to +55°C ±0.4% −20°C to +70°C ±0.7% 0°C to +40°C ±0.2% **Note:** The three tolerances shown should be considered independent and may be cumulative. Tolerances assume pure sine wave input signal. Time Delay Instantaneous model: 3 cycles or less operating time. Definite Time models (see appropriate curve). ±10% or ±20 milliseconds, whichever is greater.
Tolerances: (With harmonic filter module)	All ratings are the same except: Pickup and dropout settings, repeatability over temperature range: 0°C to +55°C ±0.75% +10°C to +40°C ±0.40% −20°C to +70°C ±1.50%
Reset Time:	Less than 2 cycles (Type 27N), Less than 3 cycles (Type 59N). (The relay resets when the input voltage goes above the pickup setting −27N, below the dropout setting −59N.)
Seismic Capability:	More than 6g ZPA either AXIS biaxial broadband multifrequency vibration without damage or malfunction ANSI/IEEE C37.98.
Transient Immunity:	More than 2500V, 1MHz bursts at 400 Hz repetition rate, continuous (ANSI C37.90.1 SWC); Fast transient test, EMI test.
Dielectric:	2000 Vac RMS 60 seconds all circuits to ground.
Weight:	Unboxed - 3.7 lbs. (1.7 kg) Boxed - 4.3 lbs. (2.0 kg) Volume - 0.26 cubic feet

How To Specify

Voltage Relay shall be Asea Brown Boveri Type 27N, Type 59N or approved equal, draw-out case, capable of withstanding up to 6g ZPA seismic stress without damage or malfunction, at minimum voltage and time settings. A magnetic operation indicator shall be provided which retains position on loss of control power. Built-in means shall be provided to allow operational tests without additional equipment.





Note: Time delays associated with the time taps for the Type 59N Overvoltage Relay are identical to those of the Type 27N Undervoltage Relay, except the delay occurs on pickup; i.e., when voltage increases to above the pickup tap setting.

How To Order

For a complete listing of available versions of single and three phase voltage relays see TD 41-025.

Models are available for 48 to 250 Vdc control power, and 120 Vac potential transformers. For other control voltages contact the nearest ABB Representative.

To place an order, or for further information, contact the nearest ABB Representative.

Further Information

List Prices: PL 41-020
Technical Data: TD 41-025
Instruction Book: IB 7.4.1.7-7
Other Protective Relays:
Application Selector Guide, TD 41-016

Printed in U.S.A.

September 1995
Supersedes Descriptive Bulletin 41-233S, page 3, dated September 1990
Mailed to: E, D, C/41-200B

High Accuracy

CIRCUIT SHIELD ®

Type 27N and 59N Undervoltage and Overvoltage Relay

Single-Phase Undervoltage Relays

Type	Max. Voltage Rating	Pickup Tap Range	Dropout Curve	Time	Range	Output Contacts	Internal Connections	① Control Voltage	Catalog Number
27N See Note 1	150V 50/60 Hz	60-110V	Definite	0.1-1 sec.	70-99% of pickup adjustable	2-C	16D211N	48/125 Vdc	411T6175
								48/110 Vdc	411T6105
								220 Vdc	411T6125
								250 Vdc	411T6155
				1-10 sec.				48/125 Vdc	411T4175
								48/110 Vdc	411T4105
								220 Vdc	411T4125
								250 Vdc	411T4155
				0.1-1 sec.	30-60% of pickup adjustable			48/125 Vdc	411T6275
								48/110 Vdc	411T6205
								220 Vdc	411T6225
								250 Vdc	411T6255
				1-10 sec.				48/125 Vdc	411T4275
								48/110 Vdc	411T4205
								220 Vdc	411T4225
								250 Vdc	411T4255
			Inst.	—				48/125 Vdc	411T0275
								48/110 Vdc	411T0205
								220 Vdc	411T0225
								250 Vdc	411T0255
					70-99% of pickup adjustable			48/125 Vdc	411T0175
								48/110 Vdc	411T0105
								220 Vdc	411T0125
								250 Vdc	411T0155
		70-120V						48/125 Vdc	411T0375
								48/110 Vdc	411T0305
								220 Vdc	411T0325
								250 Vdc	411T0355

Single-Phase Overvoltage Relays

Type	Max. Voltage Rating	Pickup Tap Range	Dropout Curve	Time	Range	Output Contacts	Internal Connections	Control Voltage	Catalog Number
59N See Note 1	160V 50/60 Hz	100-150V	Definite	0.1-1 sec.	70-99% of pickup adjustable	2-C	16D211N	48/125 Vdc	411U6175
								48/110 Vdc	411U6105
								220 Vdc	411U6125
								250 Vdc	411U6155
				1-10 sec.				48/125 Vdc	411U4175
								48/110 Vdc	411U4105
								220 Vdc	411U4125
								250 Vdc	411U4155
			Inst.					48/125 Vdc	411U0175
								48/110 Vdc	411U0105
								220 Vdc	411U0125
								250 Vdc	411U0155

① For other control voltages contact nearest ABB Representative.

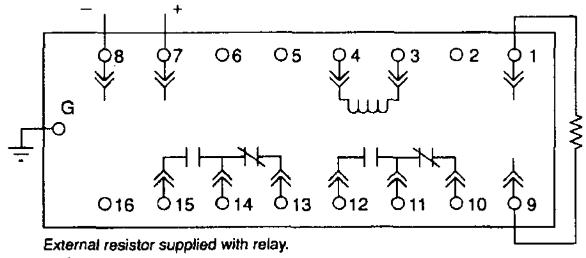
Note 1. Add suffix — HF to catalog number for harmonic filter module. Harmonic filter not available on instantaneous Type 27N relays.

To place an order, or for further information, contact the nearest ABB Representative.

Internal Connection Diagram

Note: Refer to Instruction Book IB 7.4.1.7-7 for contact logic data.
Instruction Book available upon request.

16D211N
Single-Phase Voltage Relays
Drawout Test Case



External resistor supplied with relay.

ABB Power T&D Company Inc.
Relay Division
4300 Coral Ridge Drive
Coral Springs, FL 33065
954-752-6700

ABB Power T&D Company Inc.
Relay Division
7036 Snowdrift Road, Suite 2
Allentown, PA 18106
610-395-7333

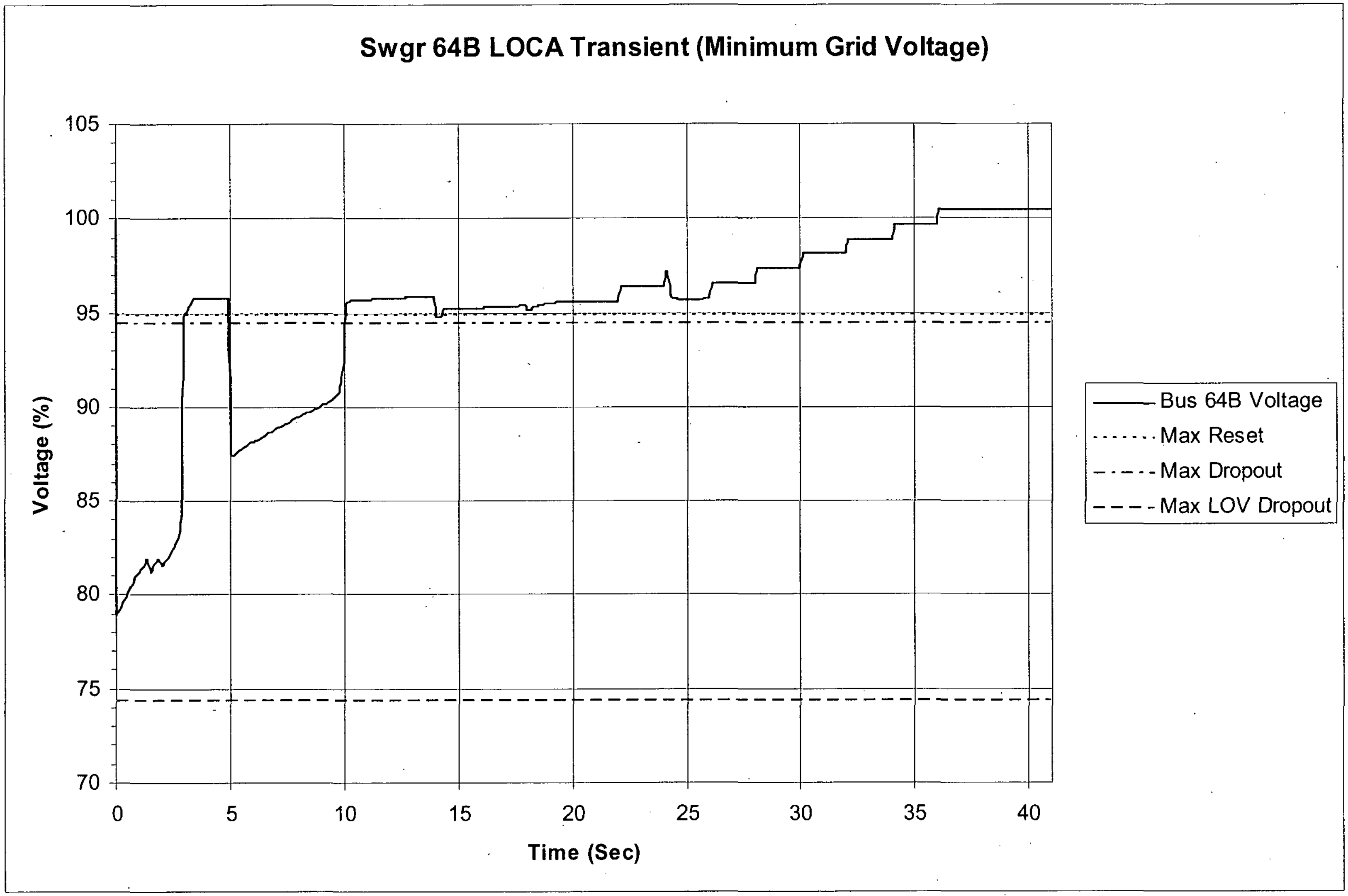
September 1995

Enclosure 7 to
NRC-10-0006

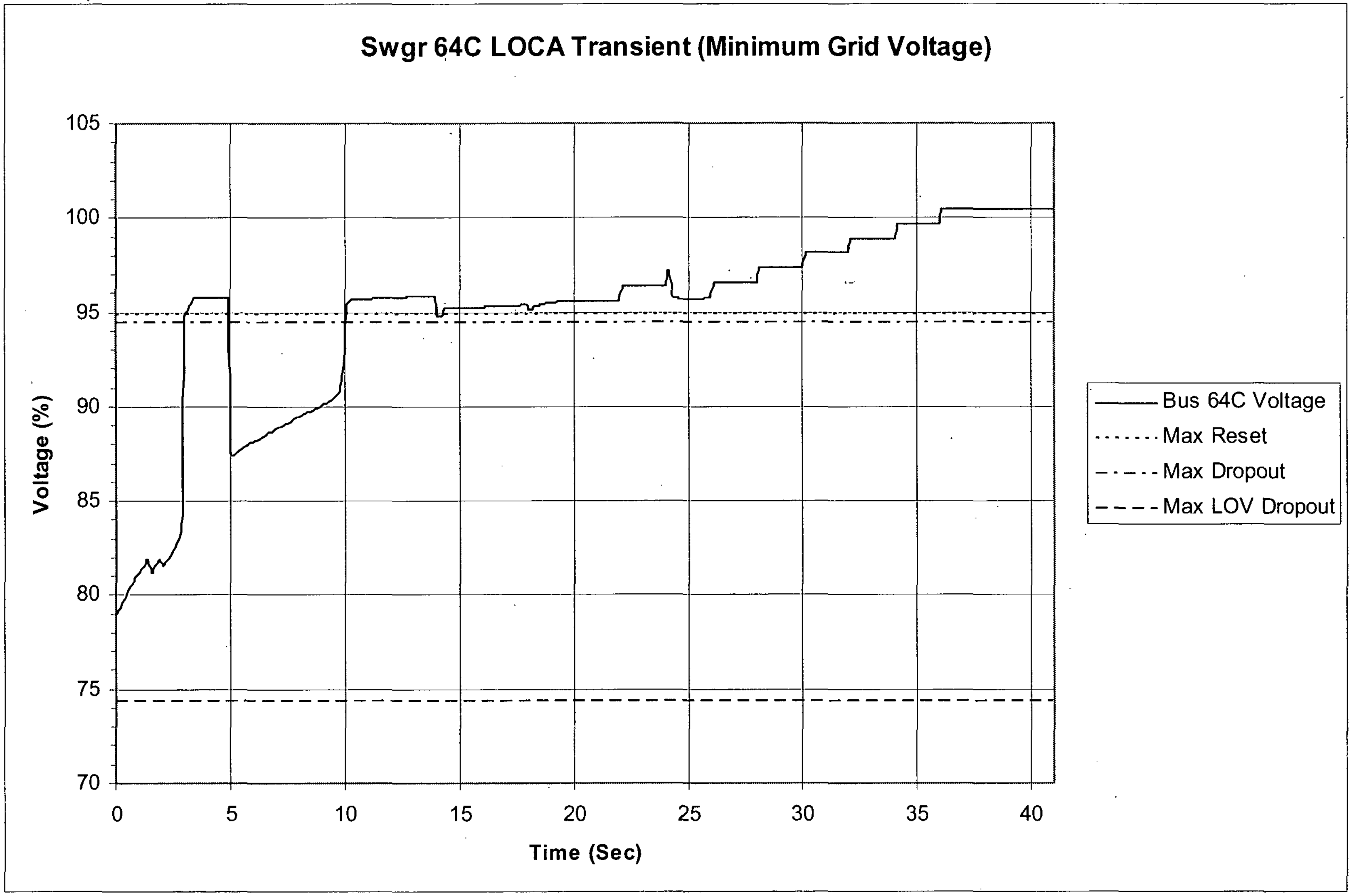
Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

Response to Request for Additional Information (RAI)
Regarding the Proposed License Amendment to Revise
The Degraded Voltage Function Requirements of
Technical Specification Table 3.3.8.1-1
to Reflect Undervoltage Backfit Modification

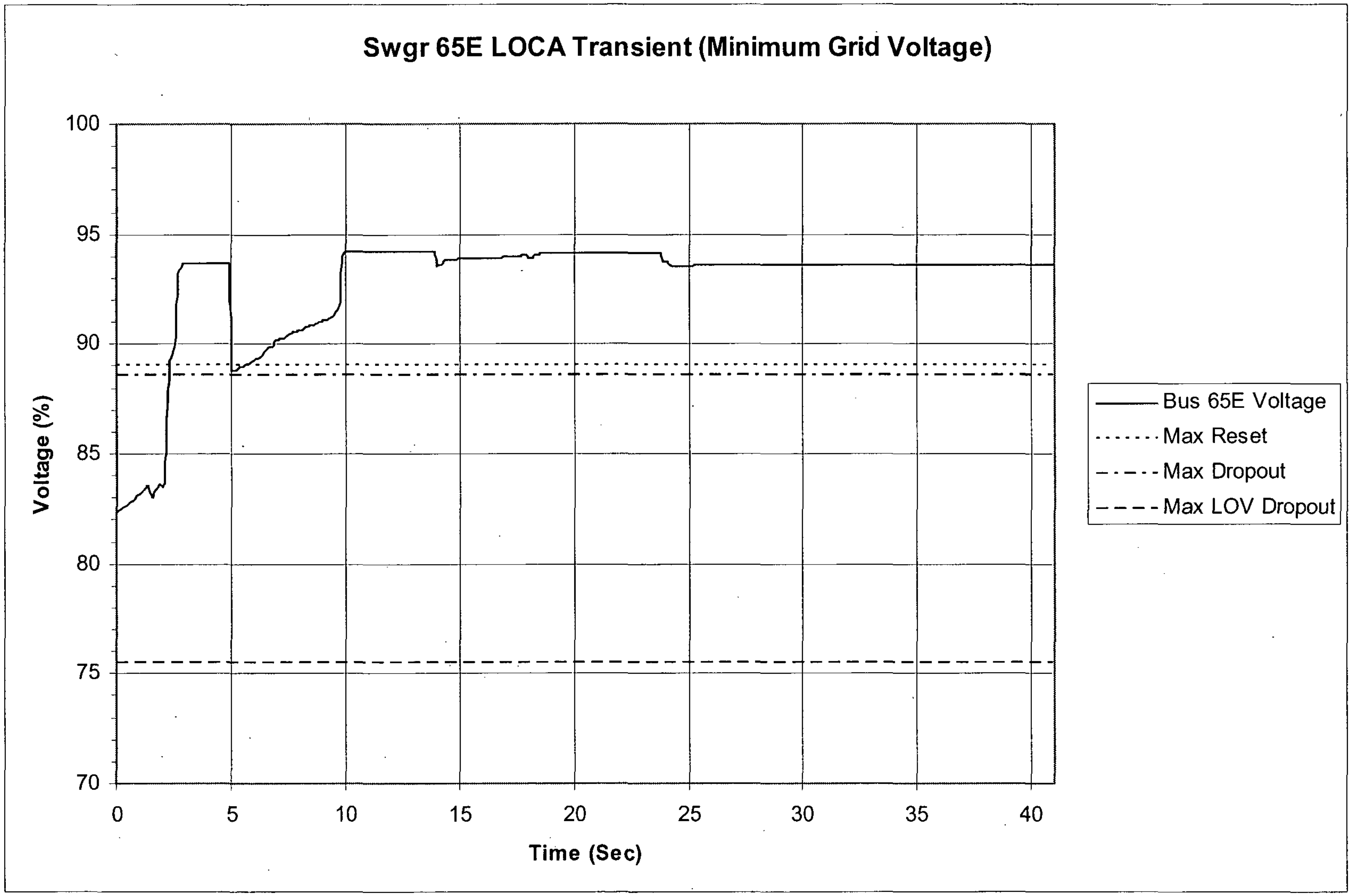
LOCA Voltage Transient Profiles



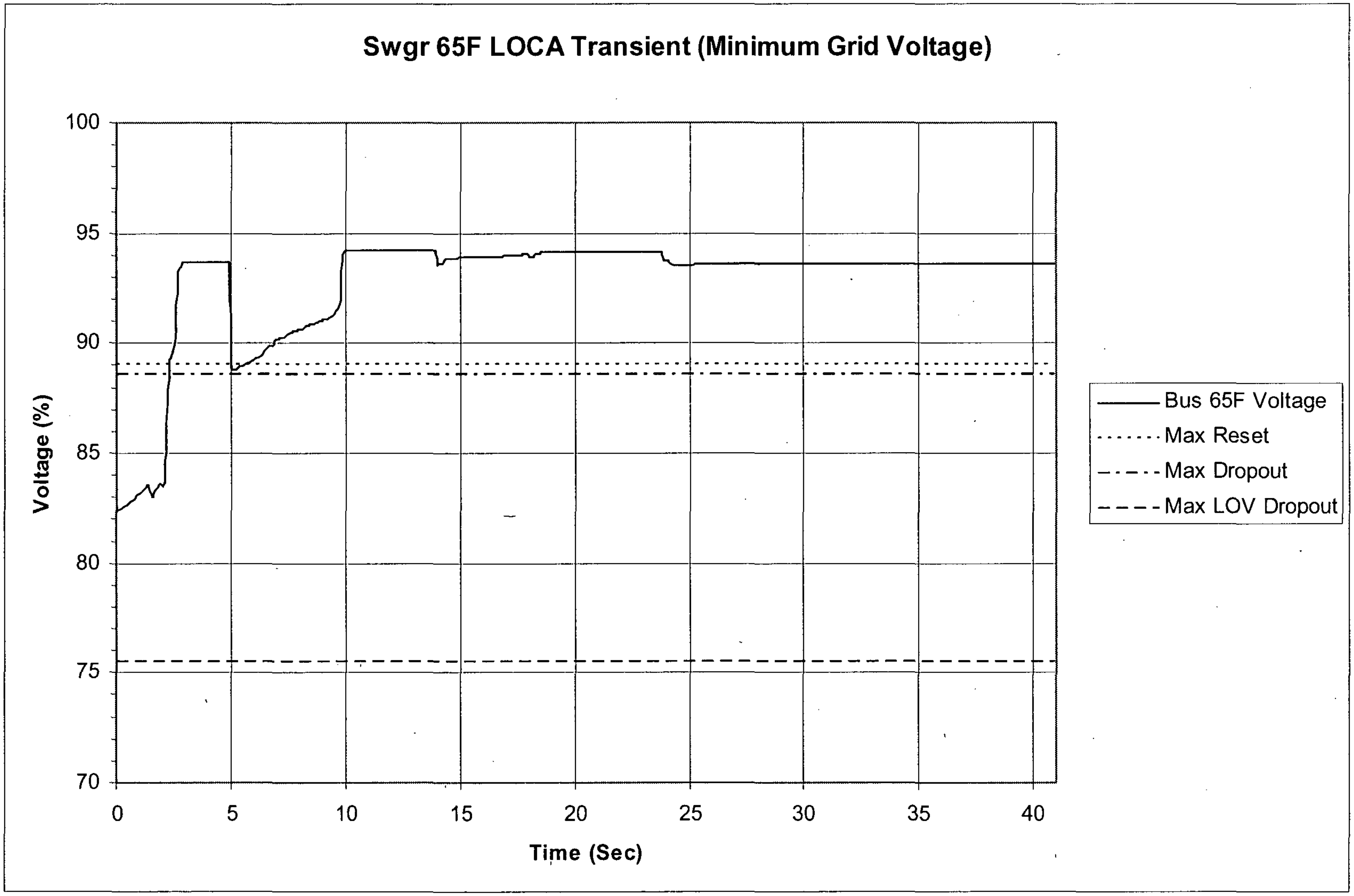
Swgr 64B LOCA Transient (Minimum Grid Voltage)
Voltage (%)
105
100
95
90
85
80
75
70
0
5
10
15
20
25
30
35
40
Time (Sec)
Bus 64B Voltage
Max Reset
Max Dropout
Max LOV Dropout



Swgr 64C LOCA Transient (Minimum Grid Voltage)
Voltage (%)
105
100
95
90
85
80
75
70
0
5
10
15
20
25
30
35
40
Time (Sec)
Bus 64C Voltage
Max Reset
Max Dropout
Max LOV Dropout



Swgr 65E LOCA Transient (Minimum Grid Voltage)
Voltage (%)
100
95
90
85
80
75
70
0
5
10
15
20
25
30
35
40
Time (Sec)
Bus 65E Voltage
Max Reset
Max Dropout
Max LOV Dropout



Swgr 65F LOCA Transient (Minimum Grid Voltage)
100
95
90
85
80
75
70
Voltage (%)
0
5
10
15
20
25
30
35
40
Time (Sec)
Bus 65F Voltage
Max Reset
Max Dropout
Max LOV Dropout