June 30, 2015

MEMORANDUM TO: Meena K. Khanna, Chief
Plant Licensing Branch IV-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: Jacob I. Zimmerman, Chief ***/RA/***
Electrical Engineering Branch
Division of Engineering
Office of Nuclear Reactor Regulation

SUBJECT: RIVER BEND STATION UNIT 1 – SAFETY EVALUATION INPUT REGARDING APPLICATION FOR CHANGE TO TECHNICAL SPECIFICATIONS 3.8.1, "AC SOURCES – OPERATING" (TAC NO. MF4421)

By letter dated July 9, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14212A396), Entergy Operations, Inc. (the licensee), requested an amendment to the River Bend Station Nuclear Generating Plant, Unit 1, Operating License NPF-47. The license amendment request (LAR) proposes to revise steady state voltage, frequency, and test load limits for Technical Specification Surveillance Requirements associated with diesel generators DG 1A, DG 1B, and DG 1C. By letter dated November 28, 2014 (ADAMS Accession No. ML14332A420) the staff requested additional information (RAI) and the licensee provided responses in letters dated February 24, 2015 (ADAMS Accession No. ML15168A234), and June 3, 2015 (ADAMS Accession No. ML15159A190). The supplemental information did not change the intent of the original amendment request.

The Electrical Engineering Branch (EEEB) staff reviewed the information provided in the LAR and RAI responses and concluded that the proposed amendment, as discussed in the enclosed safety evaluation (SE), is acceptable. This memorandum and the enclosed SE complete the EEEB staff's review and evaluation efforts for TAC Number MF4421.

Docket No. 50-458

Enclosure:
Safety Evaluation

Contacts: N.Otto, NRR/EEEB, (301) 415-6695
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*By E-Mail **OFFICIAL RECORD COPY**

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
ENHANCEMENTS TO DIESEL GENERATOR SURVEILLANCE REQUIREMENTS
ENTERGY OPERATIONS, INC.
RIVER BEND STATION, UNIT 1
TAC NO. MF4421
DOCKET NO. 50-458

1.0 INTRODUCTION

By letter dated July 9, 2014 (Agencywide Documents Access Management System (ADAMS) Accession No. ML14212A396), Entergy Operations, Inc. (the licensee) requested an amendment to the River Bend Station (RBS), Unit 1, Facility Operating License No. NPF-47. The proposed license amendment request (LAR) would revise the RBS Technical Specifications (TS) Surveillance Requirements (SRs) related to the steady state voltage, frequency, and test load limits for the emergency diesel generators (EDGs) DG 1A, DG 1B, and DG 1C.

The licensee proposed to modify the TS SRs 3.8.1.2, 3.8.1.3, 3.8.1.7, 3.8.1.10, 3.8.1.11, 3.8.1.12, 3.8.1.14, 3.8.1.15, 3.8.1.19 and 3.8.1.20 to revise the SR Acceptance Criteria Tolerance Band (ACTB). The licensee stated that the proposed changes will; lower the upper bound of the frequency SR ACTB, lower the upper bound of the voltage SR ACTB for DG 1A and DG 1B (existing DG 1C voltage SR ACTB is retained), and raise the lower bound of the test load SR ACTB.

Specifically, the following changes are proposed:

Frequency Steady State SR ACTB Changes

DG 1A and DG 1B
From: ≥58.8 Hz and ≤61.2 Hz [60.0 +/-1.2 Hz (+/-2.0%)]
To: ≥58.8 Hz and ≤ 60.2 Hz [59.7 +0.5 Hz / -0.9 Hz (+ 0.8% /-1.5%)]

DG 1C
From: ≥58.8 Hz and ≤61.2 Hz [60.0 +/-1.2 Hz (+/-2.0%)]
To: ≥58.8 Hz and ≤60.2 Hz [60.0 +0.2 Hz / -1.2 Hz (+ 0.3% /-2.0%)]

Voltage Steady State SR ACTB Changes

DG 1A and DG 1B
From: ≥3740 V and ≤4580 V [4160 +/-420V (+/-10%, rounded to +/- 420 V)]
To: ≥3740 V and ≤4368 V [4160 + 208V, - 420V (+5%, -10%, rounded to -420 V)]

DG 1C
No change from existing SR ACTB:
≥3740 V and ≤4580 V [4160 +/-420V (+/-10% rounded to +/- 420 V)]

Test Load Steady State SR ACTB Changes

DG 1A and DG 1B
From: ≥ 3000 kW and ≤ 3100 kW
To: ≥ 3050 kW and ≤ 3100 kW

DG 1C
From: ≥ 2500 kW and ≤ 2600 kW
To: ≥ 2525 kW and ≤ 2600 kW

By letters dated November 28, 2014 (ADAMS Accession No. ML14332A420) and may 4, 2015 (ADAMS Accession No. ML15124A793), the staff requested additional information (RAI) and the licensee provided responses to staff's questions in letters dated February 24, 2015 (ADAMS Accession No. ML15168A234), and June 3, 2015 (ADAMS Accession No. ML15159A190). The supplemental information did not change the intent of the original amendment request.

2.0 REGULATORY EVALUATION

The following U.S. Nuclear Regulatory Commission (NRC) requirements are applicable to the staff's review of the LAR:

General Design Criterion (GDC) 17, "Electric power systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, requires, in part, that nuclear plants have an offsite and onsite electric power system to permit functioning of structures, systems, and components important to safety. The safety function for each system 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 offsite power system is required to be supplied by two physically independent circuits that are designed and located so as to minimize, to the extent practical, the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. In addition, this criterion requires provisions to minimize the probability of losing electric power from the remaining electric power supplies as a result of loss of power from the unit, the offsite transmission network, or the onsite power supplies.

GDC 18, "Inspection and Testing of Electric Power Systems," requires, in part, that electric power systems important to safety shall be designed with a capability to periodically test the full operation sequence that brings the systems into operation, including operation of applicable portions of the protection system, and the transfer of power among the nuclear power unit, the offsite power system, and the onsite power system.

10 CFR, Part 50, Section 36, "Technical Specifications," requires that TS shall be included by applicants for a license authorizing operation of a production or utilization facility. The TS must include items in five specific categories related to station operation, as required by 10 CFR50.36(c). These categories are (1) safety limits, limiting safety system settings, and limiting control settings, (2) limiting condition of operations, (3) SRs, (4) design features, and (5) administrative controls. The proposed changes to the TS discussed in this safety evaluation

are within the SRs category. 10 CFR50.36(c)(3) requires that TSs include SRs, which are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.

NRC Regulatory Guide (RG) 1.9, Revision 2, dated December 1979, "Selection, Design, Qualification and Testing of Emergency Diesel Generators used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants," describes a method acceptable to the NRC staff for complying with the Commission's regulations with regard to design and testing of onsite EDG. The NRC staff recognizes that the licensee has used RG 1.9 Revision 2 as a guidance document. However, requirements for EDG slow starts were clarified in RG 1.9 Revision 4, dated March 2007, and the NRC staff has considered some pertinent sections of this revision for review of this LAR where no guidance was previously available.

3.0 TECHNICAL EVALUATION

3.1 RBS ELECTRICAL POWER SOURCES

The offsite and onsite power systems at RBS are designed to comply with the requirements of GDC 17 and GDC 18. The RBS alternating current (AC) electrical power sources consist of three EDGs that constitute the onsite standby Class 1E power sources and two offsite power sources. The RBS has two standby EDGs (DG 1A and DG 1B) that provide power to the emergency 4.16-kV buses and a high pressure core spray EDG (DG 1C). The Class 1E AC distribution system supplies electrical power to three divisional load groups, with each division powered by an independent Class 1E ESF bus. Each bus has two separate and independent offsite sources of power and a dedicated onsite EDG. The ESF systems of any two of the three divisions provide for the minimum safety functions necessary to shut down the unit and maintain it in a safe shutdown condition.

The onsite standby power source for each ESF bus is a dedicated EDG that starts automatically on a loss-of-coolant accident (LOCA) signal or an ESF bus degraded voltage or undervoltage signal. The onsite AC emergency power system has the required redundancy; meets the single-failure criterion; is testable; and has the capacity, capability, and reliability to supply power to all required safety loads. According to the RBS Updated Safety Analysis Report (USAR) the standby diesel generators DG1A and DG1B are manufactured by Transamerica Delaval, Inc. and have a continuous rating of 3500 kilo Watts (kW) and a 2 hour rating of 3850 kW. However, special requirements are imposed by the Facility Operating License for continuous operation of these two standby diesels above 3130 kW.

Standby diesel generator DG 1C supplies the High Pressure Core Spray (HPCS) Power Supply System and has a Stewart and Stevenson EMD 20645-E4 engine with a continuous 2,000-hr duty rating of 2850 kW. The HPCS EDG starts automatically on a LOCA signal from the plant protection system or undervoltage on the HPCS 4.16-kV bus and will be automatically connected to the HPCS bus when the plant preferred AC power supply is not available.

3.2 PROPOSED TS CHANGES

The licensee in its letter dated July 9, 2014, stated that the proposed change would revise the RBS TS SRs as follows:

SR 3.8.1.2 is being revised to verify that each DG starts from standby conditions and achieves:

a. For DG 1A and DG 1B, steady state voltage ≥ 3740 Volt (V) and ≤ 4368 V, and frequency ≥ 58.8 Hertz (Hz) and ≤ 60.2 Hz.

b. For DG 1C, steady state voltage ≥ 3740 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 60.2 Hz.

SR 3.8.1.3 is being revised to verify each DG operates for ≥ 60 minutes at a load ≥ 3050 kW and ≤ 3100 kW for DG 1A and DG 1B, and ≥ 2525 kW and ≤ 2600 kW for DG 1C.

SR 3.8.1.7 is being revised to verify that each EDG starts from a standby condition and achieves:

a. For DG 1A and DG 1B, steady state voltage ≥ 3740 V and ≤ 4368 V, and frequency ≥ 58.8 Hz and ≤ 60.2 Hz.

b. For DG 1C, the steady state voltage ≥ 3740 V and ≤ 4580 V, and steady state frequency ≥ 58.8 Hz and ≤ 60.2 Hz.

SR 3.8.1.10 is being revised to verify each DG operating at a power factor ≤ 0.9 does not trip and voltage is maintained ≤ 4784 V for DG 1A and DG 1B and ≤ 5400 V for DG 1C during and following a load rejection of a load ≥ 3050 kW and ≤ 3130 kW for DGs 1A and 1B and ≥ 2525 kW and ≤ 2600 for DG 1C.

SR 3.8.1.11 is being revised to verify on an actual or simulated loss of offsite power signal:

c. DG auto-starts from standby condition and:

3. maintains steady state voltage ≥ 3740 V and ≤ 4368 V for DG 1A and DG 1B and ≥ 3740 V and ≤ 4580 V for DG 1C,

4. maintains steady state frequency ≥ 58.8 and ≤ 60.2 Hz.

SR 3.8.1.12 is being revised to verify that on an actual or simulated Emergency Core Cooling System (ECCS) initiation signal each DG auto-starts from standby condition and:

c. Achieves steady state voltage $\geq$ 3740 V and $\leq$ 4368 V for DG 1A and DG 1B and $\geq$ 3740 V and $\leq$ 4580 V for DG 1C and frequency $\geq$ 58.8 and $\leq$ 60.2 Hz.

SR 3.8.1.14 is being revised to verify each DG operating at a power factor $\leq$ 0.9, operates for $\geq$ 24 hours:

a. For DG 1A and DG 1B loaded $\geq$ 3050 kW and $\leq$ 3130 kW

b. DG 1C for the remaining hours of the test loaded $\geq$ 2525 kW and $\leq$ 2600 kW.

SR 3.8.1.15 Notes 1 and SR 2 are being revised to:

Note 1. This surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated $\geq$ 1 hour loaded $\geq$ 3050 kW and $\leq$ 3100 kW for DG 1A and DG 1B, and $\geq$ 2525 kW and $\leq$ 2600 kW for DG 1C, or operating temperatures have stabilized, whichever is longer.

Verify each DG starts and achieves:

2. Steady state voltage $\geq$ 3740 V and $\leq$ 4368 V for DG 1A and DG 1B, and $\geq$ 3740 V and $\leq$ 4580 V for DG 1C, and frequency $\geq$ 58.8 Hz and $\leq$ 60.2 Hz.

SR 3.8.1.19 is being revised to verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ECCS initiation signal:

c. DG auto-starts from standby condition and:

3. Achieves steady state voltage $\geq$ 3740 V and $\leq$ 4368 V for DG 1A and DG 1B, and $\geq$ 3740 V and $\leq$ 4580 V for DG 1C,

4. Achieves steady state frequency $\geq$ 58.8 Hz and $\leq$ 60.2 Hz

SR 3.8.1.20 is being revised to verify when started simultaneously from standby condition, each DG achieves

2. Steady state voltage > 3740 V and < 4368 V for DG 1A and DG 1B and > 3740 V and < 4580 V for DG 1C and frequency > 58.8 Hz and < 60.2 Hz.

The LAR proposes more restrictive steady state voltage and frequency limits and test loads for the EDGs. The allowable voltage range is revised to within plus 5 percent and minus 10 percent of the nominal safety-related bus voltage of 4160V for DG 1A and DG 1B. The allowable voltage range for DG 1C is unrevised and is within 10 percent or minus

10 percent of the nominal safety-related bus voltage of 4160V. The frequency range is revised to plus 0.8 percent or minus 1.5 percent tolerance band around the nominal frequency of 60 Hz for starts of the EDGs 1A and 1B and plus 0.3 percent minus 2 percent for DG 1C.

3.3 EVALUATION

The licensee evaluated the consequences of EDG operation at the extremes of the proposed frequency limits on safe shutdown equipment. The licensee in LAR section 3.2.1, "DG 1A and DG 1B Technical Evaluation," stated in part that:

- "The new frequency nominal setpoint and upper limit have been evaluated, and no adverse effects have been identified with respect to the performance of the EDGs, EDG loads, mission time, or affected equipment. The engineering evaluation demonstrated that a decrease in EDG nominal frequency of 0.3 Hz (from 60 Hz to 59.7 Hz) would not prevent the safety related equipment from performing their design functions. Additionally, safety related motor operated valves would not exceed their maximum allowed stroke times if the EDG nominal frequency was reduced by 0.3 Hz, because the allowed stroke times are based on the minimum SR ACTB, which remains unchanged at 58.8 Hz."

- "Since the standby diesel generator nominal frequency is being reduced (from 60 Hz to 59.7 Hz), the "ready to load" speed setpoint above which the DG output breaker will close has been verified to be below the new nominal frequency of the generator set. Therefore, the EDG sets will be able to start and load at the new nominal frequency setpoint of 59.7 Hz."

The licensee in LAR section 3.2.2, "DG 1C Technical Evaluation," stated in part that:

- "Historical Plant Data System (PDS) frequency data for DG 1C surveillance tests from August through December of 2012 indicate that DG 1C starts and settles in at a steady state frequency of approximately 59.9 Hz. Combining the setpoint, 60.0 Hz, with the governor tolerance band (+/- 0.15 Hz) yields a bounding range of 59.85 Hz to 60.15 Hz, which is within the SR ACTB of 58.8 Hz to 60.2 Hz."

The licensee evaluated the consequences of EDG operation at the extremes of the proposed voltage limits on safe shutdown equipment. The licensee in LAR section 3.3.1, "DG 1A and DG 1B Technical Evaluation," stated in part that:

- "The voltage regulators are capable of maintaining the voltage within +/- 0.5% (+/- 21 V). The total loop uncertainty, including an allowance for meter reading is +/- 105 V. Combining the nominal voltage, 4160 V, with the regulator control (+/- 21 V) and total loop uncertainty (+/- 105 V), yields a range of 4034 V to 4286 V, which is within the SR ACTB of 3740 V to 4368 V."

The licensee in LAR section 3.3.2, “DG 1C Technical Evaluation,” stated that:

- The DG 1C voltage SR ACTB is retained unchanged. Therefore, a technical evaluation is not required.

The licensee evaluated the consequences of EDG operation at the extremes of the allowable frequency and voltage on EDG loading criteria and concluded that the test load had to be increased. The licensee in LAR section 3.4.1, “DG 1A, DG 1B Technical Evaluation,” stated in part that:

- “One result of increasing the minimum SR test load is to narrow the margin to the operating limit, 3130 kW indicated, from 130 kW (currently 3000 kW to 3130 kW) to 80 kW (proposed 3050 kW to 3130 kW). However, the 80 kW allowance is sufficient to ensure that controls currently in place can maintain the SR test load runs below the operating limit of 3130 kW indicated.”

The licensee in LAR section 3.4.2, “DG 1C Technical Evaluation,” stated in part that:

- “One result of increasing the minimum SR test load is to narrow the margin to the 2000 hr. rating, 2850 kW indicated, from 350 kW (currently 2500 kW to 2600 kW) to 325 kW (proposed 2525 kW to 2850 kW). However, the 325 kW allowance is more than sufficient to ensure that controls currently in place can maintain the SR test load runs below the 2000 hr. limit of 2850 kW indicated. The increases in the minimum EDG SR test loads do not affect the EDG capability to accept the loads in the accident analysis.”

The RBS USAR, section 8.3, “Offsite Power Systems,” states in part that the diesel generators are sized to accept full standby requirements and to ensure frequency and voltage stability during starting periods in accordance with RG 1.9, except for the HPCS diesel. RG 1.9, Position 4 Conformance: The design function of the HPCS diesel generator unit is considered to be a justifiable departure from strict conformance to RG 1.9, regarding voltage and frequency limits during the initial loading transient. The HPCS diesel generator loads consist of one large pump and motor combination (approximately 2,500 horsepower (hp)), one medium size pump (450 hp), and other miscellaneous loads; consequently, limiting the momentary voltage drop to 25 percent and the momentary frequency drop to 5 percent would not significantly enhance the reliability of HPCS operation”.

By letter dated November 28, 2014, NRC staff issued RAI to clarify information provided in the LAR and the licensee provided responses by letter dated February 24, 2015 RAI question 1, asked the licensee to clarify whether the minimum test Load Steady State SR ACTB loading for DG 1C was 2525 kW or 2530 kW because there was an inconsistency in pages of the LAR and the markups provided. In response to this RAI, the licensee indicated that the correct value was 2525 kW and provided the revised markup pages.

Section 2.3 of the LAR states in part that a NRC Component Design Basis Inspection (CDBI) identified that the EDG electrical load calculations did not account for the EDG frequency variation and, therefore, did not provide for the maximum expected load conditions.

RAI question 4 asked the licensee to confirm that the proposed minimum loading for DGs 1A, 1B (3050 kW) and 1C (2525 kW) envelop the maximum postulated loads on the respective DGs if they were operating at the proposed extremes of the allowable voltage and frequency during a design bases accident. In response to RAI question 4, by letter dated February 24, 2015, the licensee stated that the CDBI finding was documented in the River Bend corrective action program. As part of the corrective actions, the station diesel loading calculations were revised. The conclusions of the revised calculations confirm that the proposed minimum loading for the diesel generators envelop the maximum postulated loads on the respective DGs if they were operating at the proposed extremes of allowable voltage and frequency during a design basis accident. By letter dated May 4, 2015, the staff requested supplemental information about the documentation in the corrective action program. In response by letter dated June 3, 2015 the licensee provided the corrective action program information for staff review. Based on the information provided by the licensee, the staff concluded that the licensee had corrected EDG loading calculations to support the EDG operation at the allowable voltage and frequency range and finds the response acceptable.

In RAI question 5, the staff asked the licensee to confirm whether the updated EDG loading requirements will be included in the RBS USAR as stated in RBS LAR, Section 2.1. In response by letter dated February 24, 2015, the licensee stated that the affected RBS USAR pages were updated as a result of the updated EDG loading requirements but did not provide the markup pages. By letter dated May 4, 2015, the staff requested that the licensee provide the USAR pages. In response, by letter dated June 3, 2015 the licensee provided a copy of the marked up pages of the USAR. The staff has reviewed the changes of the USAR and found them to be satisfactory.

In RAI question 6, the staff asked the licensee to confirm that the voltage and frequency transient observed during a large motor start does not adversely impact any operating loads with the bus voltage and frequency at the minimum allowable values for DG 1C. In response to question 6, by letter dated February 24, 2015, the licensee stated in part the following:

> "High core spray (HPCS) diesel generator loads consist of one large pump and motor combination (approximately 2,500 HP), one medium size pump (450 hp), and other miscellaneous loads. The HPCS motor was tested with a reduced LRC voltage of 1830 (46%) and the reduced voltage LRC was 875.1 (111%) amps. The HPCS pump motor is capable of starting and accelerating load at 75% terminal voltage (3000V) applied. The 58.8Hz is 98% which is within the normal 5% frequency tolerance for induction motors. The service water pump (450 hp.) was purchased with a requirement for starting and accelerating the driven equipment with 70% of motor nameplate voltage at the motor terminals.
>
> The largest motor, 2500 HP is immediately loaded on the bus as soon as the diesel output breaker closes when the generator reaches rated voltage and speed. Review of the most recent ECCS LOCA Test for the HPCS diesel shows that the initial voltage transient envelopes the minimum allowable values. The voltage and frequency recover in less time than the voltage transient analyzed in the degraded voltage calculation, since multiple divisions are acting on the off-site source at the same time. During degraded voltage conditions the lower analytical limit for the Division III bus is 3650 V which is lower than the 3740 V minimum steady state voltage for the division III bus

> when connected to the grid. The degraded voltage calculation evaluates the operation of motor operated valves at the lower voltage and during a large motor starting transient."

Based on the explanation provided by the licensee, the staff has concluded that the frequency and voltage transients associated with the large HPCS motor will not adversely impact other operating equipment associated with the HPCS electrical system.

In RAI question 7a, the staff asked the licensee to explain the impact of EDGs operating at the lower end of allowable frequency on flow rates for critical pumps assumed in accident analysis. In response to question 7a, by letter dated February 24, 2015, the licensee explained that the core cooling analysis was reviewed and determined that the Low Pressure Core Spray pump and Residual Heat Removal pumps have a flow margin greater than 10%. The diesel generator operation at 58.8 Hz was evaluated in an Engineering Change package. By letter dated May 4, 2015, the staff requested that the licensee provide the relative Engineering Change package information associated with this amendment. In response by letter dated June 3, 2015 (ADAMS Accession ML15159A190) the licensee provided a copy of the relative Engineering Change package information regarding this amendment referenced. Based on the response provided by the licensee stating that there was adequate margin between the evaluated flow rates at lower EDG frequency and required accident flow rates and margin available in the design of heat removal pumps, the staff agrees that the proposed lower range of the EDGs is acceptable.

In RAI question 7b, the staff asked the licensee to explain the impact of change in pressure for systems with motors operating at the higher allowable frequency. In response to question 7b, by letter dated February 24, 2015 the licensee stated that there is no detrimental impact on the systems with motors operating at the higher allowable frequency. The staff finds this response acceptable as the minor change in fluid pressure will not adversely impact piping systems.

In RAI question 7c, the staff asked the licensee to explain the impact of change in stroke time for critical motor operated valves when the DGs are operating at the lower allowable frequency. In response to RAI question 7c, by letter dated February 24, 2015 the licensee explained that the impact of increased valve stroke time caused by a decrease in motor speed due to lower than nominal EDG frequency had been evaluated for critical valves and concluded that there was sufficient margin between the maximum allowable stroke time and the calculated new stroke time. Based on the licensee's response, the staff has concluded that the lower DG frequency will not adversely affect the valve performance and therefore finds the response acceptable.

In RAI question 7d, the staff asked the licensee to explain the impact of the change in torque when the EDGs are operating at the lower allowable voltage and frequency. In response to RAI question 7d, by letter dated February 24, 2015 the licensee explained that for HPCS motor (largest motor), the maximum torque occurs at approximately 92.5% (1665 rpm). The actual motor torque is dependent on its load so the pump speed-torque curves for the large injection pump show that for a 2% reduction in speed the torque is reduced by approximately 5%. This is typical for the other large injection pumps. Therefore the torque is adequate since the motors are sized to provide adequate torque at 75% voltage. The staff finds that the response is

acceptable based on the margin between the design capability of large motors and the nominal reduction in torque due to frequency and voltage variation.

In question 8, the staff asked the licensee to explain why SRs 3.8.1.2 and 3.8.1.7 have allowable values of 5400 V and 66.75 Hz for DG 1C when it starts. These values are greater than a +/- 10% withstand voltage allowable for most equipment. The staff also asked the licensee to confirm that these allowable values do not have an adverse impact on safety related equipment. In response to question 8, by letter dated May 7, 2015 the licensee explained that Technical Specification Task Force -163 Revision 2 eliminated the maximum voltage and frequency limits from the start test and that this was previously approved by NRC via amendment No. 165 dated August 11, 2009 (RBC-50735). Also, since SRs 3.8.1.2 and 3.8.1.7 are manual starts, the EDG would reach steady state prior to loading, so there would not be any impact on the safety related loads. The staff agrees that manual starts of the EDGs should not result in high bus voltages.

4.0 CONCLUSION

The Licensee has evaluated the impact of TS allowable EDG voltage, frequency and test load on safe shutdown equipment. For DG 1A and DG 1B, the licensee evaluated the impact of voltage variation in the range $\geq$3740 V and $\leq$4368 V and frequency variation in the range $\geq$58.8 Hz and $\leq$ 60.2 Hz. For DG 1C, the licensee evaluated the impact of voltage variation in the range $\geq$3740 V and $\leq$4580 V and frequency variation in the range $\geq$58.8 Hz and $\leq$60.2 Hz. For DG 1A and DG 1B, the licensee has also evaluated the impact of the EDG test load variation in the range $\geq$3050 kW and $\leq$3100 kW and in the range $\geq$2525 kW and $\leq$2600 kW for DG 1C. The staff has reviewed the licensee's proposed TS changes and supporting documentation for performance of equipment at allowable extremes of frequency and voltage. Based on the evaluation discussed above, the Electrical Engineering Branch staff determined that the proposed amendment, related to the allowable steady state operating voltage and frequency band of the DGs, is consistent with the recommendations of the NRC guidance in RG 1.9 Rev. 2. The staff also concludes that the proposed TS change maintains compliance with requirements in GDC 17 and 18 governing the design and operation of the onsite electrical power systems and provides reasonable assurance of system operability. Therefore, the staff finds the proposed changes acceptable and consistent with the NRC Regulations and the Regulatory Guidance.

Principal Contributor: Ngola Otto

Date: June 30, 2015