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Todd Brumfield
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RBG-47565

May 7, 2015

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Response to Request for Information - Change to Technical Specification 3.8.1, "AC Sources – Operating"
River Bend Station, Unit 1
Docket No. 50-458
License No. NPF-47

References
1. Entergy letter, Application for Change to Technical Specification 3.8.1, "AC Sources – Operating" dated July 9, 2014 (RBG-47461)
2. NRC email, River Bend Station Unit 1 License Amendment Request for Change to Technical Specifications 3.8.1, "AC Sources - Operating" (MF4421) dated January 20, 2015

Dear Sir or Madam:

In Reference 1 Entergy submitted a request for an amendment to the Technical Specifications (TS) for River Bend Station (RBS), Unit 1, modifying the existing Surveillance Requirements (SRs) related to Technical Specification 3.8.1, "AC Sources – Operating." In Reference 2 the NRC Staff requested additional information to continue their review of the request.

Attachment 1 provides a response to the NRC request for additional information and Attachment 2 provides the revised Technical Specification pages as discussed in Attachment 1.

Please contact Mr. J. A. Clark at (225) 381-4177, if you have any questions.

A001
NRR

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 7, 2015.

Sincerely,

NTB/JAC/bmb

Attachments:
1. Response to Request For Information
2. Revised Technical Specification Pages

cc: Regional Administrator
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RBF1-15-0068
LAR 2014-02

Attachment 1

RBG-47565

Response to Request For Information

By letter dated July 9, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14212A396), Entergy Operations Inc. (Entergy, the licensee) submitted a license amendment request (LAR) for River Bend Station (RBS) Unit 1. Entergy submitted a license amendment request (LAR) to modify the Surveillance Requirements (SR) related to Technical Specification (TS) 3.8.1, "AC [Alternating Current] Sources – Operating." The proposed changes will lower the upper bound of the frequency SR Acceptance Criteria Tolerance Band (ATCB), lower the upper bound of the voltage SR ACTB for diesel generator (DG) 1A and DG 1B, and raise the lower bound of the test load SR ACTB. The US Nuclear Regulatory Commission (NRC) staff has reviewed the July 9, 2014, submittal and has determined that the following additional information is required to complete its review of the amendment request:

1. In the RBS LAR, Attachment 1, on pages 2, 3, 4, and 10 of 16, for DG 1C Entergy proposed a new minimum Test Load Steady State SR ACTB loading of 2525 kW. However, in the markups for the TS changes for the SRs in Attachment 2 on pages 3.8-6, 3.8-8, 3.8-11, and 3.8-12, the number is 2530 kW. Please clarify the discrepancy in the different values for DG 1C.

Response:

The markups for the TS changes for the SRs 3.8-6, 3.8-8, 3.8-11, and 3.8-12 are corrected to 2525 kW.

2. In RBS LAR, Attachment 3, the licensee provided the TSs Bases markups for TS 3.8.1, "AC Sources – Operating" Surveillance Requirements (SR) 3.8.1.2, 3.8.1.3, 3.8.1.7, and 3.8.1.14. The proposed changes affect TS 3.8.1, SR 3.8.1.2, SR 3.8.1.3, SR 3.8.1.7, SR 3.8.1.10, SR 3.8.1.11, SR 3.8.1.12, SR 3.8.1.14, SR 3.8.1.15, SR 3.8.1.19, and SR 3.8.1.20. While the NRC staff does not review TS bases, please explain why the submittal did not identify TS bases changes in all affected SRs.

Response:

The changes to the Tech Spec sections were limited to revising the EDG loading values, voltages, and operating frequency. These parameters are not specified in all the current bases sections and were therefore unaffected.

3. In the RBS LAR, Section 2 states "Proposed Technical Specification pages are provided in Attachment 4." However, Attachment 4 includes a list of Regulatory Commitments. Please update the LAR and provide the proposed information.

Response:

The proposed Technical Specification pages are already provided in Attachment 2. The sentence stating "Final Technical Specification pages are provided in Attachment 4" is deleted.

4. In RBS LAR, Section 2.3 states that in the course of an NRC Component Design Basis Inspection (CDBI), it was found 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. Please confirm that the proposed minimum loading for DGs 1A, 1B (3050kW) and 1C (2525kW) envelop the maximum postulated loads on the respective DGs if they were operating at the proposed extremes of voltage and frequency during a design bases accident.

Response:

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 voltage and frequency during a design basis accident.

5. In RBS LAR, Section 2.1 states in part that "these changes will align the SR ACTBs with updated EDG electrical loading calculations." Please confirm if the updated EDG loading requirements will be included in the RBS USAR.

Response:

The affected RBS USAR pages were updated as a result of updated EDG loading requirements.

6. The NRC staff notes that the minimum voltage (3740 V) and frequency (58.8 Hz) requirements for DG 1C during the start are not being revised by the LAR. DG 1C is referred to as the high pressure core spray (HPCS) diesel generator in the USAR. The NRC staff also notes that Updated Safety Analysis Report (USAR) Table 1.8-1 documents an exception to Regulatory Guide 1.9, Position 4 Conformance. The USAR notes:
The design function of the HPCS diesel generator unit is considered to be a justifiable departure from strict conformance to Regulatory Guide 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 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.

Assuming the bus voltage and frequency at the minimum allowable values, please confirm that the voltage and frequency transient observed during a large motor start, does not adversely impact any operating loads.

Response:

As noted above, 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 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 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 MOVs at the lower voltage and during a large motor starting transient.

7. The RBS LAR section 3.2.1 states "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." Please provide the following information as pertains to performance of safety related equipment required to respond at the onset of an accident:

a. Please explain any impacts due to change in flow rates for critical pumps when the motors are operating at the lower frequency. Include the flow rates assumed in accident analyses.

Response:

A reduction in AC motor power supply frequency results in a proportional reduction in motor speed. According to the Affinity Laws ($Q_1/Q_2 = N_1/N_2$, where Q = flow rate and N = pump shaft speed, impeller diameter is constant), centrifugal pump flow is proportional to pump speed, and a reduction in AC power supply frequency results in a linear reduction in flow. Thus, the reduction in frequency from 60 Hz to 58.8 Hz is a 2% reduction in frequency and equates to a 2% reduction in flow. Diesel generator operation at 58.8Hz was evaluated in the Engineering Change package (EC). The core cooling analysis was reviewed in attachment 9.9 of the EC and determined that the low pressure core spray pump and residual heat removal pumps have a flow margin greater than 10%. It was judged to be approximately twice the margin required to allow for EDG operation at 58.8HZ and the measurement uncertainties in the PUMP inservice test acceptance limits in SR 3.5.1.4.

EC also notes that after reduction in flow for 58.8 Hz for auxiliary building drain pumps, fuel pool cooing pumps, standby liquid control system (SLCS) pumps, and

standby service water pumps still have adequate margin remaining. Review of the head-capacity curve for the HPCS pump shows that the design flow requirements are satisfied with a 2% reduction in flow. The latest quarterly surveillance test shows that the HPCS pump achieved a flow rate of 5050 gpm (minimum required of ≥5010 gpm) at a discharge pressure of 454.8 psid (within an acceptance range of ≥415 to ≤471.6 psid).

For the positive displacement SLCS pumps, a reduction in frequency from 60 to 58.8 Hz results in an approximate 0.8 gpm reduction in flow. Performance of the last surveillance test showed flow rates of 44.3 and 44.1 gpm at 1250 psig discharge pressure. A reduction of 0.8 gallon would result in the flow rates being well above the required minimum of ≥ 41.2 gpm per RBS Surveillance Requirement (SR) 3.1.7.7.

b. Please explain any impacts due to change in pressure for systems when the motors are operating at the higher allowable frequency.

Response:

According to the Affinity Laws for centrifugal pumps, the change in developed head due to speed change can be determined from the equation: $H_1/H_2 = (N_1/N_2)^2$ where H = pump head and N = pump shaft speed (impeller diameter remains constant). Thus, the change in pump head is equal to the square of change in pump shaft speed resulting from the change in AC motor power supply frequency.

The existing maximum EDG frequency (61.2 Hz) increase would result in an increase of 4.04% in pressure for a centrifugal pump. The HPCS pump is protected by an over-frequency relay to prevent over-speed, and the impact of its setpoint has been analyzed in RBS calculations . A review of Line Designation Tables (LDT) for safety related systems show that there is approximately 17% margin between the system operating pressure and the system design pressure for RHR and approximately 87% for low pressure core spray. For HPCS, the LDT shows a 2.6% margin between the operating pressure and the design pressure. However, the HPCS pump discharge piping was hydrostatically tested at 1.5 times the design pressure; thus, there is approximately a 54% margin between the system operating pressure and the test pressure value. Therefore, there is no detrimental impact on the systems due to operating at the higher allowable frequency.

In addition, the change made by the EC will decrease the upper allowable generator frequency, i.e., the higher allowable frequency was lowered. This lowers the upper limit on pump discharge head and is a conservative change with respect to adverse impacts on system pressure (i.e. over-pressurization).

For the SLCS pump, the vendor manual shows pump flow rate varies little with changes in differential pressure. As pressure increases, the flow rate decreases at a relatively small amount. SR 3.1.7.7, Standby Liquid Control System requires verification of a minimum flow rate of ≥ 41.2 gpm at a discharge pressure ≥ 1250 psig to ensure that pump performance has not degraded. The pumps are tested quarterly in accordance with the STP to verify the acceptance criteria are satisfied.

c. Change in stroke times for critical motor operated valves when the DGs are operating at the lower allowable frequency. Please include a summary of stroke times assumed in accident analyses and validated during the last surveillance test. Explain if the DG voltage and frequency variations observed during DG sequencing were considered in evaluating valve stroke times.

Response:

The valve stroke times are directly affected by reducing the DG governor frequency setpoint from 60 Hz to 59.7 Hz. This modification results in MOV stroke times being slightly longer. The MOV motor start/stop and surveillance test data reports for the MOVs evaluated in the Division I and II DG Loading Calculation were reviewed. The effect on stroke times as a result of the frequency change is ((60 – 59.7) Hz/60 Hz) x 100 = 0.5 %. Since AC motor speed varies directly with AC frequency, the reduction in frequency results in a proportional reduction in motor speed and a proportional increase in stroke time, which was added to the tested stroke time. The new tested stroke time and the design stroke time provided in the MOV specifications were then compared to the maximum stroke time allowed by the surveillance test procedures to verify that sufficient margin exists. The adjusted tested stroke times for all of the MOVs considered are less than the maximum stroke time allowed. Thus, the increased valve stroke time caused by a decrease in motor speed due to lower than nominal Diesel Generator frequency will not adversely affect the valve performance. It should also be noted that, as shown in the motor performance curves for motor operated valves, the motors for MOVs are designed such that torque increases as the speed decreases.

The minimum analytical limit for the safety related 4160 VAC buses is lower than the lowest steady state voltage allowed when the diesels are the source. This lower voltage was considered in calculating the MOV stroke times.

Therefore, the modification does not adversely impact MOV functions.

d. The change in torque when the DGs are operating at the lower allowable voltage and frequency.

Response:

Motor torque is proportional to motor horse power (HP) divided by motor speed (RPM). Since RPM is proportional to frequency, a change from 60 Hz to 58.8 Hz would result in a 2.0% reduction in speed (60 - 58.8/60 x 100%). For the 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 pumps show for a 2.0 % reduction in speed the torque is reduced 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.

As noted in the motor performance curves for motor operated valves , the MOV motors are designed such that torque increases as the speed decreases. Therefore,

the change in frequency results in a slightly lower running speed, which results in a slightly longer stroke time, but also a slightly higher running torque.

8. The NRC staff notes that 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% allowable for most equipment to withstand. Please confirm that these allowable values do not have an adverse impact on safety related equipment.

Response:

The NRC staff and the industry have reviewed and resolved similar issue on a generic basis via TSTF-163 Rev 2, which eliminated the maximum voltage and frequency limits from the start test. This was previously approved by NRC via amendment No. 165 dated August 11, 2009 (ML092010370). The voltage and frequency range currently specified above are transient limits. SRs 3.8.1.2 and 3.8.1.7 are manual starts of the diesel. The diesel has reached steady state prior to closing the generator output breaker, so no safety related equipment is subject to a transient with the stated limits. Note these values are not in SR 3.8.1.11, SR 3.8.1.12, 3.8.1.15, and 3.8.1.19, which are starts with an automatic closing of the output breaker. In addition, the HPCS pump is protected by a frequency relay set at 63Hz, which functions to prevent generator damage due to engine over speed if the manual governor is set too high when operating the pump under diesel power only.

Therefore these limits do not have an adverse impact on safety related equipment.

Attachment 2

RBG-47565

Revised Technical Specification Pages

3.8-6
3.8-8
3.8-11
3.8-12

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.3	----------NOTES---------- 1. DG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients outside the load range do not invalidate this test. 3. This Surveillance shall be conducted on only one DG at a time. 4. This SR shall be preceded by, and immediately follow, without shutdown, a successful performance of SR 3.8.1.2 or SR 3.8.1.7 ---------- Verify each DG operates for ≥ 60 minutes at a load ≥ ~~3000~~ 3050 kW and ≤ 3100 kW for DG 1A and DG 1B, and ≥ ~~2500~~ 2525 kW and ≤ 2600 kW for DG 1C.	31 days
SR 3.8.1.4	Verify each day tank contains ≥ 316.3 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 the fuel oil transfer system operates to automatically transfer fuel oil from the storage tank to the day tank.	31 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.9	----------NOTE---------- 1. Credit may be taken for unplanned events that satisfy this SR. 2. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.9 ---------- Verify each DG rejects a load greater than or equal to its associated single largest post accident load and following load rejection, the engine speed is maintained less than nominal plus 75% of the difference between nominal speed and the overspeed trip setpoint or 15% above nominal, whichever is lower.	24 months
SR 3.8.1.10	----------NOTE---------- Credit may be taken for unplanned events that satisfy this SR. ---------- 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 ≥ ~~3030~~ 3050 kW and ≤ 3130 kW for DGs 1A and 1B and ≥ ~~2500~~ 2525 kW and ≤ 2600 kW for DG 1C.	24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.13	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, or 3. (Not applicable to DG 1C) However, credit may be taken for unplanned events that satisfy this SR. ---------- Verify each DG's automatic trips are bypassed on an actual or simulated ECCS initiation signal except: a. Engine overspeed; and b. Generator differential current.	 24 months
SR 3.8.1.14	----------NOTES---------- 1. Momentary transients outside the load and power factor ranges do not invalidate this test. 2. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify each DG operating at a power factor ≤ 0.9, operates for ≥ 24 hours: a. For DG 1A and DG 1B loaded ≥ ~~3030~~ 3050 kW and ≤ 3130 kW; and b. For DG 1C: 1. For ≥ 2 hours loaded ≥ 2750 kW and ≤ 2850 kW, and 2. For the remaining hours of the test loaded ≥ ~~2500~~ 2525 kW and ≤ 2600 kW.	 24 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.15	----------NOTES---------- 1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 1 hour loaded ≥ ~~3000~~ 3050 kW and ≤ 3100 kW for DG 1A and DG 1B, and ≥ ~~2500~~ 2525 kW and ≤ 2600 for DG 1C, or operating temperatures have stabilized, which ever is longer. Momentary transients outside of the load range do not invalidate this test. 2. All DG starts may be preceded by an engine prelube period. ----------	
	Verify each DG starts and achieves: 1. In ≤ 10 seconds for DG 1A and DG 1B and ≤ 13 seconds for DG 1C voltage ≥ 3740 V and frequency ≥ 58.8 Hz, and 2. Steady state voltage ~~≥ 3740 V and ≤ 4580~~ a) > 3740 V and < 4368 V for DG 1A and DG 1B b) > 3740 V and 4580 V for DG 1C ~~V~~ and frequency ≥ 58.8 Hz and ≤ ~~61.2~~ 60.2 Hz.	24 months
SR 3.8.1.16	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, or 3. (Not applicable to DG 1C) However, credit may be taken for unplanned events that satisfy this SR. ----------	
	Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to ready-to-load operation.	24 months