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RBG-46051

December 17, 2002

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

SUBJECT: River Bend Station
Docket No. 50-458
License No. NPF-47
Supplement to License Amendment Request (LAR) 2002-08, "Division 1, 2, and 3 Degraded Voltage Set Point Revision due to Updated Calculations and Installation of Improved Relays"

REFERENCE: Letter from Entergy Operations, Inc to NRC dated May 14, 2002, (RBG-45936)

Dear Sir or Madam:

In the referenced letter Entergy Operations, Inc. (Entergy) proposed a change to the River Bend Station (RBS) Technical Specifications (TSs) related to degraded voltage relay allowable values. On October 24, 2002, Entergy received questions from your staff that need formal response. Entergy's response is contained in Attachment 1.

In addition, the referenced letter requested approval of the change to the TSs by January 30, 2003, with implementation of the change prior to the restart from the Spring 2003 refueling outage (RF11). This schedule was requested to allow pre-outage preparation activities for the change, with actual plant modifications (relay replacement) to be implemented during RF11. During detailed planning and engineering, it was determined that the modifications requiring the TS change could be performed on-line, rather than during an outage. Based on this fact, Entergy requests that the approval and implementation schedule be revised

Entergy requests that the amendment be re-scheduled for NRC approval by January 17, 2003, with implementation prior to November 30, 2003. This approval date is needed to meet the planned on-line implementation schedule for Division 1 that begins the week of January 20, 2003. The requested implementation period will allow for flexibility in the modification schedule for each divisional relay modification.

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The requested implementation period will also allow for phased, divisional implementation of the modification to the degraded voltage relays and allowable values. RBS will issue the amendment to the controlled Technical Specifications after receiving approval from NRC. At that time, the degraded voltage relays for the three divisions will be operable with the allowable values approved prior to this amendment. Upon completion of the relay replacement modification for each division, operability will be restored using the revised allowable values as requested and approved for this amendment. Once the modifications are completed for the three divisions, each division will be operable using the revised allowable values.

There are no technical changes proposed by this change to the implementation schedule. The original no significant hazards considerations included in the referenced letter is not affected by any information contained in this letter.

This letter includes one new commitment as summarized in Attachment 2.

If you have any questions or require additional information, please contact David Lorfing at (225) 381-4157.

I declare under penalty of perjury that the foregoing is true and correct. Executed December 17, 2002.

Sincerely,

RJK/DNL

cc: U. S. Nuclear Regulatory Commission
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NRC Senior Resident Inspector
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Attachment 1

To

RBG-46051

Response to Request for Additional Information

Response to Request for Additional Information Related to LAR 2002-08, Degraded Voltage Set Points

1. **Question:** On Page 3 of Attachment 1 to the amendment request dated May 14, 2002, it states:

> Because all Class 1E motors were purchased to be capable of starting and accelerating their driven equipment with motor terminal voltages of 70 or 80 percent of motor nameplate voltage without affecting performance or equipment life, no operability concerns existed for any equipment with the exception of motor operated valves governed by GL 89-10.

This statement seems to be contradicted by the statement on Page 6 of Attachment 1 that states:

> In addition, all other loads were determined to have adequate voltage to operate once minor modifications to certain 120 volt loads are performed during RF11.

The NRC Inspection Report finding quoted on Page 3 of Attachment 1 also states:

> The non-conservative voltage assumption resulted in overestimating the minimum voltage available for motor-operated valves and other loads on the safety-related 480 Vac buses.

What are the minor modifications that will be made to certain 120 volt loads during RF11? What other non-MOV loads on the 480 Vac buses were affected by the original non-conservative voltage assumption? Were any concerns identified with steady-state operation of electric equipment due to low voltages?

Response:

Three instrumentation circuits will be transferred from one 120 volt panel board to another safety related panel of the same division to provide additional voltage (due to transformer tap differences). The remaining loads on the original panel have adequate voltage to function. The instrumentation was determined to be operable in the degraded grid condition after discussions with the instrumentation manufacturer. River Bend Station (RBS) decided to transfer the loads to comply with normal design practices.

All other 480 volt loads were potentially impacted by the non-conservative voltage assumption since the exact bus voltages were not known until completion of the degraded voltage calculation. The motors had a 10% tolerance on a 460 nameplate voltage allowing operation down to 414 volts. Most non-motor loads were purchased to operate at 480 volts -15%, +10%, (a 408 volt minimum voltage). This is lower than the calculated values used for the MOV motors ranging from 423 to 440 volts which were based on a 0.95 per unit grid voltage with LOCA loading. Thus adequate margin was assumed to exist for the remainder of the 480 volt loads.

When the degraded voltage calculation was completed, it provided analysis and justification that adequate voltage exists for operation of all the required loads.

2. **Question:** In the amendment two different voltages are specified for the River Bend minimum grid voltage. Page 4 of Attachment 1 states:

> Technical Specification Bases criteria for the Maximum Degraded Bus Voltage Allowable Values requires a voltage low enough to prevent inadvertent power supply transfer. The initial conditions assumed in these calculations are grid voltage at the design minimum value . . . .

The "design minimum value" used in the above referenced calculations is 0.95 per unit (218.5 kV) as stated on Page 5 of Attachment 1. Page 5 also states that calculations were performed at a minimum value of 220 kV, as referenced in USAR Section 8.2.1. USAR Section 8.2.1.1.1 states:

> Voltage on the bus is a nominal 230 kV, with a maximum rating of 242 kV and a minimum rating of 220 kV.

There is a conflict between the "design minimum value" of 218.5 kV referenced on Page 5 of Attachment 1 and the "minimum rating of 220 kV" referenced in USAR Section 8.2.1.1.1. Please clarify why two minimum ratings are specified, and what distinguishes one rating from the other. What is the typical seasonal minimum grid voltage? What is the seasonal minimum grid voltage during a particularly severe season?

Response:

The license basis minimum grid voltage is 220 kV as approved in the SER (NUREG-0989). The 218.5 kV voltage (0.95 per unit) is a more conservative value initially used in the RBS design basis as the minimum anticipated value.

The latest grid study shows the minimum grid voltage condition should be 1.008 per unit under 2003 spring light load conditions with RBS off line. Under double contingency conditions the grid drops to 0.989 per unit (loss of Fancy Point to Big Cajun 1 - 230 kV line plus contingency in base case). The 2005 peak load conditions result in a grid voltage of 1.016 per unit with RBS off line. The base case scenario also assumed the 500/230 kV auto transformer at Fancy Point substation was switched off. The house loads for RBS included all the motors on buses that have the 1250 horse power (hp) motors, with one 1250 hp motor in the locked rotor condition This case envelopes the LOCA motor sequencing event.

Therefore for the extreme loading conditions, the minimum grid voltage of 220 kV was used in the calculation of the degraded voltage relay reset points to avoid extreme conservatism. Industry guidance in IEEE STD 741 allows use of the minimum grid voltage based off-site power system studies. RBS elected not to change the license basis minimum grid voltage based on the off-site system study to ensure adequate margin is maintained to envelope future grid studies.

3. **Question:** Page 5 of Attachment 1 indicates that at 220 kV and maximum postulated non-safety 4160 volt bus load (including both heater drain pumps) on Preferred Station Transformer RTX-XSR1D, inadvertent power supply transfer of Divisions 2 and 3 will

occur following a LOCA. Entergy's solution for this is to revise the alarm response procedures to ensure that Preferred Station Transformer RTX-XSR1D is supplying no more than three 1250 HP motors with the grid voltage below the main control room Low-Low Grid Voltage alarm of 221.95 kV. The main control room alarm, however, is likely reading the existing grid voltage. If the River Bend generator is helping to support grid voltage, the generator trip that follows a LOCA during this period may result in a grid voltage that is less than the required 220.524 kV. The alarm that is required, therefore, should be a contingency alarm that identifies the grid voltage that will exist following the generator trip. This alarm typically is available in the transmission system operator's control room, from a contingency analysis program. Please describe how notification will be provided to the River Bend control room operator when the contingency post-River-Bend-Generator-trip grid voltage is below the required value of 220.524 kV.

Response:

The grid is very stiff at RBS. A current stability study shows the impact of the loss of RBS at 1130MW with LOCA motor sequencing would only cause a change in voltage at the off-site source of 0.69 kV assuming 2002 peak loading. The loss of RBS alone results in a change of 0.667 kV. Thus the required pre-fault voltage of 220.524 +0.69kV (or 221.214 kV) is less than the existing alarm point of 221.95 kV. The alignment of four 1250 hp motors to the bus supplying Division III is an extremely rare condition, likely only when a complete 4160 volt non-safety bus is out of service. This worst case loading includes maximum loading of the buses. The normal lineup would have only two 1250 hp motors aligned to the bus supplying Division III.

RBS Operations is proactive and contacts the system dispatcher when the initial low grid voltage alarm comes in at 0.98 per unit or 225 kV. This would be an abnormal condition.

The latest grid study was preformed to determine the impact of various contingencies on the RBS off-site sources. The base scenario for steady state analysis considered the RBS generator off line, the 230/500 kV auto transformer at Fancy Point switched off, and peak loading on 4160 volt buses with the largest motor in locked rotor condition (this was determined to be more conservative than the LOCA motor sequencing case). Eleven double contingencies were studied including the loss of each transmission line out of Fancy Point, and the loss of five nearby generation plants. The latest grid study shows the minimum grid voltage condition should be 1.008 per unit under 2003 spring light load conditions (worse than the 2005 summer peak case) with RBS off line. Under double contingency conditions the grid drops to 0.989 per unit with the loss of the Fancy Point to Big Cajun 1 - 230 kV line under 2005 summer peak conditions, and to 0.991 per unit with the loss of four Big Cajun 230 kV units. All other double contingencies resulted in Fancy Point voltages over 1.00 per unit. Therefore the voltage contribution of RBS is not determined to be significant in holding up the Fancy Point voltage. A review of historical data over the last year shows RBS normally supplies 150 to 175 MVAR with peaks up to approximately 319 MVAR for short periods.

RBS has evaluated INPO SOER 99-01 and has implemented the following in response to recommendations to 1.a and 1.b:

The President and Senior Vice President/COO of Entergy Operations, Inc. (EOI) and the Vice President of Transmission signed a letter of understanding outlining the

responsibilities of both EOI and Grid Transmission Maintenance Organization (GTMO). Specific actions of the letter which are now in effect include how to communicate activities in switchyards, how to schedule work activities, the use of preferred crews to perform work, recognizing the unique operating restrictions for nuclear plants, and training for GTMO on Operating Experience. The transmission grid operator will provide affected nuclear plants early warning of potential or developing grid instabilities. Actions also included putting the specific actions detailed in the letter in an EOI Nuclear Management Manual procedure (PL-158) addressing switchyard and transformer yard maintenance and switching operations and GTMO developing a transmission standard establishing standard practices for coordinating maintenance and switching operations with nuclear plants.

Per corporate policy, messages are sent to Plant Managers / Operations Managers as necessary regarding system load, grid conditions, and potential problems. The status reports provide the operators with sufficient warning of grid conditions.

It is unlikely RBS would experience any more severe grid problems than the double contingencies already studied. If such conditions did arise they would be notified by the grid operators of the severely degraded conditions, and would be able to take appropriate actions.

Entergy will evaluate the adequacy of the low grid voltage alarm set point and the degraded voltage relay set points following completion of future grid stability studies. If the set points are found inadequate, actions will be taken to revise the set points. This will ensure that grid conditions do not degrade beyond those assumed in the current set point calculations without appropriate indication to plant operators.

4. **Question:** As a follow-on to Question 2 above, it appears that when Preferred Station Transformer RTX-XSR 1C is supplying maximum postulated non-safety 4160 V bus load (including both heater drain pumps) inadvertent power supply transfer of Divisions 1 and 3 will occur following a LOCA when the grid voltage is somewhere between 220 kV and 218.5 kV (.95 per unit). Please provide that value of grid voltage. Also, describe how notification will be provided to the River Bend control room operator when the contingency post-River-Bend-Generator-trip grid voltage is below that value, in order to allow the operator to reduce 1250 hp load.

Response:

The inadvertent power supply transfer of Division 1 may occur following a LOCA when the grid voltage is approximately 219.466 kV (.9542 per unit) and Division 3 (if Division I has not transferred) may occur following a LOCA when the grid voltage is approximately 219.006kV (.9522 per unit). There is sufficient margin between the Lo-Lo Grid Voltage Alarm (at 221.95 kV) and the post-RBS Generator trip grid voltage under this lineup. Thus the existing alarm can provide the notification to the operator to transfer or trip the 1250 hp load.

5. **Question:** There is a value of grid voltage below which the safety systems will not perform properly to mitigate the consequences of a LOCA, even given the operator

actions to reduce the 1250 HP motor load specified in questions 3 and 4 above. Please provide that value. Notification should be provided to the River Bend control room operator when the contingency post-River-Bend-Generator-trip grid voltage is below that value. Please verify that this is the case and that the off-site power system will be declared inoperable when the notification is received.

Response:

To reach the minimum dropout values of the degraded voltage relays with the proposed setpoints, the grid voltage would have to drop to 215.119 (0.9353 per unit) for Division I and 215.096 (0.9352 per unit) for Division II and Division III with three 1250 hp pumps on the bus supplying Division III. All required equipment was reviewed to ensure it would be able to perform its safety function at this voltage level. In the normal line-up of RBS with two 1250 hp pumps per bus, the grid would have to drop even lower to reach the minimum evaluated safety bus voltage. Sustained operation of the bus at levels below 0.95 per unit is not deemed credible since generators are only rated for a voltage variation of ± 5%. Thus operation of nearby generation at less than 95% voltage would cause greater than 105% current flow. The generators would have to reduce power to operate at the lower voltage to prevent overheating of the generator. This power reduction would further degrade the grid. Fancy Point substation, the RBS off-site source is in the middle of the Entergy grid. The transmission group, in order to maintain 0.95 per unit voltage at all points on the transmission grid, has to keep the Fancy Point voltages at a higher voltage.

6. **Question:** On Page 6 of Attachment 1 under Minimum Allowable Voltage Basis, the total loop uncertainty for the degraded voltage protection is given in what appears to be grid voltage units (22.9 kV and 23.4 kV). For the nominal 230 kV grid at River Bend the uncertainty amounts to approximately 10 percent. This number appears high. Please provide the calculation for the degraded voltage setpoint, uncertainties, and allowable values.

Response:

The values on page 6 have a typographical error in the voltage units. The total loop uncertainty is 22.9 and 23 4 volts (not kV) on the 4160 volt buses. This is approximately 0.5%. This would equate to less than 1.3 KV on the 230 kV level. The uncertainty and setpoint calculations were prepared using the methodology of GE NEDC 31336 October 1986 "GENERAL ELECTRIC INSTRUMENT SETPOINT METHODOLOGY," which has been approved by the NRC.

The relays have a reset differential of approximately 18.7 volts on the 4160 volt bus basis. The loop accuracy (not including drift) is 20.54 volts for Division I and II and 22.67 volts for Division III at the 4160 volt bus.

Attachment 2

RBG-46051

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Entergy will evaluate the adequacy of the low grid voltage alarm set point and the degraded voltage relay set points following completion of future grid stability studies. If the set points are found inadequate, actions will be taken to revise the set points. This will ensure that grid conditions do not degrade beyond those assumed in the current set point calculations without appropriate indication to plant operators.		X	