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SUBJECT: Responds to NRC 920618 ltr re violations noted in insp repts 50-259/92-15,50/260/92-15 & 50-296/92-15 on 920420-920522. Corrective actions:plant procedures revised.

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O. J. "Ike" Zeringue
Vice President, Browns Ferry Operations

JUL 20 1992

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of	)	Docket Nos. 50-259
Tennessee Valley Authority	)	50-260
		50-296

BROWNS FERRY NUCLEAR PLANT (BFN) - NRC INSPECTION REPORT 50-259, 260, 296/92-15 - REPLY TO NOTICE OF VIOLATION (NOV) AND ELECTRICAL DISTRIBUTION SYSTEM FUNCTION INSPECTION (EDSFI) TEAM FINDINGS

This letter provides TVA's reply to the NOV and EDSFI team findings transmitted by letter from A. F. Gibson to M. O. Medford dated June 18, 1992. In this letter, NRC cited TVA with a violation involving a failure to adequately implement design requirements in operating procedures.

Enclosure 1 to this letter provides TVA's "Reply to the Notice of Violation" (10 CFR 2.201). Enclosure 2 provides TVA's response to EDSFI team findings. Enclosure 3 provides a list of commitments made by TVA in response to the EDSFI team findings.

If you have any questions regarding this response, please telephone Raul R. Baron at (205) 729-7566.

Sincerely,

O. J. Zeringue

Enclosures
cc: See page 2

DEDI 1/1

U.S. Nuclear Regulatory Commission

JUL 20 1992

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ENCLOSURE 1

Tennessee Valley Authority

Browns Ferry Nuclear Plant (BFN)

Reply to Notice of Violation (NOV)

Inspection Report Number
50-259, 260, 296/92-15

VIOLATION

"During an NRC inspection conducted on April 20-May 22, 1992, a violation of NRC requirements was identified. In accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions," 10 CFR Part 2, Appendix C (1990), the violation is listed below:

10 CFR 50 Appendix B, criterion III and the licensee's accepted Nuclear Quality Assurance Plan 89-A, Revision 2, Section 7.0 collectively specifies that measures shall be established to assure that appropriate quality standards are specified and included in design documents and that deviation from such standards are controlled.

Licensee calculation ED-Q2000-870026, "4.16 kV and 480 V Busload and Voltage Drop Calculations with Offsite Power", Revision 9, demonstrates that adequate safety system operation is only possible when the Unit Station Service load tap changer selector switch is monitoring the winding supplying the shutdown board.

Technical Specification 6.8.1 states in part that adequate procedures will be implemented covering safety-related activities.

Contrary to the above, the licensee failed to adequately implement design requirements in Switchyard Operating Procedure 6055 and General Operating Procedure 0-G01-3001. These procedures specified that the most heavily loaded winding should be monitored, which could be the winding supplying non-essential loads. If the tap changer was not monitoring the winding supplying the shutdown board when a Loss of Coolant Accident (LOCA) occurs, the tap changer would not properly respond to the voltage drops resulting from LOCA load sequencing. This could result in actuation of the undervoltage protection scheme which would isolate the preferred (offsite) source from the shutdown boards.

This is a Severity Level IV violation (Supplement I)."

1. Reason for the Violation

This violation was caused by an ineffective corrective action for Licensee Event Report (LER) 50-259/91007. Specifically, a procedure revision issued to resolve the concern did not give consideration to every condition that could result in actuation of the EDG undervoltage protection scheme.

That LER reported the inadvertent start of emergency diesel generator (EDG) A and B due to an undervoltage condition on 4 kilovolt (KV) shutdown boards A and B. The undervoltage condition occurred while the winding selector switch on the unit station service transformer (USST) was set to monitor the lighter loaded nonessential windings feeding the nonessential boards.

The winding selector switch selects the winding of the USST in which the voltage will be monitored. If the voltage fluctuates on the selected winding then the tap changer automatically adjusts to maintain the voltage on this winding within a specified range. However, the winding that is not selected is not monitored and the voltage may fluctuate without automatic compensation.

Under normal plant conditions one winding of the USST is feeding the 4KV shutdown boards and the other winding is feeding nonsafety-related loads. For the event described in the LER, the voltage on the winding feeding the 4KV shutdown boards was not being monitored. This allowed the voltage on these boards to drop below the EDG low voltage start setpoint.

TVA's corrective action for the inadvertent start of the EDG's was to revise plant procedures such that the winding selector switch would be placed to monitor the heavier loaded winding. This corrective action did not take into account that under normal conditions the winding that feeds the 4KV shutdown boards may be the lighter loaded. Therefore, the selector switch would be set to monitor the other winding. This resulted in a plant configuration in which it would still be possible for the voltage on the 4KV shutdown boards to drop below the low voltage setpoint for the autostart of the EDG's when additional loads were added to the shutdown boards.

2. Corrective Steps Taken and Results Achieved

Plant procedures have been revised to require the winding selector switch to be set to monitor the winding feeding the 4KV shutdown boards. This will ensure that under normal plant conditions the voltage on the 4KV shutdown boards is not degraded as a result of the position of the winding selector switch. However, under abnormal plant conditions (e.g., the testing of a USST), both windings of a USST would be used to feed separate 4KV shutdown boards. To address this plant configuration, procedures have been revised to require the monitoring of the heavier loaded winding.

3. Corrective Steps That [Have Been or] Will Be Taken To Avoid Further Violations

No additional corrective steps are required for this event.

4. Date When Full Compliance Will Be Achieved

TVA considers that full compliance has been achieved.

ENCLOSURE 2

Tennessee Valley Authority

Browns Ferry Nuclear Plant (BFN)

Reply to EDSFI Findings

Inspection Report Number
50-259, 260, 296/92-15

FINDING 1: Existing Calculations Did Not Contain Sufficient Data to Determine LOCA Load Sequencing Voltage Profile

DESCRIPTION:

"Calculation ED-Q2000-870026, Revision 9, "4.16 kV and Busload and Voltage Drop Calculations with Offsite Power," was intended to determine minimum voltages at safety buses during LOCA load sequencing. However, the calculation did not contain sufficient data to establish the actual voltage profile at the safety busses during worst case conditions. The Licensee provided additional computer runs which established the actual profile and which demonstrated adequate system performance."

SAFETY SIGNIFICANCE:

"This calculation was necessary to establish that adequate voltages are available during load sequencing and that the degraded voltage relays will reset within required time intervals. Failure of relays to reset could cause loss of offsite power to safety loads during LOCA load sequencing and present unnecessary challenges to the standby power systems."

TVA RESPONSE: As stated, TVA provided additional computer runs which established the actual profile and which demonstrated adequate system performance. As explained during the inspection, the previous revision to the calculation had inadvertently omitted iterations of the computer run for the calculation. TVA will revise ED-Q2000-870026 to include the previously omitted information.

FINDING 2: Incorrect Acceptance Criteria for Degraded Voltage Relay in Surveillance Instruction

DESCRIPTION:

"The acceptance criteria in Surveillance Instruction 3-SI-4.4.A.4.C(I), Revision 1, "4160 V SDB 3EA and 3EB Under/Degraded Voltage Time Delay Relay Calibration," did not properly reflect the 26 V tolerance applicable to the Degraded Voltage Relay dropout and reset values, as determined in Calculation ED-Q2211-890144, Revision 4, Setpoint and Scaling Calculations 4 kV Bus Degraded Voltage Relays (ITE 27N), as follows . . . .

The licensee revised the Surveillance Instruction to conform to constraints determined in the latest setpoint calculation. In addition, the licensee stated that applicable administrative procedures shall be revised to assure that appropriate design inputs are used in all Surveillance Instructions."

SAFETY SIGNIFICANCE:

Improper criteria used in this surveillance instruction could have resulted in operating voltages below analyzed minimum requirements, or in loss of offsite power to safety loads during LOCA load sequencing due to failure of Degraded Voltage Relays to reset.

TVA RESPONSE: As stated, TVA has revised the applicable Surveillance Instructions to conform to constraints determined in the setpoint calculation. In addition, TVA will develop plant setpoint and scaling documents for electrical surveillance calibrations to document the design output for the setpoint as-found and as-left bands.

FINDING 3: 460 V Motors Do Not Have Critical Voltages Stated in FSAR

DESCRIPTION:

"Calculation ED-Q20000-870027, Revision 3, "460 V Class 1E Motors and Equipment Volt Drop," Attachment 2, demonstrated that certain motors did not have the minimum required terminal voltage stated in section 8.4.8.1.4 of the FSAR as follows . . . .

The Licensee demonstrated adequate equipment operation based on available equipment design margins."

SAFETY SIGNIFICANCE:

This item represented a deviation from a FSAR commitment but did not have safety significance since adequate equipment performance was demonstrated.

TVA RESPONSE: As stated, TVA has included the necessary corrections in the FSAR submittal to be issued by July 23, 1992, to allow departure from the stated criteria.

FINDING 4: Calculation Weaknesses

DESCRIPTION:

"The following weaknesses were noted during a review of various EDS calculations.

1. Calculation ED-Q2000-870027, Revision 3, "460V Class 1E Motors and Equipment Volt Drop":

   a. The calculation relied on equipment design margins to justify voltage below manufacturer's recommended minimums rather than removing known conservatism or correcting circuit deficiencies, for the following motors . . . .

   b. Section 7.0.2. justified voltage below the criteria stated in section 3.0 based on adequate torque available at 70% voltage for NEMA B motors. However, this justification did not consider the effects of increased current and possible tripping of protective devices. In response, the licensee provided additional justification which demonstrated adequate performance.

   c. Calculation ED-Q2000-870027, paragraph 3.7 stated that the calculation tabulated in Attachment 2 used the lowest actual operating voltages at the various buses as determined by calculation ED-Q0999-890090. However, some voltages in Attachment 2 did not match the lowest voltages in calculation ED-Q0999-890090. Examples are as follows . . . .

   The team determined that the use of non-conservative voltages did not affect the final results.

2. Calculation ED-Q2211-890144, Revision 4, "Setpoint and Scaling Calculations 4 kV Bus Degraded Voltage Relays (ITE 27N)":

   a. Paragraph 8, page 5a, stated that the 26 V tolerance applicable to the DVR dropout setting was random so that it was unlikely that two relays would be subject to the maximum inaccuracy at the same time. This contention, combined with two out of three logic, was used to justify using the actual setpoint of 3920 V as the lowest possible bus voltage rather than using the setting less tolerance. However, at least two of the factors contributing to the 26 V tolerance are not random as applied to two separate relays, temperature effect (TNe), and power supply effect (PSEe). This increases considerably the chance that drift in the same direction will occur simultaneously on two (or three) relays. In addition, the magnitude of drift inaccuracy (De) is time dependent which could effect all relays calibrated at the same time similarly. Consequently, minimum voltage used as the basis for degraded voltage calculations should reflect actual setting less tolerance. The team determined, however, that using the non-conservative voltage did not have a significant effect on the final results of the calculations concerned.

c. Paragraph 8.0 stated that calculation ED-Q2000-870026 determined the minimum steady state voltage on a 4 kV SD bus was 3986 V. However, this figure could not be found in the referenced calculation. The team determined the actual minimum voltage was 4004 V which was less limiting than the referenced figure.

d. Paragraph 8.0 incorrectly stated that the dropout and reset would drift in the same direction as justification for the small (20 V) difference between the two settings. The licensee revised the calculation and established settings which will prevent convergence of dropout and reset due to drift."

SAFETY SIGNIFICANCE:

"The items noted above were determined to be isolated examples of weakness in otherwise generally conservative calculations. None of these items represented operability concerns and all were appropriately resolved by the licensee by calculation revision or other justification."

TVA RESPONSE: As stated, TVA will revise calculation EQ-Q2000-870027 to resolve the inconsistencies and provide additional justification as necessary. In addition, Calculation ED-Q2211-890144 has been revised to resolve the noted concerns.

FINDING 5: Control Bay Water Chiller A and B circuit breaker settings.

DESCRIPTION:

"Calculation ED-Q2000-870548, Revision 10, identified the analytical basis for the long term pick-up settings of the load center circuit breakers (480 V). For a motor having a service factor of 1.15 the calculation asserts that the setting should be greater or equal to 139% of the full load current. This constraint had not been applied to all motor loads (class 1E and non-1E) and in particular to the 1E load "Control Bay Water Chiller B".

The result of this finding was that with the motor demanding full load current at its rated terminal voltage of 460 V, the operating point on the coordination curve lies within the tripping region of the circuit breaker. The problem would be intensified at degraded bus voltage conditions, when the motor was drawing more current. The problem also occurs on "Control Bay Water Chiller A".

The licensee stated that the circuit breaker setting was inappropriate, and advised that a safety assessment report DCNG17047A dated September 27, 1991 had identified this condition; and a modification to the breaker was being initiated. The circuit breaker will be fitted with a new G.E. Type RMS-9 trip unit set to 132% of the motor full load current, and work request C044046 had been written to install the unit."

SAFETY SIGNIFICANCE:

"This equipment was used to provide cooling for the control room and equipment rooms located on elevation 593. The equipment relying on the chiller for cooling could operate for approximately 30 minutes before being adversely affected by the loss of cooling, giving adequate time for operator action. In addition, some cooling was available from chillers in Unit 3, which are not subject to these possible inadvertent trips because of the different circuit breaker settings."

TVA RESPONSE: As stated, TVA had previously determined that the circuit breaker setting was inappropriate, as documented in Safety Assessment Report DCNG17047A dated September 27, 1991, and a modification had been initiated. Work Request C044046 and C044047 has been written to install a new GE Type RMS-9 trip unit in each breaker.

FINDING 6: Procedure Weaknesses

DESCRIPTION:

"The following weaknesses were noted in procedures for operating the EDS:

1. Alarm response procedure 1/2 ARP 9-23, Revision 12, did not provide adequate guidance regarding Diesel Generator Ground Fault Annunciation.

   The diesel generators were grounded using a high resistance scheme. This limits the magnitude of ground fault currents and permits continued operation of the system during an emergency. A ground fault was annunciated as a "DIESEL GEN X GROUND FAULT". In case of LOOP, procedures required transfer back to the offsite source through the USSTs, if it became available again. However, these transformers were grounded through a low resistance scheme which would allow much larger fault currents and consequent loss of the faulted load. In case of an emergency, continued operation with a fault limited to a small current would be preferable to loss of the load. However, the

alarm response procedure did not caution operators against attempting a retransfer prior to isolating the fault so that operators could attempt to transfer back to the preferred source, rather than first selective tripping loads, conditions permitting, to locate the fault. In addition, the "Probable Cause" section of the procedure did not clearly alert the operators that the fault could be anywhere on the 4.16 kV system, not just on the DG. The Licensee revised the procedure to address these concerns.

2. Procedure 0-01-82, Revision 35, "Standby Diesel Generator System Operating Instruction", did not provide guidance on restarting large loads, in particular a 2000 hp RHR pump, should it become disconnected while being powered from a diesel generator. In response to this concern, the licensee provided specific instructions for reducing load on the DGs to prevent overloading and to check for any 480 V loads which may be inadvertently tripped due to the voltage dip during restart."

SAFETY SIGNIFICANCE:

"The above examples do not represent threats to the operability of the EDS but could have resulted in unnecessary interruption of power to important loads."

TVA RESPONSE: 1) Alarm Response Procedure 1/2 ARP 9-23, Revision 12 has been revised to provide appropriate guidance regarding diesel generator ground fault annunciation.

2) Abnormal Operating Instruction 0-AOI-57-1A, "Loss of Offsite Power", has been revised to provide specific instructions for reducing load on the diesel generators prior to manually initiated RHR pump starts to prevent overloading and to check for any 480 V loads which may be inadvertently tripped due to the voltage dip during restart.

FINDING 7: D.C. Battery Systems Ground Detectors

DESCRIPTION:

"Each class 1E battery system at the BFN employs a ground detection system, comprising principally a DC center zero voltmeter acting as null detector of a Wheatstone bridge, the arms of the bridge being two resistances connected between the positive and negative poles of the battery supply, and the resistance to ground of each pole. With no ground fault on the system the voltmeter reading is zero.

The system at the BFN uses inverse logic, where an operator conducting a daily check, interprets a zero reading as a "no ground fault" situation, whereas a zero reading may also be the consequence of a faulty meter or open circuited connections. Checking and calibration of the meter is at three year intervals, and results from BFN indicated that the incidence of faulty meters to be about 28%.

A secondary system employing meter relays was also fitted to each battery system, the meter relays being energized from non-1E 120 VAC supplies. The relay gives annunciation in the control room of a ground fault or of a relay failure or of a loss of power to the unit. The system was not set to detect a high/medium impedance ground fault, and should be self powered, or powered from the DC battery, for reliable operation."

SAFETY SIGNIFICANCE:

"Failure of the voltmeter or the connections thereto, will not be recognized during the daily check of the system, and more than one ground fault can occur on the system without being detectable by the existing monitor. No calculation was available relating meter reading to ground fault resistance but the assessment by the team was that a significant ground may occur before the trip point setting of the associated relay was reached (±75 volts for the 250 VDC and ±40 VDC for the 125 VDC battery systems)."

TVA RESPONSE: TVA will revise the appropriate procedure to increase the frequency of checking and calibration of the ground fault meter to coincide with the DC Battery Discharge Test (24 month). At this time, TVA considers the ground fault detection system to be adequate. However, if future calibrations indicate that a sufficient confidence level is not achieved, then TVA will give consideration to additional monitoring or a design change.

FINDING 8: Improper Breaker Replacement

DESCRIPTION:

"The team identified that circuit breaker changeouts in the 480 V SDBs had resulted in two non-class 1E breakers being placed in class 1E SDBs. The licensee identified that this improper circuit breaker changeout had occurred in two instances. The circuit breakers for 480 V SDB 2A, cubicle 3D and 480 V SDB 3A, cubicle 2B were improperly replaced. The licensee issued a problem evaluation report BFPER920039 to investigate this occurrence."

SAFETY SIGNIFICANCE:

"Replacement of class 1E circuit breaker with nonclass 1E breakers could result in failure of the circuit breakers during a design basis event and unavailability of safety related equipment."

TVA RESPONSE: As stated, TVA issued a Problem Evaluation Report (BFPER920039) to investigate this concern. The breaker located in 480V SDB 2A was a spare breaker and was removed prior to the staff's inspection. In addition, an engineering evaluation concluded that the breaker located in 480V SDB 3A was capable of performing its required function and this breaker was subsequently replaced by Work Request C025335. TVA is performing walkdowns of the plant AK type breakers to address and resolve improper breaker changeout concerns. TVA will initiate additional controls to ensure that proper breaker changeout occurs.

FINDING 9: Configuration Control

DESCRIPTION:

"The team found the drawings for the EDS correctly reflected the installed condition of the EDS with several exceptions. Instances were found where configuration control had not been maintained. In 480 V RMOV board 2A, 30 ampere breakers were installed for the inboard and outboard core spray valves of compartments 13B and 14B. Drawing 2-45E751-1 indicated that a 7 ampere breaker was required for these circuits. In 480 V RMOV board 2B, a 30 ampere breaker was installed for the inboard core spray valve. Drawing 2-45E751-1 indicated a 7 ampere breaker was required for this circuit. The licensee initiated work request to replace the breakers.

During the inspection of the DGs, the team identified another incorrectly installed circuit breaker. Drawing 0-761E580-1 required a 30 ampere breaker for the DG start circuit 1. The team observed a 50 ampere breaker installed in this circuit.

During the inspection of the battery chargers the team observed unterminated and unidentified wiring in 250 VDC battery chargers 1, 2A, 2B, 3 and 4. Improperly terminated spare cable were found inside 250 VDC RMOV board 2A, cubicle 7A.

The team noted during the inspection of the battery chargers that the position of the SD battery charger spare disconnect switch for chargers B and C were in the "on" position. Drawing 0-45E709-1 indicated that the switch should be in the "off" position when the spare charger was not in use."

SAFETY SIGNIFICANCE:

"Loss of configuration control can result in lack of plant integrity and failure of safety systems to operate in accordance with design requirements."

TVA RESPONSE: 1) Regarding the 30 ampere breakers installed in the core spray system instead of 7 ampere breakers, TVA has determined that the oversize breakers did not impact operability of the core spray valves. In addition, the correct 7 ampere breakers have been installed.

2) TVA will replace the breaker labelled 50 ampere with a 30 ampere breaker.

3) TVA will identify or remove the spare vendor wiring.

4) The position of the SD battery chargers disconnect switch was corrected to match the drawing.

FINDING 10: Cracked Thermal Overload Relays

DESCRIPTION:

"The team noted instances of cracked thermal overload relays. The relays were found in 480 V RMOV board 2A, cubicles 4E, 10A, and 17A. Cracked thermal overload relays were also found in 250 VDC RMOV board 2B, cubicle 5B. Work requests were issued by the licensee to replace the cracked thermal overloads."

SAFETY SIGNIFICANCE:

"Failure of thermal overload relays could result in improper operation of the relays and unavailability of safety equipment."

TVA RESPONSE: TVA will replace the cracked thermal overloads (TOL) noted by the staff. In addition, TVA will perform an inspection of TOLs installed in safety-related 480V and 250V systems.

FINDING 11: Battery Capacity:

DESCRIPTION:

"The team noted that several batteries were nearing the replacement criteria of 80% capacity. Diesel Generator C battery was at 80.67% capacity. The licensee indicated that during the next refueling outage the Main Bank 2 and Main Bank 3 batteries were scheduled for replacement. Also, scheduled for replacement were SD batteries A, B, C, D, and 3EB and DG batteries A, B, C, D, 3A, 3B, and 3C."

SAFETY SIGNIFICANCE:

"Inadequate battery capacity could result in unavailability of battery power to meet design loading requirements for the battery during loss of ac power."

TVA RESPONSE: As explained during the inspection, TVA had already identified the need to replace these batteries and had scheduled these replacements.

ENCLOSURE 3

Tennessee Valley Authority

Browns Ferry Nuclear Plant (BFN)

Reply to EDSFI Findings

Inspection Report Number
50-259, 260, 296/92-15

LIST OF COMMITMENTS

1. TVA will revise ED-Q2000-870026 to include the previously omitted information. TVA expects this revision to be completed by October 1, 1992.

2. TVA will develop plant setpoint and scaling documents for electrical surveillance calibrations to document the design output for the setpoint as-found and as-left bands. TVA expects the development of these documents to be completed by December 31, 1992.

3. TVA will revise calculation EQ-Q2000-870027 to resolve the inconsistencies and provide additional justification as necessary. TVA expects this revision to be completed by October 1, 1992.

4. TVA will revise the appropriate procedure to increase the frequency of checking and calibration of the ground fault meter to coincide with the DC Battery Discharge Test (24 month). TVA expects this revision to be completed by August 31, 1992.

5. TVA is performing walkdowns of the plant AK type breakers to address and resolve improper breaker changeout concerns. TVA will initiate additional controls to ensure that proper breaker changeout occurs. TVA expects the walkdowns to be completed by August 31, 1992, and the additional controls to be in place by December 31, 1992.

6. TVA will replace the breaker labeled 50 ampere with a 30 ampere breaker. TVA expects this replacement to be completed by October 30, 1992.

7. TVA will identify or remove the spare vendor wiring identified during this inspection. As discussed during the inspection, the wiring associated with Units 1 and 3 will be identified or removed prior to the restart of each respective unit and the wiring associated with Unit 2 will be removed or identified prior to completion of the next Unit 2 refueling outage.

8. TVA will replace the cracked thermal overloads, noted by the staff. TVA expects this replacement to be completed by September 30, 1992.

9. TVA will perform an inspection of TOLs installed in safety-related 480V and 250V systems. TVA expects this inspection to be completed by August 31, 1992.