

Omaha Public Power District
444 South 16th Street Mall
Omaha, Nebraska 68102-2247
402/636-2000

May 17, 1991
LIC-91-0019L

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Reference: Docket No. 50-285

Gentlemen:

Subject: Licensee Event Report 91-08 for the Fort Calhoun Station

Please find attached Licensee Event Report 91-08 dated May 17, 1991. This report is being submitted voluntarily.

If you should have any questions, please contact me.

Sincerely,

W. G. Gates

W. G. Gates
Division Manager
Nuclear Operations

WGG/tcm

Attachment

c: R. D. Martin, NRC Regional Administrator
W. C. Walker, NRC Project Manager
R. P. Mullikin, NRC Senior Resident Inspector
INPO Records Center

JE22
11

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Fort Calhoun Station Unit No. 1

DOCKET NUMBER (2)

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PAGE (3)

TITLE (4)

Inappropriate Surveillance Requirements for RPS Level 1 Bistables

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
0	4	1	7	9	1	9	1	0	0	8
0	0	0	5	1	7	9	1	0	5	0
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 50. (Check one or more of the following) (11)							
1			20.402(b) 20.406(a) 50.73(a)(2)(iv) 73.71(b)							
POWER LEVEL (10)			20.406(a)(1)(i) 50.38(a)(1) 50.73(a)(2)(v) 73.71(c)							
1710			20.406(a)(1)(ii) 50.38(a)(2) 50.73(a)(2)(vi) X OTHER (Specify in Abstract below and in Text, NRC Form 365A)							
			20.406(a)(1)(iii) 50.73(a)(2)(iii) 50.73(a)(2)(vii)(A) Voluntary Report							
			20.406(a)(1)(iv) 50.73(a)(2)(iv) 50.73(a)(2)(vii)(B)							
			20.406(a)(1)(v) 50.73(a)(2)(v) 50.73(a)(2)(ix)							

LICENSEE CONTACT FOR THIS LER (12)

NAME

D. J. Bannister, Shift Technical Advisor

TELEPHONE NUMBER

AREA CODE

4 0 2 5 3 3 - 6 8 3 1

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC

SUPPLEMENTAL REPORT EXPECTED (14)

EXPECTED SUBMISSION DATE (15)

MONTH DAY YEAR

YES (If yes, complete EXPECTED SUBMISSION DATE)

X NO

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

On April 17, 1991 with the plant at 70% power, the Level 1 Bistables on the Power Range Safety Channel Nuclear Instrument units (A thru D) of the Reactor Protective System (RPS) were declared inoperable due to the bistables not being tested monthly pursuant to a Technical Specification (TS) Interpretation of TS Table 3-1 requirements. However, the RPS trip units were determined to be operable. Subsequently, the interpreted requirement for monthly surveillance of the Bistables was determined to be invalid based on system design constraints; the Bistables were then declared operable.

This event was caused by the existence of inappropriate TS surveillance requirements for the Level 1 Bistables since initial issuance, and by inadequate documented verification of the incorporation of all applicable TS surveillance requirements into FCS Surveillance Test procedures.

Procedures have been implemented to calibrate and test the Level 1 Bistables prior to reactor startup. The affected TS Interpretation will be changed. A Technical Specifications Verification Action Plan is being implemented.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The Fort Calhoun Station (FCS) Unit No. 1 Reactor Protective System (RPS) helps ensure that design limits are not exceeded. The RPS consists of four instrument channels (A thru D) with twelve Trip Units (TUs) per channel. The channels continuously monitor critical plant parameters, and will cause a reactor trip if the same TU on 2 or more of the 4 channels deviate from a preselected setpoint.

Four ex-core Nuclear Instrumentation (NI) Power Range Safety Channels (PRSC) and four ex-core NI Wide Range Logarithmic Channels function to provide an input to the RPS, and provide neutron flux indication from source levels to full power. Each PRSC NI contains a Level 1 Bistable assembly which enables/disables various RPS trips at about 15% power. Each Level 1 Bistable serves to:

Enable/Disable the Loss of Load (LOL) trip (TU #10 on each RPS channel) when reactor power increases/decreases.

Enable/Disable the Axial Power Distribution (APD) trip (TU #12 on each RPS channel) when reactor power increases/decreases.

Disable/Enable the High Power Rate-of-Change (SUR) trip (TU #2 on each RPS channel) when reactor power increases/decreases.

At power levels above 15%, the Bistable can be verified to be in the tripped condition by front panel indication in the control room.

The LOL trip is an anticipatory trip provided to limit the increase in Reactor Coolant System stored energy caused by the loss of normal steam removal from the steam generators. A limit switch on each of four turbine stop valves opens when the valve comes off its open seat, providing input to each valve's respective RPS channel A thru D. The LOL trip is automatically disabled below 15% power to allow reactor startup and heatup of the secondary system prior to putting the Main Turbine Generator on-line.

The APD trip protects against unsuitable axial power distributions to ensure that neither Departure from Nucleate Boiling Ratio (DNBR) nor maximum linear heat rate limits are exceeded. The APD trip utilizes the PRSC NI system to develop a signal that describes the relative power distribution between the upper and lower elevations of the reactor core. The APD trip is automatically disabled below 15% power due to instability concerns with the PRSC NI system at low power and the fact that no local power density limits would be threatened below this power level.

The SUR trip is another anticipatory trip to limit the rate of power increase during an uncontrolled Control Element Assembly withdrawal or boron dilution incident at low power. The SUR trip receives an input from the Wide Range NI system. The input signal is compared to fixed setpoints which would generate a trip if exceeded. The SUR trip is automatically disabled above 15% power due to other installed RPS TUs (i.e., High Reactor Power Level trip and Thermal Margin/Low Pressure trip) providing adequate protection.

Since the LOL and SUR TUs are anticipatory in nature and redundant to one or more other RPS TUs, they are not taken credit for in the Fort Calhoun Station

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

(FCS) Safety Analysis as outlined in the Updated Safety Analysis Report (USAR). The APD trip is, however, required to function to ensure excessive axial peaking will not cause fuel damage. The APD trip is taken credit for in the USAR and thus has specific setpoints outlined in the FCS Technical Specifications, Section 1.3, Limiting Safety System Settings for the RPS.

The custom FCS Technical Specifications (TS) also establish general requirements for Surveillance Testing to ensure the necessary quality of systems and components is maintained. Item 1 of TS Table 3-1, Minimum Frequencies for Checks, Calibrations, and Testing of Reactor Protective System, requires that PRSC NIs be calibrated and tested monthly (at least once per 31 days); the surveillance method is noted as "internal test signal to verify trips, alarms, permissives and auctioneer circuits." There is similar methodology wording (e.g., "power level permissives") in Item 2 of the same table, which applies to the Wide-Range Logarithmic Neutron Monitors. This wording has existed since initial issuance of the TS in 1973.

During an upgrade of the Surveillance Test procedures used to satisfy the TS Table 3-1 requirements for the PRSC and Wide Range NI systems, a clarification on the use of the wording "permissive" and "power level permissive" was sought. The clarification was needed to resolve an issue concerning the logic permissive which enables Rod Withdrawal Prohibit, a feature which inhibits all Control Element Assembly outward motion upon receipt of 2 out of 4 High Power or SUR pretrips. Since Rod Withdrawal Prohibit is not an RPS function, the interlock is not tested per TS Table 3-1. To provide guidance, Technical Specification Interpretation (TSI-90-02) was written and was approved on December 17, 1990. Although this was not the main intent, TSI-90-02 noted the use of the "permissive" terms as the functional trip bypasses occurring at 1.0 E-4% and 15% power levels, which corresponds to the enable/disable function of the Level 1 Bistable of the PRSC NI system.

The upgraded surveillance procedures were approved by the Plant Review Committee on January 10, 1991. During a subsequent review for the upgrade of related procedures, it was discovered that provisions did not exist to calibrate or test the Level 1 Bistables to ensure actuation at 15% power, which conflicted with the guidance in TSI-90-02. Further investigation revealed that provisions for calibration of the Bistables had not been included in any plant procedures since initial commercial operation.

On April 17, 1991 with the plant at 70% power, the Level 1 Bistables on PRSC NI units (A thru D) of the RPS were declared inoperable due to the bistables not being tested monthly as required by TS Table 3-1, based on the guidance in TSI-90-02. However, the RPS trip units for LOL and APD were considered operable based upon the following:

The Monthly Surveillance Test for the APD TUs had been successfully performed for each month. This verified that the TUs perform their required functions with simulated inputs.

The Level 1 Bistable indicating lights were lit, indicating the bistables had tripped, which verified proper actuation for the >15% power condition at that time.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The Main Turbine LOL Test, which is required to be performed prior to reactor startup, was successfully completed during the last refueling outage, and verified Bistable operation above and below a simulated 15% power signal.

Operability of the Level 1 Bistable was verified indirectly during the last plant startup/power ascension via Operating Procedure #3 (OP-3), Hot Standby to Minimum Load. OP-3 procedurally directs Operations personnel to verify no LOL trips are enabled prior to putting the Main Electrical Generator on line at approximately 12% power.

Operability of the Level 1 Bistable was also verified indirectly during the last plant shutdown via Operating Procedure #5 (OP-5), Plant Shutdown. OP-5 procedurally directs operations personnel to verify LOL and APD trips are disabled, while verifying the SUR is enabled when at 10% power. The Bistables were observed to reset between 12.6% and 13.5% power which prompted a Maintenance Work Order to be written to recalibrate the bistables to reset at 15% power.

Based upon these factors, there was reasonable assurance that the APD, LOL, and SUR TUs would function as designed. Of the affected TUs, only APD is associated with a TS Limiting Safety System Setting. During power changes, power distribution is closely monitored and is maintained well within the required limits.

An investigation was initiated to determine if the Level 1 Bistables could be calibrated or tested during an outage or while at power. The investigation revealed that the bistables can in fact be tested and calibrated when the reactor is shutdown by injecting a simulated 15% power signal via installed circuitry on the RPS. However, there are no appropriate means to check the bistable setpoints at power via internal test signal. It would be necessary to disconnect both the upper and lower neutron detectors from the PRSC NI drawers on the RPS. Neither the USAR nor the TS provide for this.

Combustion Engineering Standard TS were reviewed to determine if specific Surveillance Requirements existed for equipment similar to the Level 1 Bistables. Standard TS have requirements for testing of operational bypasses which include the Level 1 Bistable function. They require only a functional check every 18 months and a logic check within 92 days prior to reactor startup.

Even though the Level 1 Bistables can not be tested or calibrated while at power, there is reasonable assurance that they would perform their design function based on observations of past performance during startups and shutdowns. Furthermore, since there is not a provision to test these bistables on a monthly basis at power, it was concluded that the TS never intended them to be tested as such. That the FCS TS Table 3-1 monthly requirement to "Test and Calibrate" the PRSC NI "permissives" should not apply to the Level 1 Bistable. The TSI-90-02 definition of "Permissives" and "Power Level Permissives" was invalidated to the extent that it does NOT include the Level 1 Bistables on the PRSC NI system. Thus on April 23, 1991 the Level 1 Bistables were declared operable. Because of the Technical Specification compliance aspects, this event is being reported as a voluntary LER.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 800 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (F-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20545, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 305A's) (17)

The event was significant because part of the RPS was declared inoperable when it was discovered that the Level 1 Bistables had not been tested or calibrated on a monthly basis, which seemed to be a violation of TS Table 3-1 as interpreted by TSI-90-02. It was later determined that the Bistables cannot be tested or calibrated while at power and that the corresponding portion of the TSI was inappropriate. Furthermore, the setpoint of 15% has never been established or formally checked during outages.

Reasonable assurance that the TUs (SUR, LOL, and APD) which receive an enable/disable signal from the Bistables are operable is based upon successful completion of each TU's Surveillance Test either monthly or during the last refueling outage. Of the TUs affected by the Level 1 Bistables, only the APD TUs have TS Limiting Safety System setpoints which are taken credit for in the safety analysis for core protection. Successful completion of the monthly test for the APD TUs verify that they will perform their design function. Protection is also assured due to power distribution being closely monitored and maintained well within required limits during power changes. The other two TUs are anticipatory in nature and are redundant to other installed RPS trips.

In the unlikely event that one of the Level 1 Bistables was to inadvertently disable an APD TU on one of the four installed PRSC NI channels while >15% power, core protection would still be assured since two of the remaining three APD TUs could still cause a reactor trip. Even with the TS allowed bypass of one APD TU (up to 48 hours without active maintenance before the TU would have to be placed in the tripped condition), it would require two APD TUs to be disabled by the Level 1 Bistables (while >15% power) before the RPS would fail to trip the reactor on an unsuitable axial distribution of power. Based on past reliability of these Bistables, this is deemed highly unlikely.

Power failure to a Level 1 Bistable causes it to fail in the tripped position which is the normal condition for >15% power. Power failure to the bistable at <15% power would result in reinstating both the LOL and APD trips while disabling the SUR trip. Since the SUR trip is not required for accident mitigation as outlined in the safety analysis, and the other two trips are not required for protection at <15%, this failure's effect on reactor protection is considered negligible.

This event was caused by the existence of inappropriate TS surveillance requirements for the Level 1 Bistables since initial issuance, and by inadequate documented verification of the incorporation of all applicable TS surveillance requirements into FCS Surveillance Test procedures. This resulted in uncertainty over the meaning and applicability of the "permissives" term in Table 3-1 and issuance of erroneous guidance in TSI-90-02.

Procedures (IC-CP-01-0005, -006, -007, & -008) have been issued which include provisions for calibration and testing of the Level 1 Bistables on a Refueling frequency.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-830), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

The following corrective actions will be implemented:

- (1) A calibration of the Level 1 Bistables to verify the bistable setpoint will be performed prior to reactor startup the next time the plant is shutdown.
- (2) A surveillance test will be developed to functionally test the Level 1 Bistables prior to each reactor startup. This procedure will be implemented by September 10, 1991.
- (3) The TS Interpretation TSI-90-02 will be changed to exclude the Level 1 Bistables from the definition of the "Permissives" needed to be tested on a Monthly basis. As part of the TSI approval process the need for a Facility License Change (FLC) will be assessed. This will be completed by July 1, 1991.
- (4) A Technical Specifications Verification Action Plan is being implemented. The currently existing surveillance procedures will be compared to the Surveillance Technical Specifications to ensure each required surveillance has a corresponding surveillance procedure. Each surveillance procedure will also be reviewed to ensure it adequately meets the intent of the Technical Specifications. These actions will be completed by July 1, 1992.

LERs 87-10, 87-37, 88-08, 89-02 and 91-01 concerned surveillance tests that did not meet requirements of the Technical Specifications. LER 90-17 concerned failure to perform surveillance required by an inappropriate Technical Specification.