

Omaha Public Power District

P.O. Box 399 Hwy. 75 - North of Ft. Calhoun Fort Calhoun, NE 68023-0399
402/636-2000

August 17, 1992
LIC-92-256L

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

Reference: Docket No. 50-285

Gentlemen:

Subject: Licensee Event Report 92-024 for the Fort Calhoun Station

Please find attached Licensee Event Report 92-024 dated August 17, 1992. This report is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(B). If you should have any questions, please contact me.

Sincerely,

W. G. Gates

W. G. Gates
Division Manager
Nuclear Operations

WGG/lah

Attachment

c: J. L. Milhoan, NRC Regional Administrator, Region IV
S. D. Bloom, Acting NRC Project Manager
R. P. Mullikin, NRC Senior Resident Inspector
INPO Records Center

JE28

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 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)

0 5 0 0 0 2 8 5 1 OF 0 5

PAGE (3)

TITLE (4)

Failure to Comply with Linear Heat Rate Technical Specifications During Alarm Inoperability

| 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 | 6 | 2 | 9 | 2 | 0 | 2 | 4 | 0 | 0 | 0 | 8 | 1 | 7 | 9 | 2 | N | 0 | 5 | 0 | 0 | 0 | 1 |

| OPERATING MODE (9) | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 50. Check one or more of the following: (11) | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|--|---------------------|---|-----------------|----------|-----------------|-------------|----------------|----------|------------------|-------------|-----------------|---|-------------------|------------------|---------------------|--|------------------|-----------------|---------------------|--|-----------------|------------------|-------------------|--|
| 1 | <table border="1"><tr><td>20.402(b)</td><td>20.405(c)</td><td>50.73(a)(2)(iv)</td><td>73.71(b)</td></tr><tr><td>20.405(a)(1)(i)</td><td>50.38(c)(1)</td><td>50.73(a)(2)(v)</td><td>73.71(c)</td></tr><tr><td>20.405(a)(1)(ii)</td><td>50.38(c)(2)</td><td>50.73(a)(2)(vi)</td><td>OTHER (Specify in Abstract below and in text NRC Form 586A)</td></tr><tr><td>20.405(a)(1)(iii)</td><td>X 50.73(a)(2)(i)</td><td>50.73(a)(2)(vii)(A)</td><td></td></tr><tr><td>20.405(a)(1)(iv)</td><td>50.73(a)(2)(ii)</td><td>50.73(a)(2)(vii)(B)</td><td></td></tr><tr><td>20.405(a)(1)(v)</td><td>50.73(a)(2)(iii)</td><td>50.73(a)(2)(viii)</td><td></td></tr></table> | 20.402(b) | 20.405(c) | 50.73(a)(2)(iv) | 73.71(b) | 20.405(a)(1)(i) | 50.38(c)(1) | 50.73(a)(2)(v) | 73.71(c) | 20.405(a)(1)(ii) | 50.38(c)(2) | 50.73(a)(2)(vi) | OTHER (Specify in Abstract below and in text NRC Form 586A) | 20.405(a)(1)(iii) | X 50.73(a)(2)(i) | 50.73(a)(2)(vii)(A) | | 20.405(a)(1)(iv) | 50.73(a)(2)(ii) | 50.73(a)(2)(vii)(B) | | 20.405(a)(1)(v) | 50.73(a)(2)(iii) | 50.73(a)(2)(viii) | |
| 20.402(b) | 20.405(c) | 50.73(a)(2)(iv) | 73.71(b) | | | | | | | | | | | | | | | | | | | | | | |
| 20.405(a)(1)(i) | 50.38(c)(1) | 50.73(a)(2)(v) | 73.71(c) | | | | | | | | | | | | | | | | | | | | | | |
| 20.405(a)(1)(ii) | 50.38(c)(2) | 50.73(a)(2)(vi) | OTHER (Specify in Abstract below and in text NRC Form 586A) | | | | | | | | | | | | | | | | | | | | | | |
| 20.405(a)(1)(iii) | X 50.73(a)(2)(i) | 50.73(a)(2)(vii)(A) | | | | | | | | | | | | | | | | | | | | | | | |
| 20.405(a)(1)(iv) | 50.73(a)(2)(ii) | 50.73(a)(2)(vii)(B) | | | | | | | | | | | | | | | | | | | | | | | |
| 20.405(a)(1)(v) | 50.73(a)(2)(iii) | 50.73(a)(2)(viii) | | | | | | | | | | | | | | | | | | | | | | | |

LICENSEE CONTACT FOR THIS LER (12)

NAME

Craig E. Booth, Shift Technical Advisor

TELEPHONE NUMBER

AREA CODE

4 0 2 5 3 3 1 - 6 8 7 4

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 |
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SUPPLEMENTAL REPORT EXPECTED (14)

| YES (If yes, complete EXPECTED SUBMISSION DATE) | NO | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On July 17, 1992, a review of Technical Specification (TS) 2.10.4(1)(b) identified a potential for previous violations involving Linear Heat Rate (LHR) monitoring requirements. The potential violations involved instances when the plant computer incore detector alarms were inoperable and conditions specified in TS 2.10.4(1)(b) might not have been satisfied. The review on July 17, 1992 applied LHR uncertainties and allowances of 11.8% (based on several factors referred to in TS 2.10.4(1)) that had not been applied prior to June 24, 1992. It was determined that on May 15, 1992, May 22, 1992, May 29, 1992 and June 24, 1992, a condition in TS 2.10.4(1) (that power be reduced to the limits of Core Operating Limits Figure 4 unless measured peak LHR prior to the incore detector alarm outage was no greater than 90% of the allowable peak LHR) had been violated.

The impact on the safe operation of the plant was minimal. Data for these events indicates that the peak LHR, before and after alarm inoperability, did not exceed the TS allowable peak LHR.

The root cause of these events is considered to be the lack of a procedure covering the monitoring of key reactor physics parameters.

Corrective actions will include developing a TS Interpretation to define appropriate application of uncertainties/allowances with respect to TS 2.10.4(1)(b)(i) and developing a procedure covering the monitoring of key reactor physics parameters.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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.

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TEXT (If more space is required, use additional NRC Form 398A's)(17)

The Fort Calhoun Station incore neutron flux monitoring system is composed of 28 fixed incore detector assemblies inserted into selected fuel assemblies. Each detector assembly has four, 40 cm long rhodium detectors and one thermocouple. The rhodium detectors are positioned to measure flux at four axial locations of 20, 40, 60 and 80% of core height. Axial spacing of the detectors in each assembly and radial spacing of the detector assemblies permit representative neutron flux mapping of the core.

Signals from the incore detectors are utilized to provide information on core performance and fuel management. They do not function to provide any automatic protective functions.

The signals from the incore detectors are read by the Emergency Response Facilities (ERF) computer system which scans all assemblies and prints out the data periodically or on demand. The computer continuously computes neutron flux at each detector. Incore detector alarms are checked and/or reset as needed at least once a month to compensate for rhodium burn-up as well as power distribution changes associated with burn-up. These alarms are determined by processing a "snapshot" of incore data and other parameters using the CECOR computer code. The CECOR code is typically run twice a week to provide a valid core power distribution (including a Peak Linear Heat Rate (PLHR) value based on the "snapshot" of incore data), and at least once a month to determine the alarm limits for the incore detectors. The plant computer incore detector alarms are the primary means of monitoring compliance with Technical Specification (TS) requirements for Linear Heat Rate (LHR). Neutron flux detectors external to the reactor core (i.e., excore detectors) may also be used for LHR monitoring, if appropriate power versus axial shape index requirements specified in Figure 4 of the Core Operating Limits Report (COLR) are met. The requirements in Revision 0 of the COLR for Cycle 14 indicate an upper limit of 80% power for excore monitoring of LHR.

A recent addition to the ERF computer is the on-line mini-CECOR/BASSS program. This program processes incore detector signals and provides much of the same information as the CECOR code, via an ERF computer display. One value computed by the mini-CECOR/BASSS program is a PLHR value which includes application of an 11.8% uncertainties/allowances factor, thus providing a conservative value of LHR. TS 2.10.4(1) states, in part, that "The linear heat rate shall not exceed the limits of the Allowable Peak Linear Heat Rate vs. Burnup Figure provided in the COLR when the following factors are appropriately included: ...". TS 2.10.4.(1) lists the following factors: flux peaking augmentation factors, a measurement-calculational uncertainty factor, an engineering uncertainty factor, an axial fuel densification and thermal expansion uncertainty factor, and a power measurement uncertainty factor. The 11.8% factor applied by the mini-CECOR/BASSS program is a combination of the factors referred to in TS 2.10.4(1). In the CECOR code, uncertainties and allowances are not applied to the measured value of PLHR, but are applied to the calculation of the alarm setpoints.

Prior to June 24, 1992, the Reactor Engineer and Shift Technical Advisors (STAs) had considered the PLHR value provided by the CECOR program to appropriately include TS designated uncertainties/allowances and be an appropriate value for comparison to the allowable PLHR limit of 13.8 kw/ft specified in Revision 0 of the COLR. Differences between the values of PLHR from the on-line mini-CECOR/BASSS program and CECOR, however, caused the Reactor Engineer to question the validity of the PLHR values.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.5 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 360A's)(17)

The Nuclear Engineering Department was contacted and verified for the Reactor Engineer that in the mini-CECOR/BASSS program, the uncertainties and allowances applied to the alarm limits in CECOR, are applied directly to the calculated PLHR. The inclusion of the uncertainties and allowances in the PLHR values calculated by the mini-CECOR/BASSS program results in a difference of 11.8% between the PLHR values calculated by the two programs, with the CECOR value being the less conservative.

Based on this verification, on June 24, 1992 the Reactor Engineer and the STAs began applying the uncertainties and allowances of 11.8% to the measured PLHR from CECOR. Applying the uncertainties/allowances to the PLHR value from CECOR eliminated the differences between mini-CECOR/BASSS and CECOR PLHR values.

TS 2.10.4(1) specifies Limiting Conditions for Operations with respect to PLHR, including conditions for continued operation with the incore detector alarms inoperable. TS 2.10.4(1)(b) allows for continued operation without reducing power for seven days from the date of the last valid core power distribution, when the incore detector alarms are inoperable, provided each of the following conditions is satisfied:

- 1) A core power distribution was obtained utilizing incore detectors within 7 days prior to the incore detector alarm outage and the measured peak linear heat rate was no greater than 90% of the value allowed by TS 2.10.4(1).
- 2) The Axial Shape Index as measured by excore detectors remains within +/- 0.05 of the value obtained at the time of the last measured incore power distribution.
- 3) Power is not increased nor has it been increased since the time of the last incore power distribution.

On July 17, 1992, a review of TS 2.10.4(1)(b) was being performed. During the course of the review a potential for previous violations of TS 2.10.4(1) was identified. The concern involved the condition that requires that the measured PLHR be less than 90% of the maximum allowed by TS 2.10.4(1) prior to loss of incore detector alarm operability. Prior to June 24, 1992, values of PLHR measured by CECOR, that did not include uncertainties and allowances, had been used in determining whether the PLHR was less than 90% of the maximum allowed.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

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.

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

A review of previous occurrences, since Cycle 14 startup on May 3, 1992, of incore detector alarm inoperability (i.e., ERF computer inoperability) and associated PLHR values was performed. The allowable PLHR specified for Cycle 14 in Revision 0 of the COLR was 13.8 kw/ft. In the review, four occasions were found when the PLHR (with the 11.8% uncertainties/allowances factor applied) exceeded 12.42 kw/ft (i.e., 90% of the allowable PLHR) concurrent with plant computer incore detector alarms being inoperable for more than 2 hours and the plant at a power level greater than 80% power. The following four instances were identified:

| ERF Computer Inoperable (date/time) | Power Level (%) | Unadjusted PLHR (kw/ft) | Adjusted PLHR (kw/ft) | 90% of Allowable PLHR (kw/ft) |
|--|--------------------|----------------------------|--------------------------|----------------------------------|
| 5/12/92 0954-1505 | 98 | 11.68 | 13.06 | 12.42 |
| 5/22/92 1352-1600 | 99 | 11.90 | 13.30 | 12.42 |
| 5/29/92 1050-1352 | 100 | 11.98 | 13.39 | 12.42 |
| 6/24/92 0949-1201 | 100 | 12.28 | 13.73 | 12.42 |

On each occasion it should be noted the logged (unadjusted) value for PLHR was less than 90% of the allowable PLHR and only exceeded 90% when the 11.8% uncertainties/allowances factor was applied. Each event had occurred prior to the determination that the uncertainties/allowances were not already applied to the CECOR output.

Operation of the plant at power levels in excess of 80%, with the ERF computer inoperable for more than 2 hours and the PLHR greater than 90% of the maximum allowed by Technical Specifications, violates TS 2.10.4(1). Based on application of the 11.8% uncertainties/allowances factor to Cycle 14 data, four instances were identified in which this TS was violated. These events are being reported pursuant to 10 CFR 50.73(a)(2)(i)(B). (Note: The 'Event Date' specified on page 1 of this LER is based on the most recent of the four identified occurrences of violation of TS 2.10.4(1). The 'Discovery Date' for the violations is July 17, 1992.)

The impact on the safe operation of the plant was minimal. CECOR analysis of the core and on-line mini-CECOR/BASSS provided indication that, before the ERF computer was removed from service and after it was restored, the PLHR did not exceed the TS allowable PLHR.

The fact that the failure to comply with the TS was not identified until Cycle 14, means that the potential existed for this violation to have occurred in previous cycles. A preliminary review of the core follow data back to Cycle 7 indicates that with the uncertainties and allowances applied to the PLHR value measured by CECOR and the assumption that the ERF computer was inoperable during the time of maximum LHR, a potential did exist to violate this TS in Cycles 10 and 11.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.2 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 305A's)(17)

The root cause of these events is considered to be the lack of a procedure covering the monitoring of key reactor physics parameters. No documentation was available to the Reactor Engineer on whether or not uncertainties/allowances were to be applied to the PLHR obtained from the CECOR program. A contributing factor was the lack of a training program for the Reactor Engineer and the STAs on the operation and application of CECOR. The lack of adequate instruction on the operation of mini-CECOR/BASSS is also considered to be significant.

The following corrective actions will be completed:

- 1) A Technical Specification Interpretation will be developed by September 18, 1992 to define the appropriate application of uncertainties/allowances to PLHR when operating under TS 2.10.4(1)(b)(i).
- 2) A procedure will be developed by October 31, 1992 on the mini-CECOR/BASSS to include operation, alarm response, and functional inputs to the program.
- 3) The Checklist for CECOR performance will be revised by August 31, 1992 to include a step to inform the Shift Supervisor if the PLHR is in excess of 90% of that allowed by TS 2.10.4(1).
- 4) A procedure will be developed by October 31, 1992 covering the monitoring of key reactor physics parameters.
- 5) Training will be provided by December 31, 1992 to the Reactor Engineer and the STAs on the material developed under corrective actions 1, 2, 3 and 4 and on the operation of CECOR.

LER 91-023 reported a previous violation of TS 2.10.4(1) involving an increase in power during inoperability of the ERF computer.