

Duke Power Company
Catawba Nuclear Station
4800 Concord Rd.
York, S.C. 29745

(803) 831-3000



DUKE POWER

October 10, 1991

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

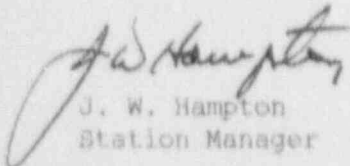
Subject: Catawba Nuclear Station
Docket No. 50-413
LER 413/91-014, Revision 1

Gentlemen:

Attached is Licensee Event Report 413/91-014, Revision 1, concerning TECHNICAL SPECIFICATION VIOLATION DUE TO IMPROPER OVERTEMPERATURE DELTA TEMPERATURE SETPOINT CALCULATION.

This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,


J. W. Hampton
Station Manager

cc: Mr. S. D. Ebner
Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
101 Marietta Street, NW, Suite 2900
Atlanta, GA 30323

M & M Nuclear Insurers
1211 Avenues of the Americas
New York, NY 10020

R. E. Martin
U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

INPO Records Center
Suite 1500
1100 Circle 75 Parkway
Atlanta, GA 30339

Mr. W. T. Orders
NRC Resident Inspector
Catawba Nuclear Station

210535
9110240166 911009
PDR ADOCK 05000413
S PDR

JE22 1/1

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1): Catawba Nuclear Station, Unit 1										DOCKET NUMBER (2): 0 5 0 0 0 4 1 3 1 OF 0 7										PAGE 1																													
TITLE (4): TECHNICAL SPECIFICATION VIOLATION DUE TO IMPROPER OVERTEMPERATURE DELTA TEMPERATURE SETPOINT CALCULATION																																																	
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 (3):										
																													N/A										0 5 0 0 0 0 0 0 0 0										
0 6			2 8			9 1 9 1				0 1 4			0 1			1 0 0			9 9 1														0 5 0 0 0 0 0 0 0 0																
OPERATING MODE (9): 1										THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5. (Check one or more of the following) (11):																																							
POWER LEVEL (10): 1.00										20 405(a)										20 405(b)										50 73(a)(2)(i)										73 71(b)									
										20 405(a)(1)(i)										50 38(a)(1)										50 73(a)(2)(ii)										73 71(c)									
										20 405(a)(1)(ii)										50 38(a)(2)										50 73(a)(2)(iii)										OTHER (Specify in Appendix below and in Text NRC Form 366A)									
										20 405(a)(1)(iii)										X 50 73(a)(2)(i)										50 73(a)(2)(iv)(A)																			
										20 405(a)(1)(iv)										50 73(a)(2)(ii)										50 73(a)(2)(iv)(B)																			
										20 405(a)(1)(v)										50 73(a)(2)(iii)										50 73(a)(2)(i)																			
LICENSEE CONTACT FOR THIS LER (12):																																																	
NAME																				TELEPHONE NUMBER																													
C. L. Hartzell, Compliance Manager																				8 0 3 8 3 1 1 ~ 3 6 6 5																													
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):																																																	
YES (If yes, complete EXPECTED SUBMISSION DATE):																				X NO																													
																				EXPECTED SUBMISSION DATE (15):										MONTH DAY YEAR																			

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

On June 28, 1991, at 1600 hours, with Unit 1 in Mode 1, Power Operation at 100% power, the Loop B Overtemperature Delta Temperature (OTDT) Operator Aid Computer alarm was received following Nuclear Instrumentation System calibrations. On June 30, 1991 at 1000 hours, a manual calculation was performed to determine channel operability. The calculation was performed incorrectly, but Loop B OTDT was determined to be operable. At approximately 2200 hours, the on-coming shift performed the CTDT calculation and determined Loop B OTDT to be inoperable. Loop B OTDT was placed in the tripped condition, as required by Technical Specifications, and a Work Request was issued to repair the channel. This incident is attributed to an inappropriate action due to lack of attention to detail in that a mistake was made during the manual calculation. On July 1, 1991, Neutron Detector N-42 was recalibrated, taken out of the tripped condition, and declared operable. Corrective actions include enhancements of affected procedures and manual calculation methods to improve their reliability.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Catawba Nuclear Station, Unit 1	050004113	91	014	01	02	OF	07

TEXT (If more space is required, use additional NRC Form 366A (1/77))

BACKGROUND

The purpose of the Reactor Cool. [EIIIS:AB] (NC) System is to transport heat from the Reactor [EIIIS:VSL] to the Steam Generators [EIIIS:HX] (S/G), where heat is transferred to the Feedwater [EIIIS:SJ] (CF) and Main Steam [EIIIS:EB] (SM) Systems of the secondary side. Resistance temperature detectors [EIIIS:XT] (RTD) are located in the NC loops and provide signals [EIIIS:XC] for delta temperature (DT) between the hot leg and cold leg of each loop and an average of NC temperature (T-AVE).

The Excore Nuclear Instrumentation System [EIIIS:JGO] (ENB) monitors the neutron flux and generating appropriate trips and alarms [EIIIS:X1] for various phases of Reactor operating and shutdown conditions. It also provides a secondary control function and indicates Reactor status during startup and power operation.

Technical Specifications (T/Ss) 2.2.1 and 3/4.3.1 specify the Reactor Trip System Instrumentation and Interlocks Setpoints that are consistent with the Trip Setpoint values shown in Tables 2.2-1 and 3.3-1. One of the parameters specified is Overtemperature Delta Temperature (OTDT). The OTDT trip provides Core protection to prevent Departure from Nucleate Boiling (DNB) for all combinations of pressure, power, coolant temperature, and axial power distribution.

According to Table 3.3-1 of T/S, with the Unit operating in Mode 1 (Power Operations) or 2 (Startup), a minimum of 3 out of the 4 NIS power channels [EIIIS: JX] are required to be operable. With the number of OPERABLE channels one less than the total number of channels, STARTUP and/or POWER OPERATION may proceed provided the following conditions are satisfied: (1) the inoperable channel is placed in the tripped condition within six hours, and (2) the minimum channels OPERABLE requirement is met; however, the inoperable channel may be bypassed for up to four hours for surveillance testing of other channels per T/S 4.3.1.1.

Procedure PT/1/A/4600/02A, Mode 1 Periodic Surveillance Items, specifies to perform surveillance items semi-daily, once on day shift (0800-1100) and once on night shift (2000-2300). Channel checks meet the acceptance criteria when the redundant channels are within the tolerances listed in Enclosure 13.1, Periodic Surveillance Items Data. Redundant channels may be checked on either the Operator Aid Computer [EIIIS:IMOD] (OAC), control room or local gauges, but the acceptance criteria shall not be met by checking the same channel on two redundant indications such as a control room gauge and the OAC.

The OAC performs various calculations to facilitate unit operation. Per the Operator Aid Computer Documentation Manual, Section 2.3.8.54, the purpose of the OAC regarding Overtemperature Delta Temperature is to calculate the trip setpoints, compare the calculated setpoints to process indications and generate an alarm if the absolute value of the difference between calculated and

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104
EXPIRES 8/31/98

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Catawba Nuclear Station, Unit 1	05000413	91	014	01	03	OF	07

TEXT: If more space is required, use additional NRC Form 366A (9-83).

indicated setpoint is greater than the T/S Limit. When an OTDT channel is "in alarm", manual calculations are performed per FT/1/A/4600/09, Loss of Operator Aid Computer. When the OAC point is inoperable, the OTDT channel is considered to be "in alarm". The applicable surveillance item is then performed using the available control room or local indications. Manual calculations for alarmed OTDT Setpoint Channels are continued every 12 hours and recorded on Enclosure 13.14, OTDT Setpoint Channel Check, until the OAC Setpoints have been restored to operable condition. The manual calculations are forwarded to the Control Room SRO and the Unit Shift Supervisor for evaluation. The results are acceptable when the difference between the calculated OTDT Setpoint and the NC Loop B OTDT Setpoint, from gauge indications, is $\geq -3\%$. If the acceptance criteria are not met, all applicable sections are logged in the Technical Specification Action Item Logbook (TSAIL). If the acceptance criteria are met, the discrepancy is not considered to be a deficiency and the unit may continue to operate in Mode 1.

EVENT DESCRIPTION

On June 28, 1991, prior to 1600 hours, Unit 1 was in Mode 1, Power Operation, at 100% power. After completing the End of Cycle 5 Refueling Outage, Power Range Neutron Detectors N-41, N-42, N-43, and N-44 had been calibrated by Instrumentation and Electrical (IAE) personnel. On June 28, Neutron Detector N-42 was calibrated per Work Request (W/R) 3933SWR; however, it was determined, on July 1, 1991, that the calibration for Neutron Detector N-42 was not accurate due to defective test leads being used at the time of calibration. On June 28, at 1600 hours, the Loop B OTDT OAC alarm was initiated. At 2117 hours, during the night shift surveillance while performing PT/1/A/4600/02, a manual calculation was performed by the Control Room Reactor Operator to determine the operability of Power Range Channel 2. The acceptance criteria were applied to the values obtained, and the OTDT channel was determined to be operable; therefore, the channel was not placed in the tripped position.

On June 29, 1991, at 0856 hours, the required OTDT Periodic Surveillance Item was checked using the OAC for the calculation. Computer point D4732 OTDT Setpoint was not in alarm at this time because Reactor Power was at 20% following a Load Rejection test. The acceptance criteria were satisfied and the channel was determined to be operable. At 1125 hours, Reactor Power reached 70% power and computer point D4732 for Channel 2 (Loop B) went into an alarm status. At 2235 hours, during the night shift surveillance items check, manual calculations were required to obtain the OTDT Setpoint Channel check due to Computer point D4732 being in alarm. The calculated difference acceptance criteria were satisfied and the channel remained operable.

On June 30, 1991, at 0100 hours, Unit 1 Reactor Power returned to 100% power. Manual calculations to determine the required surveillance item OTDT Setpoint Channel check were required by both shifts. The day shift calculation was

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMR NO. 3180-0104
EXPIRES 8-31-96

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
Catawba Nuclear Station, Unit 1	0 5 0 0 0 4 1 3	9 1	— 0 1	4 — 0 1	0 4	OF	0 7

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

performed at 0830 hours by the Control Room Reactor Operator. Part of the input for the calculation was incorrectly applied. A value of "negative 3.11" was used in the calculation instead of "positive 3.11", leading to a wrong calculated result; however, at the time of the calculation, the acceptance criteria were determined to have been met and the OTDT channel was determined to be operable. OTDT Channel 2 was not placed in the tripped condition. At 2200 hours, the night shift performed the manual calculation as part of procedure PT/1/A/4600/02A. All inputs for the calculation were correctly applied. When the acceptance criteria were applied, it was determined that the channel was inoperable. At 2331 hours, the channel was placed in the tripped condition, as required, by IAE personnel per 3994SWR. A review of the day shift manual calculation for June 30 was performed by the night shift personnel. It was determined that the day shift calculation was in error, and Channel 2 should have been placed in the tripped condition at 0830 hours. Problem Investigation Report (PIR) 1-C91-0281 was written to document this event.

On July 1, 1991, at 1015 hours, the day shift manual calculation was performed. The calculation results determined that OTDT Channel 2 was still inoperable, and the channel remained in the tripped condition. During this investigation, it was determined that the calculation performed on July 1, at 1015 hours, was performed incorrectly. The correct data was used in the calculation, but a mathematical error resulted in a calculated difference of "negative 19.06" instead of "negative 6.97". The channel was put in a tripped condition since "negative 19.06" was not within the acceptance criteria; however, the results of the correct calculation determined that the channel should still remain in the tripped condition. By 1530 hours, IAE personnel had completed the recalibration of Neutron Detector N-42 per W/R 12347IAE. The defective test leads discovered during the calibration were discarded. The W/R was removed from TSAIL at 1530 hours. At this time, the Axial Flux Difference (delta I) now agreed with the other calibrated power range channels. The OAC computer point (D4732) was no longer in the alarm status and Channel 2 OTDT was declared operable and returned to service.

CONCLUSION

This incident has been attributed to improperly performing the manual calculation required by PT/1/A/4600/09, and therefore taking no action, when required, because the need was not recognized. During the required OTDT Periodic Surveillance Items check on June 30, 1991, the Unit Supervisor used PT/1/A/4600/09 to determine if the channel was operable. The input data recorded in the procedure on Enclosure 13.14 was not used correctly during the manual calculation performed. The Axial Flux Difference value recorded on Enclosure 13.14 was a "positive 3.11" instead of a "negative 3.11". The "negative 3.11" value, when applied in the formula for the calculated OTDT Setpoint, caused the calculation value to be incorrect. The resulting calculated OTDT Setpoint Difference was a value that was within the acceptance

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1) Catawba Nuclear Station, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 4 1 3 9 1	LER NUMBER (6)			PAGE (3)		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		91	014	011	05	OF	07

TEXT (if more space is required, use additional NRC Form 388A's) (17)

criteria, as determined. If the correct value of "positive 3.11" had been used in the calculation, the resulting OTDT Setpoint Difference would have indicated the channel was not operable and should have been put in a tripped condition at that time. This resulted in the channel not being declared inoperable, resulting in the violation of T/S 3/4.3.1.

Per PT/1/A/4600/02A, if the OTDT Channel Check Setpoints are "in alarm", manual calculations are required for that point per PT/1/A/4600/09. The OTDT Channel 2 OAC computer point D4732 was in an alarm condition from 1600 hours to approximately 2212 hours on June 28, 1991 and from 1125 hours on June 29, 1991, until 1530 hours on July 1, 1991. This is due to Power Range Neutron Detector N-42 being out of calibration during this time. A contributing factor to this incident is that the test leads used in the calibration of this detector on June 28, 1991, were defective resulting in erroneous data being input to the OAC. The detector was not recalibrated over the weekend, and when work resumed on July 1, 1991, to determine why the data was erroneous, the defective test leads were discovered. They were discarded and new test leads were used for the recalibration.

During the subsequent investigation, previous Mode 1 Periodic Surveillance Items records were reviewed, and all day and night shift manual calculations were checked from June 28, 1991, through July 1, 1991. In addition to the calculation errors made on the day shift of June 30, 1991, and documented in PIR 1-C91-0281, the investigator discovered that another calculation error was made on day shift of July 1, 1991. Even though there was an error creating a different value for the calculated OTDT Setpoint, the channel was still required to remain in the tripped position per the correct calculation. It was also observed that out of five manual calculations required during this time, most of the actual calculations were not included with the PT/1/A/4600/09, Enclosure 13.14 data sheet. From a human factors standpoint, when calculations are performed on a separate paper, there is a greater possibility that a value could be transferred incorrectly and used in the calculation, especially concerning the Axial Flux Difference (delta I) Penalty. Even though the manual calculations are usually checked at least once by a second individual, there are no personnel signoff blanks on Enclosure 13.14 at this time. Procedure PT/1/A/4600/09, Enclosure 13.14, will be enhanced to allow space below the calculation formula to actually work the calculation on the same sheet and to allow a double signoff on the sheet (for the Originator and the Reviewer). The Reviewer will verify the original calculation is correct by performing the same manual calculation and ensuring that the answers are identical. This will decrease future calculation errors and the chance of violating a T/S requirement.

There was another incident in the last two years in which action was not taken when required because the need was not recognized (LER 414/89-012). This is considered to be a recurring event, since the same acceptance criteria involved

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104
EXPIRES 8-31-90

FACILITY NAME (1) Catawba Nuclear Station, Unit 1	DOCKET NUMBER (2) 0 5 0 0 0 4 1 3	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9 1	0 1 4	0 1	0 6	OF 0 7

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

Operations personnel in the 1989 event. The procedure changes prompted by this event, and the caution to Operations personnel who perform manual calculations for OTDT, should alleviate problems of this type.

CORRECTIVE ACTIONSUBSEQUENT

- 1) This incident was discussed with the appropriate personnel.
- 2) IAE personnel placed Overtemperature Delta Temperature Channel 2 in the tripped position per Work Request 3994SWR.
- 3) Control Room Operators declared OTDT Channel 2 inoperable.
- 4) IAE personnel recalibrated Neutron Detector N-42 to within specified criteria per Work Request 12347IAE. Defective test leads were discarded.
- 5) Control Room Operators declared OTDT Channel 2 operable after recalibration of Neutron Detector N-42 is completed.

PLANNED

- 1) Procedures PT/1,2/A/4600/09 will be revised to allow space to work the manual calculation and for signoffs (Originator and Reviewer) on Enclosure 13.4. The Reviewer will verify the original calculation is correct.
- 2) Possible alternative calculation changes will be evaluated to determine if the existing calculation formula for the OTDT Setpoint can be simplified to avoid further miscalculations.

SAFETY ANALYSIS

There are four channels per Unit which receive inputs for Overtemperature Delta Temperature. Technical Specification 3/4.3.1 requires that three channels are to be operable. Three channels for OTDT were operable throughout this incident (June 28, 1991, 1600 hours to July 1, 1991, 1530 hours) and would have provided Reactor Trip signals if required.

After the recalibration of Neutron Detector N-42 on July 1, 1991, Performance personnel recalculated the OTDT Setpoint using actual plant conditions and Channel 2 indications. By pulling computer data from the analog point history for the same time on June 30, at 0830 hours, and comparing the "actual"

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (4)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Catawba Nuclear Station, Unit 1	0 5 0 0 0 4 1 3	9 1	— 0 1	4 — 0 1	0 7	OF 0 7

TEXT (If more space is required, use additional NRC Form 385A 3/ (17))

condition to the old "calibrated" values (performed on June 28, 1991). Performance concluded that the channel was actually operable and operating in a conservative condition, although at the time (on June 30) per T/Ss, all indications were that the channel should be placed in the tripped condition. Nevertheless, three channels were unaffected through the time in question that would have provided necessary Reactor Trips.

The health and safety of the public were not affected by this incident.