NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Catawba Nuclear Station, Unit 1	0 5 0 0 0 4 1 3	1 OF 0 5

TITLE (4) Technical Specification Violation Due To Inoperable Reactor Coolant System Instrumentation Because Of A Design Deficiency

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)
1 1	0 5	8 7	8 7	—	0 4 3	— 0 0	1 2	3 0	8 7	Catawba, Unit 2	0 5 0 0 0 4 1 1 4
											0 5 0 0 0

OPERATING MODE (9)	6	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 0 0	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	
		20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
Julio G. Torre, Associate Engineer - Licensing	7 0 4 3 7 3 - 1 8 0 2 9

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)

		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
XX	YES (If yes, complete EXPECTED SUBMISSION DATE)		0 2	0 6	8 8
	NO				

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

On November 5, 1987, while performing an inspection of safety related instrumentation cable termination splices, a Duke Power Electrical Design Engineer discovered that the Unit 1 Reactor Coolant (NC) System wide range (W/R) resistance temperature detector's (RTD's) cable termination junction boxes were not sealed. Following a review of the problem, Station management was notified of the possible inoperability of the Unit 1 and Unit 2 W/R hot and cold leg RTDs on November 13, 1987. Unit 1 and Unit 2 have operated in all modes of operation with the affected W/R RTDs being technically inoperable before compensatory measures were implemented. The Unit 2 RTDs were conservatively declared inoperable at 1530 hours. At approximately 1800 hours, a Statement of Operability was issued which justified operability of the Unit 2 W/R hot leg RTDs through the use of compensatory measures in the event of a high energy line break inside Containment. The loop 2A and 2B cold leg RTDs were determined not to have an operability concern due to their cables being environmentally qualified. Control Room personnel were trained on the required compensatory measures and the Unit 2 RTDs were declared operable on November 14, 1987, at 0800 hours. Duke Power Station Management personnel determined this event to be reportable on November 30, 1987.

This incident is attributed to a design deficiency. The engineer responsible for review of the appropriate drawings failed to recognize the need to revise installation specifications. The affected Unit 1 RTD junction boxes were subsequently sealed by filling them with epoxy. The affected Unit 2 RTD junction boxes will be sealed with epoxy or replaced with environmentally qualified (sealed) junction boxes. The health and safety of the public were unaffected by this event.

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FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

BACKGROUND:

The Reactor Coolant (EIIS:AB) (NC) System wide range (W/R) resistance temperature detectors (EIIS:DET) (RTDs) provide continuous hot and cold leg temperature indication to Control Room Operators (CROs) under normal and accident conditions. These measured temperatures are available to CROs via meters, chart recorders and the Inadequate Core Cooling System (ICCS) monitors. The W/R temperature indications are utilized to monitor the NC System during Unit heat up and cooldown operations when the narrow range (N/R) RTDs are off scale low. They do not provide any automatic control functions. There is one W/R RTD installed in a well in each of the four NC loop's hot and cold legs.

In addition to the W/R loop temperature indication (0 - 700 degrees F), each loop contains N/R hot and cold leg RTDs (530 - 630 degrees F) installed in bypass piping. The N/R RTDs are immersion type which provide rapid response to NC System temperature changes. Since they are not installed directly in each NC loop, the N/R RTDs rely on NC pump operation to provide flow through the bypass piping for proper loop temperature indication. The N/R RTDs provide CROs with the most accurate NC loop temperature indication when at normal operating temperature and are used to provide various automatic control functions.

The In-Core Instrumentation (ENA) System provides 65 thermocouples (EIIS:THC) (100 - 700 degrees F normal range) installed on the Reactor upper internals to measure core outlet temperature. This data is available to CROs on the ICCS monitors.

The ICCS monitors provide CROs with a graphic display of actual measured NC temperature and pressure super- imposed upon a background outlining safe temperature and pressure limits. There are two trains of ICCS. Train A monitors loops C and D while train B monitors loops A and B. Train B is the designated Post Accident Monitor (PAM). Also displayed on the ICCS monitors are: 1)degrees of subcooling based upon the 5 highest reading ENA thermocouples, 2)degrees of subcooling based upon each loops W/R RTD reading, and 3)W/R NC pressure.

There are two loops of W/R hot and cold leg RTDs designated as PAM instrumentation (loops A and B). Technical Specification 3.3.3.6 requires that if both channels are inoperable, the inoperable channel(s) must be restored to operable status within 48 hours or be in at least Hot Standby within the next 6 hours and in Hot Shutdown within the following 6 hours. The operability of the PAM instrumentation ensures that sufficient information is available on selected plant parameters to monitor and assess these variables following an accident.

DESCRIPTION OF INCIDENT:

On May 12, 1978, the original NC System W/R RTD installation drawings were approved by Westinghouse Electric Corporation and supplied to Duke Power Company's Design Engineering (D/E) Department. These drawings showed the RTD cables protected by a spiral or braided steel jacket and specified that the cable should enter the junction box from the side to avoid contamination by condensation or drippage. The junction boxes are supplied by Duke Power.

During Environmental Qualification testing of the RTDs by Westinghouse, the RTDs were immersed in water. This resulted in unacceptably low readings for some of the RTDs involved due to moisture migration through the cable insulation to the RTD lead wires. To correct the problem, the cables were covered with stainless steel bellows hose with a stainless steel overbraid, and a sealed junction box was utilized. On October 8, 1981, Westinghouse approved revised drawings which showed the new cable covering material and specified a sealed junction box. The revised drawings were received by D/E on November 13, 1981, and distributed for review. The Design Engineer (now deceased) responsible for ensuring the RTD environmental qualification, reviewed the revised drawings without taking action to change the installation instructions for Catawba. The revised drawing was approved by D/E on December 15, 1981. The RTDs were subsequently installed on Unit 1 and Unit 2 by Construction personnel utilizing splash proof junction boxes in conjunction with Raychem splices to connect the RTD cables to Duke cables.

The loop A and B W/R cold leg RTDs were later changed to dual element RTDs with different cables which were environmentally qualified without a sealed junction box.

On November 5, 1987, an Electrical Design Engineer was performing an inspection of Raychem splices on safety related instrumentation in Unit 1 Containment. The Design Engineer discovered that the W/R hot and cold leg RTD junction boxes were not sealed as he thought was required. D/E began a review of the RTD drawings and contacted Westinghouse representatives regarding the requirement for sealed junction boxes. The information obtained by D/E verified the requirement for the W/R hot and cold leg RTD junction boxes to be sealed to ensure accuracy of the RTD temperature indications following high energy line breaks inside Containment.

On November 13, 1987, D/E initiated a Problem Investigation Report (PIR) to document their findings and notified Catawba's Compliance section of the possible inoperability. D/E had calculated that the RTD temperature indication could become inaccurate by as much as 60 degrees F lower than actual NC temperature. At 1530 hours, the Unit 2 W/R hot and cold leg RTDs were declared inoperable per Technical Specification 3.3.3.6. Unit 2 was in Mode 1, Power Operation, at this time. Unit 1 was in Mode 6, Refueling, and the Technical Specification was not applicable. At approximately 1800 hours, D/E issued a Statement of Operability for the Unit 2 W/R hot leg RTDs which justified operability through the use of compensatory measures which could be administratively implemented in the event of a high energy line break inside Containment. The loop A and B W/R cold leg RTDs were determined to have no operability concerns due to their having environmentally qualified cables. The compensatory measures identified by D/E for a high energy line break in Containment were: 1)to use A and B loop W[illegible] cold determinations, 2)to add 60 degrees F to indicated W[illegible] to determine actual loop T-hot and subtract 60 degrees F from [illegible] cooling to determine actual loop subcooling when no NC pumps [illegible] 3)when NC pumps are running the coolant is sufficiently mixed such [illegible] NA thermocouples are an adequate measure of the hottest NC temperature and could be used for loop T-hot and subcooling determinations.

Oncoming Control Room shift personnel were instructed to implement the required compensatory measures in the event of a high energy line break in Containment. On November 14, 1987, at 0800 hours, the Unit 2 W/R RTDs were declared operable.

D/E approved Variation Notices (VN) CE-1482 and VN CE-1483 (for Unit 1 and Unit 2 respectively) to fill the affected W/R RTD junction boxes with Scotchcast 9 Epoxy or to replace them with environmentally qualified (sealed) junction boxes. The Unit 1 junction boxes were epoxied on November 23, 1987. The Unit 2 W/R RTD junction boxes will be sealed with epoxy or replaced with sealed junction boxes during an upcoming refueling outage.

On November 30, 1987, Station management personnel determined that this incident was reportable to the NRC since the affected Unit 1 and 2 W/R RTDs had been unknowingly technically inoperable (due to possible inaccuracy following a high energy line break) in excess of the time limit specified in Technical Specification 3.3.3.6. This condition has existed since initial start up of both Catawba Units and continued until compensatory measure training was provided to Control Room personnel. Both Units were in all modes of operation since initial startup.

CONCLUSION:

This incident is attributed to a design deficiency. Following environmental qualification testing of the W/R RTDs, Westinghouse drawing revisions were reviewed by an Electrical Design Engineer responsible for ensuring proper RTD installation instructions for Catawba. His review of the revised drawings did not result in the installed junction boxes being sealed as specified. It is most likely that the engineer (now deceased) considered the use of Raychem splices in conjunction with splash proof junction boxes to be an acceptable alternative to sealed junction boxes for this application. However, this method cannot totally seal each conductor wire to the cable's protective stainless steel bellows hose which results in the cable insulation being exposed to the environment inside the junction box. The sealed junction box was specified for these RTDs when it was discovered that moisture could migrate through the cable insulating material to the RTD lead wires and cause inaccurate temperature indication. The revised drawings and the Environmental Qualification Test Report did not clearly explain the importance of or describe what constituted a sealed junction box. This may have contributed to the error.

D/E subsequently approved filling the affected junction boxes with epoxy or replacement with sealed junction boxes to prevent possible moisture induced RTD inaccuracy problems. The Unit 1 RTD junction boxes were epoxied on November 23, 1987. The Unit 2 RTD junction boxes will be epoxied or replaced with sealed junction boxes during an upcoming refueling outage. Compensatory measures will be continued until that time.

There has been one previous LER involving a Technical Specification violation due to a Duke Power Design Engineering deficiency caused by a D/E oversight at Catawba (see LER 413/85-68). This previous incident did not involve environmental qualifications of equipment, and the corrective actions

identified could not have prevented or shortened the duration of this event. Therefore, Duke Power does not consider this LER to involve a recurring type of event.

There has also been one previous non-reportable incident at Catawba involving non-environmentally qualified equipment. The incident resulted when wiring which could not be verified as environmentally qualified was installed in valve motor operators by the manufacturer. This incident is documented in Duke Power Incident Investigation Report C86-112-1, Revision 1.

CORRECTIVE ACTION:

SUBSEQUENT

(1) Operations issued a Technical Memorandum describing necessary compensatory measures.

(2) Oncoming Control Room Shift personnel were instructed regarding necessary compensatory measures.

(3) Unit 1 RTD junction boxes were sealed with epoxy.

PLANNED

(1) Unit 2 RTD junction boxes will be sealed with epoxy or replaced with environmentally qualified equipment as it may be required.

(2) Duke Power personnel will develop a safety analysis for this event. This analysis will be provided in a revision to this LER prior to February 6, 1988.

SAFETY ANALYSIS:

A detailed safety analysis will be provided in a revision to this report prior to February 6, 1988.

This incident is reportable pursuant to 10 CFR 50.73, Section (a)(2)(i)(B).

The health and safety of the public were unaffected by this incident.

DUKE POWER COMPANY
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December 30, 1987

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

Subject: Catawba Nuclear Station, Units 1 and 2
Docket Nos. 50-413 and 50-414
LER 413/87-43

Gentlemen:

Pursuant to 10 CFR 50.73 Section (a) (1) and (d), attached is Licensee Event Report 413/87-43 concerning a failure to implement vendor design changes rendering Reactor Coolant System temperature monitoring instrumentation unknowlingly inoperable under certain conditions violating Technical Specifications. This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

JGT/1102/sbn

Attachment

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