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FACIL:50-316 Donald C. Cook Nuclear Power Plant, Unit 2, Indiana & 05000316
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SUBJECT: LER 86-023-03:on 860715, erroneous accumulator level indication resulting in low accumulator volume.
W/8 ltr.

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TITLE: 50.73 Licensee Event Report (LER), Incident Rpt, etc.

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NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/88

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
D. C. COOK NUCLEAR PLANT - UNIT 2	0 5 0 0 0 3 1 6	1 OF 0 7

TITLE (4) ERRONEOUS ACCUMULATOR LEVEL INDICATION RESULTING IN LOW ACCUMULATOR VOLUME

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 5 0 0 0
0 7	1 5	8 6	8 6	— 0 2 3	— 0 3	0 3	0 9	8 9		0 5 0 0 0

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
1	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 0 4 8	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
T. P. BEILMAN INSTRUMENTATION AND CONTROL DEPARTMENT SUPERINTENDENT	AREA CODE 6 1 6 4 6 5 - 5 9 0 1

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
X	B P	E C B D	I 2 0 4	Y	X	B P	P I T	I 2 0 4	Y
X	B P	T D	I 2 0 4	Y					

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)

This revision is being submitted to change the completion date for long term preventive actions on Unit One.

Between July 15 and 18, 1986, problems were encountered with the process instrumentation monitoring the volume within accumulator #2. Complications developed during ultrasonic testing (UT) conducted to verify accumulator operability which resulted in the failure to identify a violation of the action statement associated with low accumulator volume and a missed surveillance for boron concentration. The administrative problems associated with accumulator level verification by UT were corrected and this method was used in lieu of the process instrumentation to verify accumulator operability until unit shutdown for an outage March 3, 1987.

Testing performed during the March 1987 outage, determined that three instrument components were defective; all were replaced in kind. On April 26, 1987 ILA-121 began to drift upwards. On April 30, 1987, as a precautionary measure, ILA-121 was declared inoperable. Accumulator level was monitored using UT until unit shutdown on August 27, 1987.

Testing performed during the September 1987 outage determined that one instrument component was defective. The component was replaced in kind and the process instrumentation has subsequently functioned normally.

IE22 1/1

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
D. C. COOK NUCLEAR PLANT - UNIT 2	0 5 0 0 0 3 1 6	8 6	— 0 2 3	— 0 3	0 2 OF 0 7

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

This revision is being submitted to change the completion date for long term preventive actions on Unit One.

Conditions Prior To Occurrence

Unit 2 in Mode 1, RTP at 48 percent (@1330 hours on 7-15-86)

Description of Event

Technical Specification 3.5.1b requires that each accumulator (EIIS/BP-TK) must maintain between 929 and 971 cubic feet of borated water while the unit is in Modes 1-3 (Power Operation, Startup, and Hot Standby, respectively). If the accumulator volume deviates from the prescribed limits, the volume must be restored within 1 hour or the unit must be in hot shutdown (Mode 4) within the next 12 hours.

Process instrumentation monitoring accumulator inventory (EIIS/BP-LIT) displays water volume in cubic feet. The system is comprised of 2 indicators for each accumulator, one wide range (300 - 1000 cubic feet) and one narrow range (900 - 1000 cubic feet). On July 15, 1986, operators on shift became suspect of the accumulator #2 volume indication and requested an ultrasonic test (UT) be performed to verify water inventory. Quality Control personnel located the water level using ultrasound and then marked/dated the tank accordingly; however, during this process their data sheet became contaminated and was discarded before leaving access control. A new data sheet was subsequently filled out from memory and the Control Room was informed at 1330 hours on July 15 that accumulator #2 was at 115.75 inches. When mathematically converted to volume, this level corresponds to 969.58 cubic feet; which, by coincidence only, happened to closely agree with the process instrumentation indication at that time.

On July 18, 1986, at 0800 hours another UT was requested for accumulator #2 because of questionable volume indication. When QC arrived at accumulator #2 they discovered a 10 inch error was made in the July 15 report. The level was actually 105.75 inches (909.58 cubic feet) on July 15, and not 115.75 (969.58 cubic feet) as reported. It can therefore be deduced that the lower limit for continued operation (929 cubic feet) had been violated since at least July 15 without the appropriate compensatory actions being taken.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
D. C. COOK NUCLEAR PLANT - UNIT 2	0 5 0 0 0 3 1 6	8 6	— 0 2 3	— 0 3	0 3 OF 0 7

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

Description of Event (cont'd)

This error was compounded during communications between Quality Control and Operations following the UT performed the morning of July 18. At 0945 hours on that morning, Quality Control reported the level of accumulator #2 had risen 3 inches since the last test performed on July 15. Operations was not made aware of the 10 inch error discovered earlier. Consequently, acting under the impression that accumulator #2 had risen from 115.75 inches (969.58 cubic feet) to a volume exceeding the upper limiting condition for continued operation, Operations personnel declared accumulator #2 inoperable based upon high level (it was actually low) and measures were taken to begin draining the tank.

With respect to the volume increase which occurred sometime between July 15 and July 18, no conclusive evidence can be produced confirming that said increases actually happened within a six hour time span preceding boron sampling performed at 0925 hours on July 18. Therefore, the plant must assume the boron concentration was not verified following a solution increase >/= 1 percent of tank volume as required by Technical Specification 4.5.1b.

It should be noted that at 0952 hours on July 18, while preparations were underway for draining accumulator #2, Unit 2 tripped on a steam generator level high-high signal thus placing the unit in Mode 3.

This event was further complicated at 1447 hours on July 18 when the Control Room was informed that UT results placed #2 accumulator's level 3 inches below the last measurement taken earlier that morning (due to draining). With this information, and still unaware of the 10 inch error made on July 15, Operations declared the accumulator operable because they believed the apparently high volume of water had been reduced to within acceptable limits for continued operation. In reality, the accumulator volume was drained down from an already too low condition to an even lower status.

At 1620 hours on July 18, Operations became cognizant of the 10 inch error made on July 15. It was recognized at this time that accumulator #2 was, and had been since at least 1330 hours on July 15, in violation of the lower volume limit required by Technical Specification 3.5.1b. Accumulator #2 was immediately declared inoperable. Cooling of the reactor coolant system (EIIS/BP-AB) to achieve Mode 4 began at 1720 hours and the NRC was notified of the event by phone at 1808 hours. Efforts towards filling accumulator #2 via the refueling water storage tank (EIIS/BP-TK) commenced at 1839 hours and the event was terminated at 2120 hours on July 18 when the accumulator volume and boron concentration were verified to be within the limiting condition for operation as described in Technical Specification 3.5.1b and 3.5.1c respectively. Cooldown was halted prior to reaching Mode 4.

With the exception of the loop 2 accumulator volume instrumentation, there were no inoperable structures, systems, or components at the start of this event which could have contributed to its occurrence.

Cause of the Event

The cause of this event has been attributed to the inability of the process instrumentation to accurately reflect the volume within accumulator #2, which resulted in the need for ultrasonic testing to verify accumulator operability. Three defective components within the system were diagnosed as the root cause for the instrumentation failure. The instrumentation consists of a circuit board (EIIS/BP-ECBD), strain gauge (EIIS/BP-TD), potentiometer span (EIIS/BP-EC), potentiometer zero (EIIS/BP-EC) and a narrow range differential pressure unit (DPU) (EIIS/BP-PIT). The initial investigation indicated that the "zero" was drifting, which results from a faulty circuit board and strain gauge. Subsequently, these components were replaced. The instrumentation subsequently zeroed properly, but data was not repeatable when ranged up and back down the measurement scale. As a result, the DPU narrow range was replaced which eliminated the repeatability problem. Later the span and zero potentiometers were replaced to ensure proper instrumentation operation. The calibrated instrument was returned to service on April 2, 1987, and functioned normally until April 26, at which time the system began to exhibit signs of drifting upwards. Ultrasonic measurements taken after April 26 confirmed the actual volume within accumulator #2 was steady and well within the Technical Specification allowable range, however, the results also confirmed that ILA-121 was continuing a slow but steady upward drift towards the administrative limit for operability. As a precautionary measure, ILA-121 was declared inoperable at 1328 hours on April 30, 1987.

Further investigation conducted during the September 1987 outage indicated that the root cause of the second instrument failure was a faulty DPU narrow range. the DPU narrow range was replaced and the calibrated instrument was returned to service on September 24, 1987. The instrument has subsequently functioned normally.

Contributing to this event was the fact that Quality Control personnel who performed the original UT on July 15 did not implement sound work practices while conducting activities in a radioactive environment. This resulted the the loss of hard copy data supporting test results forcing those involved to rely solely upon memory recall. It should be noted that the UT was performed within an extremely harsh environment consisting of elevated temperature and airborne radioactivity. These adverse conditions complicated efforts of the test crew because full face mask was required and the fatigue process was accelerated.

Inadequate communication between the Control Room and Quality Control personnel further complicated this event. No formal mechanism had been established to verify that operators on shift had a complete and accurate understanding of the UT results.

Analysis of Event

This event is reportable under the criteria of 10 CFR 50.73 (a)(2)(i) as described below.

- For approximately 3 days prior to July 18, 1986, the volume of accumulator #2 was below its lower limiting condition for operation and the corresponding action statement associated with Technical Specification 3.5.1b was not satisfied.

- Between July 15 and July 18, 1986, accumulator #2 experienced a solution increase greater >/=1 percent of the tank volume and the boron concentration was not verified to be acceptable within the next 6 hours as required by Technical Specification 4.5.1b.

The safety significance of power generation with accumulator volume of one accumulator at 909.6 cubic feet rather than 929 cubic feet is limited to impact on the loss-of-coolant accident analysis. The limiting loss-of-coolant accident analysis for Unit 2 Cycle 6 predicts a peak clad temperature of 2079 degree F with a 121 degree F margin to the 2200 degree F limit specified in 10 CFR 50.46. Exxon Nuclear Company, the fuel vendor for Cycle 6, was requested to evaluate the impact of the event on public health and safety. Their response stated:

> "... it is Exxon's opinion that a significant safety hazard to the public did not exist for the following reason. The limiting case in the reference indicated a peak cladding temperature (PCT) of 2079 degree F for operation at 100 percent power. Operation at 90 percent power would result in a reduction in the PCT and would tend to offset any increase in PCT due to the reduced accumulator liquid volume. The reduced accumulator liquid volume alone is expected to have a very small effect on the PCT. The accumulator flow would end approximately 1 second sooner than the time indicated in the reference. Since this occurs after the beginning of core recovery time (BOCREC) when the downcomer is full, a very small adverse effect on reflood rate and PCT would occur and would be much less than the 121 degree F margin indicated in the reference."

It is of note that the difference between the as-found condition (909.6 cubic feet) and the value specified in the Technical Specification of 929 cubic feet is 19.4 cubic feet, or approximately 960 lbs. of water. In order to conservatively evaluate the effect on peak clad temperature, a hypothetical scenario was evaluated in which it was assumed that this water was deficient during the refill period, and had to be made up by pumped injection water. It would have taken the pumps approximately 1.1 seconds to make up this water. Since the PCT rate of heatup during the early reflood/refill period is about 13 degree/second, this would have resulted in a PCT increase of about 15 degree F. Adding 15 degree F to the calculated PCT results in a new PCT of 2094 degree F, which is still well within the limits of 10 CFR 50.46.

Analysis of Event (cont'd)

The actual change in peak clad temperature, had a new analysis been performed, would have been well below the above 15 degrees F value because the deficit in water would have occurred after the beginning of core recovery when heat transfer mechanisms associated with the reflood were in place, and the need for accumulator water had significantly lessened.

It is also concluded that the missed boron surveillance was not of significance, since a boron sample taken at 0925 hours on July 18 contained a concentration of 1975 parts per million (ppm), which is well within the required limits of 1900 and 2100 ppm.

Based on all of the above information, it is concluded that the event did not constitute an unreviewed safety question as defined in 10 CFR 50.59 nor did it adversely impact public health and safety.

Corrective Action

Immediate corrective/preventive action consisted of: 1) promptly increasing accumulator volume to within Technical Specification Limits and verifying acceptable boron concentration; and 2) obtaining independently verified UT level indication at least once every 10 hours, to ensure Technical Specification compliance while the process instrumentation was/is out of service.

Long term preventive action will be to replace all of the accumulator level instrumentation with Foxboro instrumentation as similar problems have been experienced in several of the other ITT-Barton instruments. The replacement is scheduled for Unit One and Unit Two during their respective scheduled refueling outages in 1990. Detailed walkdowns for design development were completed during the 1988 Unit Two refueling outage for the 1990 Unit Two installation. Walkdowns are scheduled in Unit One during the 1989 refueling outage for the 1990 Unit One installation.

The personnel responsible for the inaccurate report on July 15 have been instructed in the appropriate methods for maintaining cleanliness of written documents while in a contaminated environment, and the importance of transmitting accurate information utilized to evaluate plant conditions. These persons have since demonstrated the necessary skills to prevent a recurrence of this event during activities performed under similar circumstances.

To enhance the effectiveness of communications between Quality Control and Operations personnel, the data sheet(s) within the ultrasonic test procedure have been revised to require: 1) independent verification of test results; and 2) Unit Supervisor/SRO review and signature.

Failed Component Identification

Component: Circuit Board
EIIS: ECBD
Manufacturer: ITT-Barton
Model Number: 384

Component: Strain Gauge
EIIS: TD
Manufacturer: ITT-Barton
Model Number: 386

Component: Differential Pressure Unit
EIIS: PIT
Manufacturer: ITT-Barton
Model Number: 224-352

Previous Similar Events

There have been no similar events in the past where the plant has failed to meet the action statement associated with accumulator volumes being out of specification. Also, the plant has never failed in the past to verify boron concentration in the accumulators within 6 hours following a solution increase of >/= 1 percent of tank volume.

Indiana Michigan
Power Company
Cook Nuclear Plant
P.O. Box 458
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INDIANA MICHIGAN POWER

March 9, 1989

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Operating License DPR-74
Docket No. 50-316

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled Licensee Event Reporting System, the following report is being submitted:

86-023-03

Sincerely,

W. G. Smith, Jr.
Plant Manager

WGS:clw

Attachment

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