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 7

TITLE (4)

Both Trains of Residual Heat Removal Inoperable

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	2 2	8 5	8 5	0 2 8	0 0	0 5	2 2	8 5		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	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)	X 50.73(a)(2)(v)	73.71(c)
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	X OTHER (Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iii)	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)	50.72(b)(2)(iii)
		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
Roger W. Ouellette, Assistant Engineer - Licensing	7 0 4 3 7 3 - 7 5 3 0

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
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 22, 1985, from 2039:21 to 2051:17 hours, both trains of Residual Heat Removal (ND) were inoperable. This was a result of ND Train A being declared inoperable on April 20, 1985, at 1600 hours, for the performance of various ND Train A related work requests, and ND Pump B being secured on April 22, 1985, at 2039:21 hours due to Loss of Pump suction. Also, Technical Specification 3.4.1.4.2 was violated on April 22, 1985, at 0522 hours when Reactor Coolant (NC) System draining began with ND Train A inoperable. Catawba Unit 1 was in Mode 5 (Cold Shutdown) when these incidents occurred.

False NC System Level Indication apparently contributed to the loss of ND Pump B suction. However, the cause of the false level indication is not known at this time.

With ND Train A inoperable, the Limiting Conditions for Operation of Technical Specification 3.4.1.4.2 were not met. However, prior to beginning NC System draining, a decision had been made to allow draining to begin with ND Train A inoperable. Therefore, this incident is also classified as a Personnel Error.

After ND Pump B was secured, Centrifugal Charging Pump (CCP) A was aligned to the Refueling Water Storage Tank (FWST) and started to restore NC System Level. ND Pump B was then vented and re-started at 2051:17 hours. On April 24, 1985, at 1843 hours, an operable ND Train A flowpath was established.

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

Certain maintenance activities associated with the Reactor Coolant (NC) System require the NC System to be drained to various levels. NC System draining is performed using Procedure OP/1/A/6150/06 (Draining the Reactor Coolant System) which provides guidelines for the NC System levels required for various maintenance activities. During this incident, NC System level was to be decreased to 6% for NC pump seal maintenance. During NC System draining, NC System level is monitored by transmitters 1NCLT5200 and 1NCLT6450, located on NC Loops A and B respectively. These transmitters provide input to Control Room indicators 1NCP5200 and 1NCP6450. These indicators measure NC System level from 0 to 100% with each 1% indication being equal to 4 inches in NC System level. 0% NC System level corresponds to the inside bottom of the NC System hot legs. Also, for additional NC System level indication, tygon tubing can be installed on the NC System piping downstream of valve 1NC282 (Loop A Low Point Drain). The NC System can be drained via the Residual Heat Removal (ND) System or via the NC Drain Tank (NCDT) Pumps.

During NC System draining, the ND System is used to provide core cooling. The ND System provides redundant trains (A and B) with each train consisting of a pump, heat exchanger, and the associated piping, valves, and instrumentation required for operational control. During ND operation, Reactor Coolant passes through the respective pump and heat exchanger and is returned to the NC Cold Legs. ND Train A takes suction from NC Loop B Hot Leg and discharges to NC Loops C and D Cold Legs. ND Train B takes suction from NC Loop C Hot Leg and discharges to NC Loops A and B Cold Legs. The 12 inch diameter ND suction piping intersects the 29 inch diameter NC piping at 45 degrees below horizontal.

During ND System operation with NC System draining in progress, Procedure OP/1/A/6150/06 requires that ND Pump flow be maintained at 3000 GPM or less for one train operation at NC System levels of 6%. If level is to be reduced below 6%, ND Pump flow must be reduced by 500 GPM for each 1% decrease in NC system level.

On April 20, 1985, at 0329 hours, ND Pumps A and B were started per Procedure OP/1/A/6200/04, (Residual Heat Removal System) to provide core cooling. At 0337 hours, ND Pump B was secured. ND Train A remained in service to provide core cooling. At 1029 hours, ND Pump B was started and core cooling was transferred from ND Train A to ND Train B. ND Pump A was secured and at 1600 hours, ND Train A was declared inoperable for the performance of various ND Train A related work requests.

On April 22, 1985, at 0420 hours, preparations were made to begin NC System draining per OP/1/A/6150/06. This was required to perform NC Pump Seal maintenance. After NC System Level Transmitters 1NCLT5200 and 1NCLT6450 were valved in and placed in service, it was discovered that the level indicated by 1NCP5200 did not agree with the level indicated by 1NCP6450. From the indicated levels, it was determined that 1NCP5200 was inaccurate. At 0522 hours, the NC System was being drained via the ND System, using 1NCP6450 for NC System level indication. At this time, ND Train A was

inoperable. Work Request 158310PS was subsequently issued to investigate and repair the cause of 1NCP5200 not agreeing with 1NCP6450. At 0525 hours, NC System Level was 60% as indicated by 1NCP6450.

By approximately 1400 hours, NC System level had been decreased to approximately 10%, and was gradually being decreased to 6%. At 1913:11 hours, an ND Pump B Low Discharge Pressure Digital Computer Alarm initiated. NC System level was approximately 7% as indicated by 1NC6450 with ND Pump B operating at approximately 1500 GPM. Also during this period, valve 1ND59B (ND Pump B Miniflow) cycled open and closed (opens when ND Pump B flow is <500 GPM and closes when flow is >1000 GPM).

The low discharge pressure digital computer alarm and the cycling of 1ND59B continued intermittently until ND Pump B was manually tripped. At approximately 1930 hours, during Control Room shift change, a Nuclear Control Operator (NCO) noticed ND Pump B amps and discharge pressure fluctuating as indicated by Control Room indicators. NC System level was approximately 6% at this time. The NCO closed valve 1NV135 (ND Flow to Letdown Heat Exchanger) and valve 1ND58B (ND Heat Exchanger B Outlet to Letdown Heat Exchanger) to isolate NC System draining and reduced ND Pump B flow by approximately 300 to 500 GPM. A Nuclear Equipment Operator (NEO) was then dispatched to vent the ND Pump B suction piping. At 2030:45 and 2036:45 hours, a Low ND Heat Exchanger B Outlet Flow Computer Alarm was initiated (occurs when flow is <500 GPM).

When the NEO began venting the pump suction piping, pump discharge pressure and flow dropped to zero. NC System level dropped to approximately 5% and NC System temperature began increasing. At 2039:21 hours, ND Pump B was secured to prevent pump damage. Procedure AP/1/A/5500/19 (Loss of Residual Heat Removal System) was initiated. Valves 1NV253B (Chemical Volume and Control (NV) System Pump Suction from the FWST) and 1NI10B (NV Pump to Cold-Leg Discharge Isolation) were opened and Centrifugal Charging Pump (CCP) A was started to restore NC System level (level had decreased to approximately 2% and NC System temperature had increased to approximately 177 degrees F). By 2051:17 hours, ND Pump B venting was completed, and the pump was started on miniflow. A discharge pressure of 195 psig was established and valve 1ND60 (ND Heat Exchanger 1B Outlet Control) was slowly opened to supply ND flow to NC Loops A and B. At this time, NC System temperature began decreasing. By 2056 hours, NC System level had been restored to 11% with ND Pump B operating at approximately 1000 GPM. At 2057:33 hours, CCP A was secured. After ND Pump B was started, ND Pump B low discharge pressure digital computer alarm and the cycling of valve 1ND59B continued intermittently until 2110 hours.

CONCLUSIONS

When ND Train A was declared inoperable, Unit 1 was in Mode 5 with the NC Loops filled. ND Train B was in operation, providing core cooling. Technical Specification 3.4.1.4.1 requires at least one ND Train operable and in operation during Mode 5 with the NC Loops filled. However, Technical Specification 3.4.1.4.2 requires two ND Trains operable with at least one

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train in operation during Mode 5 with the NC Loops not filled. Prior to beginning NC System draining, the Initial Conditions of OP/1/A/6150/06 requires review of these Technical Specifications to ensure all requirements are met. The decision was made that draining could begin, based on an earlier occurrence where NC System draining was in progress, and an ND Train was declared inoperable for the performance of a work request. Action Statement (a) of Technical Specification 3.4.1.4.2 states that "with less than the required Residual Heat Removal Loops OPERABLE, immediately initiate corrective action to return the required Residual Heat Removal Loops to OPERABLE status as soon as possible". Since work was being pursued to return ND Train A to an OPERABLE condition (ND Train A related work requests were in progress), it was decided that Technical Specification 3.4.1.4.2 could be entered. Therefore, when draining began, Action Statement (a) of Technical Specification 3.4.1.4.2 was immediately entered due to the inoperability of ND Train A. Prior to entering a particular Technical Specification, all Limiting Conditions For Operation should be met. For this situation, since ND Train A was inoperable, the Limiting Conditions For Operation were not met. Therefore, NC System draining should not have been allowed to begin until ND Train A was declared operable. Therefore, this accident is classified as a Personnel Error.

As NC System level was decreased, it is believed that a false indication of level occurred, which resulted in NC System level being decreased low enough to affect ND Pump B operation. Air probably entered the ND Pump B suction piping and was trapped in the pump casing, causing pump cavitation and fluctuations of ND Pump B discharge pressure and amps. This lead to the eventual loss of pump discharge flow and pressure. However, the cause of the false level indication is not known at this time.

As the NC System was drained, a pressure difference may have developed between the Pressurizer and Pressurizer Relief Tank, which could have caused erroneous level indication as level was decreased. Also, as NC System Level reaches the Reactor Vessel nozzles, NC System water will begin to drain from the Steam Generators in slugs, causing erratic level indications. NC System level transmitters 1NCLT5200 and 1NCLT6450 are located in NC Loops A and B respectively. ND Pumps A and B take suction from NC Loops B and C respectively. Therefore, erratic level deviations between NC loops may have gone undetected, allowing level to be dropped low enough to allow air to enter the ND suction piping. Also, level is indicated from 0 to 100% with each 1% being equal to 4 inches in NC System level. Therefore, these transmitters actually provide wide range indication. The NC System levels maintained during draining operation are only a small percentage of the total indicated range. This could allow level to be decreased low enough to impair ND Pump operation due to the errors which could occur when reading Control Room indicators. Modification NSM CN-10303 was initiated on July 5, 1984, to install narrow range level transmitters and receiver gauges in addition to the existing level transmitters.

These will be used to monitor NC System level when the system is being drained. However, this NSM has not yet been implemented. On April 23, 1985, the calibration of 1NCLT5200 and 1NCLT6450 was checked per Work Request 158310PS, and 1NCLT6450 was in calibration. 1NCLT5200 was found to be out of calibration and was subsequently adjusted and recalibrated.

Following the Loss of ND Pump B, it is not known why NC System level decreased to 2%. Some decrease can be attributed to air being vented from the ND system. At the time the pump was secured, the NC System drain was isolated. Also, levels in the Boron Recycle Holdup Tank, Waste Evaporator Feed Tank, and the Volume Control Tank were checked. No increase, which could be attributed to the decrease in NC System level, was found.

After the incident occurred and NC System level was increased, level was maintained at approximately 10% through April 25, 1985, at 0445 hours. During this period, NC System level would gradually decrease, dropping approximately 1% every 12 hours, and would have to be restored from the FWST (Refueling Water Storage Tank) by the CCP. Tygon tubing was installed on the NC System on April 24, 1985, to provide additional NC System level indication.

On April 24, 1985, at 2319 hours, ND Pump A was started for a functional checkout. NC System level was approximately 10% and ND Pump B was in operation. At 0018 hours, ND Pump A was secured due to the inability to establish stable discharge pressure indication. A NEO was dispatched to vent the pump, and at 0100 hours, after venting was completed, ND Pump A was re-started. The pump ran for approximately 40 seconds and was then secured due to low amps and zero discharge pressure. At 0125 hours, ND Pump A was re-started and run for approximately 3 minutes. The pump was again secured due to loss of pump discharge pressure and erratic amp indication. The pump was vented again and re-started at 0241 hours. At this time, pump amps and discharge pressure stabilized. Following the pump start, NC System level was decreased from 10% to 7% as indicated by the tygon tubing installed on Loop A. ND Pumps A and B were both operating at this time.

On April 25, 1985, ND Pump A was secured to allow functional testing of valve 1ND-27A. When ND Pump 1A was secured, NC System level increased from 7% to 10% as indicated by 1NCP6450.

Difficulties with ND Pump operation during drained conditions have been experienced throughout the Nuclear Industry. Refer to Special Report NSAC-52, Residual Heat Removal Experience Review and Safety Analysis.

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CORRECTIVE ACTION

1) Control Room initiated Procedure AP/1/A/5500/19.

2) CCP A suction was aligned to the FWST, and the pump was started to restore NC System level.

3) ND Pump B was vented and re-started.

4) NC System Level Transmitter 1NCLT5200 and 1NCLT6450 were calibrated per Work Request 158310PS.

5) An operable ND Train A flowpath was established.

6) All Operators will be advised of this incident.

7) A change to OP/1/A/6150/06 will be made such that draining will not proceed at <21% NC level unless at least two NC level indications are available and are in agreement. Also draining will not proceed at <12% NC level unless tygon tubing is installed and vented back to the NC system (or both vented to atmosphere).

8) A change to OP/1/A/6150/06 will be made to specify monitoring the total volume drained (by increase in Recycle Holdup Tank level) to key the operator when NC level is approaching loop nozzles. Information on the appropriate volume to indicate draining to this level will be provided.

9) A correlation between NC System level and the Reactor Vessel Level Instrumentation System (RVLIS) will be developed for Mode 5 operation with the loops drained. This information will be referenced in OP/1/A/6150/06.

10) A permanent sight glass of 3 to 6 feet vented to the NC system that can be valved in when NC level approaches the vicinity of the nozzles during draining will be installed.

11) Present NC level transmitters will be replaced with more reliable (Less likely to drift) transmitters.

12) A change in OP/1/A/6150/06 and AP/1/A/5500/19 to specifiy monitoring incore thermocouples for NC temperature will be initiated.

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

SAFETY ANALYSIS

At the time ND Pump B was secured, immediate corrective action was taken to return the pump to service as required by Action Statement (a) of Technical Specification 3.4.1.4.2 Corrective Action was not taken at this time on ND Train A due to the Technical Specification misinterpretation. ND Pump B was restored approximately one minute later.

Had the return to service of ND Pump B been further delayed, additional core cooling could have been provided by the FWST via the CCP. Technical Specification 3.1.2.5 requires a minimum contained borated water volume of 26,000 gallons in the FWST during Mode 5 and 6. Therefore, an adequate water supply was available.

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

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VICE PRESIDENT
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May 22, 1985

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

Subject: Catawba Nuclear Station, Unit 1
Docket No. 50-413

Gentlemen:

Pursuant to 10 CFR 50.73 Section (a) (1) and (d), attached is Licensee Event Report 413/85-28 concerning both trains of Residual Heat Removal inoperable. This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

H.B. Tucker 1/30

Hal B. Tucker

RWO:slb

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator
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