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)
Catawba Nuclear Station, Unit 2	0 5 0 0 0 4 1 1 4	1 OF 0 1 5

TITLE (4) Auxiliary Feedwater Auto Start Followed By Auxiliary Feedwater Suction Swap To The Nuclear Service Water System Due To Delaminated Coating Materials.

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 3	1 7	8 8	8 3	— 0 1 4	— 0 1	1 0	0 4	8 8	N/A	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)			
3	20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10) 1 0 0	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)	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 — 1 8 1 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
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

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

On May 17, 1988, at 1541:17 hours, Main Feedwater Pump Turbine (CFPT) 2B tripped automatically on low condenser vacuum. Since the other CFPT was not in service at this time, an Auxiliary Feedwater (CA) autostart signal was generated on loss of both CFPTs. Motor Driven CA Pump 2A suction unexpectedly swapped to the Nuclear Service Water (RN) System at 1541:24 hours, due to a sustained low suction pressure condition. The Unit was in Mode 3, Hot Standby, at the time of this incident.

This incident has been attributed to delaminated Condenser Circulating Water (RC) System interior pipe coating material restricting RC flow through the condenser which caused the drop in vacuum.

At the time of this incident, Performance and Operations personnel were testing the CA System. The CA Condensate Storage Tank (CACST) was isolated from the CA pump suction lines for testing. This alignment combined with the fact that CA Pump 2A started about one second before CA Pump 2B caused the low suction pressure condition to be sustained just long enough to initiate the suction swap for Train A.

In the future, the CA System will be maintained in standby readiness with the CACST aligned to the suction lines until other options can be evaluated and are accepted by the NRC. The feasibility of lowering the CA suction low pressure setpoints is being evaluated. The delaminated pipe coating material was later removed from the CFPT 2B Condenser waterboxes and the pump returned to service. The health and safety of the public were unaffected by this event.

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BACKGROUND:

The Main Feedwater (EIIS:SJ) System supplies feedwater to the Steam Generators (EIIS:SG) (S/Gs) at the temperature, pressure, and flow required to maintain proper S/G level. The CF System contains two 50% capacity variable speed Turbine (EIIS:TRB) Driven CF Pumps (EIIS:P) (CFPTs). Each CFPT has an associated condenser (EIIS:COND) which condenses steam exhausted from the Turbine under vacuum conditions. If a low vacuum condition (17.51 in Hg) is sensed by two out of three pressure switches in the condenser, the CFPT will be tripped automatically. Cooling water for the CFPT condensers is supplied by the Condenser Circulating Water (RC) System. The RC System piping interior is covered with a protective coating to minimize corrosion of the carbon steel piping.

The Auxiliary Feedwater (EIIS:BA) (CA) System ensures a sufficient feedwater supply to the S/Gs in the event of loss of the CF System to remove stored and residual core energy from the Reactor Coolant (EIIS:AB) (NC) System. There are two Motor Driven CA Pumps and one Steam Turbine Driven CA Pump (CAPT) per Unit. Each Motor (EIIS:MO) Driven CA Pump is capable of supplying two S/Gs while the CAPT is capable of supplying all four S/Gs. The Motor Driven CA Pumps will start automatically on a loss of both CFPTs.

There are several sources of water available to the CA pumps. The preferred sources are non-safety related condensate quality sources located in the Turbine and Service Buildings (CA Condensate Storage Tank (EIIS:TK) CACST), Upper Surge Tank (UST), and Condenser Hotwell). The assured source of water to the CA pumps is the safety related portion of the Nuclear Service Water (EIIS:BL) (RN) System. During a CA autostart, each pump's suction is designed to automatically swap to the RN System if a sustained low pressure is detected by two out of three of its associated suction pressure switches. The two out of three logic must be satisfied for approximately five seconds before a suction swap will occur. If the autostart signal has been cleared, or the pumps were started manually, the pumps will be tripped on low suction pressure rather than be aligned to RN.

DESCRIPTION OF EVENT:

On March 17, 1988, at approximately 1537 hours, a CFPT 2B Exhaust Low Vacuum alarm occurred. CFPT 2B subsequently tripped on low vacuum at 1541:17 hours. Since CFPT 2A was not in operation at the time, a CA autostart signal was generated on loss of both CFPTs. Motor Driven CA Pumps 2A and 2B started automatically and a S/G Blowdown Isolation signal was generated. Personnel in the vicinity of the CA Pumps clearly heard CA Pump 2A start first, followed approximately one second later by CA Pump 2B. At 1541:19 hours, the CA Pumps Train A Loss of Normal Suction alarm occurred followed by Train B at 1541:20 hours. 2RN250A, RN Header A to CA Pump Suction Isolation valve (EIIS:V), began opening automatically at 1541:24 hours. At the same time, 2CA15A, CA Pump 2A

Suction from RN Isolation valve, also began opening automatically. The CA Pumps Train A and B Loss of Normal Suction alarms both cleared at 1541:24 hours also. When the Control Room Operators (CROs) realized that CA Pump 2A had swapped suction to the RN System, they verified that the low suction pressure condition had cleared and then manually shut 2RN250A at approximately 1542 hours. CFPT 2B vacuum was restored and the pump was returned to service at approximately 1545 hours. At approximately 1548 hours, 2CA15A was manually closed. A CRO reset the CA autostart signal and secured both CA Pumps at approximately 1554 hours. All valves which had actuated during the CA autostart were then returned to their previous alignment at approximately 1600 hours.

CONCLUSION:

This incident has been attributed to a reduction in vacuum which was due to reduced RC flow through the CFPT 2B Condenser, caused by the delaminated pipe coating. It is likely that the delamination occurred after the RC pipe inspection during the recent outage, when the RC System was returned to service. Due to the rapid reduction in vacuum, it is speculated that the delamination occurred suddenly, traveled low in the main RC piping until it reached the low point tee which supplies the CFPT condensers. The coating then covered enough tubes to cause a reduction in flow through the condenser. However, it is also possible that loose coating material was simply missed during the inspection of the RC piping.

The CFPT 2B Condenser vacuum instrumentation was verified to be working properly under Work Request 39873 OPS. One pressure switch was found to be slightly out of calibration (1.09 in Hg). However, this could not have caused the incident. All indications are that the low vacuum condition was real. The condenser waterboxes were cleaned and the pump returned to service. Integrated Scheduling will add an inspection/cleaning of the CFPT Condenser waterboxes to the schedule for the next Unit 2 refueling outage. The inspection will occur following initial return to service of the RC System, but prior to operating the CFPTs. The intent of this inspection is to determine if the delamination occurs after the RC System is returned to service or if this incident was an isolated occurrence.

The suction swap of CA Pump 2A to the RN system was caused by a combination of factors. When the swap occurred, the CACST was isolated from the CA suction lines because of testing which was being performed to identify the cause of a similar suction swap on March 9, 1988 (see LER 414/88-12). Also, when the CA pumps started, personnel in the vicinity of the pumps clearly heard CA Pump 2A start approximately one second before CA Pump 2B. The staggered start extended the duration of the low suction pressure condition just long enough to initiate a Train A suction swap. The slight differences in start times are not considered to be unusual or have any safety significance. Subsequent testing repeated the swap and verified these causes.

Future operation of the CA System will ensure that the CACST remains unisolated from the CA suction lines on both Units until further options can be evaluated and are accepted by the NRC. A Station Problem Report has been initiated to evaluate the feasibility of lowering the CA suction low pressure setpoints. The suction swap did not occur on Train B because the low suction pressure did not exist long enough to satisfy the time delay. Previous testing had indicated that the time delay for Train B is approximately .5 seconds longer than Train A but within calibration tolerances. Also, it appears that the Train A suction pressure switches respond faster than the Train B switches, causing the low suction pressure signal to be sensed for a longer time on Train A. These factors explain why the Train B suction swap did not occur.

A review of previous reports revealed 15 Engineered Safety Features (ESF) actuations due to equipment failure related causes. Two of these reports involved loss of CFPT Condenser vacuum (see LER 413/86-07 and LER 414/88-07). The root cause of LER 413/86-07 was undetermined. However, upon inspection of CFPT 1A, some drift eliminator material from the cooling towers was found in the condenser waterboxes. This material may or may not have been the cause of the low vacuum. The incident described in LER 414/88-07 is similar to this incident except that it involved CFPT 2A. CFPT 2B was not checked at this time because it was isolated when the delamination was believed to have occurred. If an inspection had been performed on the CFPT 2B Condenser waterbox, this incident may have been prevented. This incident is considered to be recurring.

CORRECTIVE ACTION:

Subsequent

(1) CRO verified adequate normal suction pressure, then manually isolated RN to CA Pump 2A.

(2) CRO reset CA autostart signal and secured both motor driven CA pumps.

(3) CRO returned the appropriate valves to their previous alignment.

(4) CFPT 2B waterboxes were inspected and cleaned.

(5) Subsequent transient testing by Performance and Operations personnel identified the cause of the CA pumps loss of normal suction alarms and swaps to the RN System.

(6) Station Management has committed to maintain the CACST aligned to the CA suction header for standby readiness until further options can be evaluated and are accepted by the NRC.

(7) A Station Problem Report has been initiated to evaluate the feasibility of lowering the CA suction low pressure setpoints.

(8) CFPT 2B Condenser vacuum instrumentation was verified to be operating correctly.

(9) S/G water chemistry was restored to normal following the introduction of raw water into S/Gs 2A and 2B.

(10) CA System flow balance testing was performed verifying adequate flows to S/Gs 2A and 2B following the suction swap to RN.

Planned

(1) Repairs and inspections of the RC pipe coating by Construction and Maintenance Department (CMD) and Quality Control Inspectors will be scheduled for Unit 1 and Unit 2.

(2) All delaminated RC pipe coating material will be removed and repaired and pipe cleanliness will be insured before refilling.

(3) Duke Power Quality Assurance personnel will inspect the RC piping for delaminated areas, monitor the coating process to insure proper practices are used. and perform a final inspection to verify proper adhesion of the repaired areas and that damage has not occurred to the coating during the scaffold removal process.

(4) Duke Power personnel will ensure that both CFPT condenser waterboxes have been inspected and cleaned if necessary.

SAFETY ANALYSIS:

The loss of both CFPTs initiated an automatic start of the motor driven CA pumps as designed. S/G Narrow Range levels in all four S/Gs rose from approximately 40% to 60%. Therefore, adequate core heat removal capability was maintained at all times.

The five second sustained low suction pressure sensed by the Train A suction pressure switches caused 2RN250A and 2CA15A to open. This resulted in raw water entering S/Gs 2A and 2B and required that S/G chemistry be restored to normal following the event. CA Pump 2B did not swap to the RN System because the low suction pressure signal on Train B only lasted for approximately four seconds. The low suction pressure condition and subsequent suction swap to RN Train A did not affect the ability of the CA System to maintain S/G levels.

This incident is reportable pursuant to 10 CFR 50.73, Section (a)(2)(iv). The health and safety of the public were not affected by this incident.

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DUKE POWER

October 4, 1988

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

Subject: Catawba Nuclear Station, Unit 2
Docket No. 50-414
LER 414/88-14, Revision 1

Gentlemen:

Pursuant to 10 CFR 50.73 Section (a) (1) and (d), attached is Revision 1 to Licensee Event Report 414/88-14 concerning an Auxiliary Feedwater autostart due to loss of Main Feedwater pump turbine condenser vacuum followed by an Auxiliary Feedwater suction swap to the Nuclear Service Water System. 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

JGTLER02.D2/lcs

Attachment

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