

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) Catawba Nuclear Station, Unit 1										DOCKET NUMBER (2) 0 5 0 0 0 4 1 1 3										PAGE (3) 1 OF 0 4																																							
TITLE (4) Manual Reactor Trip Due To Main Feedwater Pump Trip																																																											
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 6			1 3			8 5			8 5			0 4			1 0			0 0			7 1			2 8			5															0 5 0 0 0																	
0 6			1 3			8 5			8 5			0 4			1 0			0 0			7 1			2 8			5															0 5 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) 0 1 0 1 6									20.402(b)									20.406(c)									<input checked="" type="checkbox"/> 50.73(a)(2)(iv)									73.71(b)																							
									20.406(a)(1)(i)									50.36(c)(1)									50.73(a)(2)(v)									73.71(c)																							
									20.406(a)(1)(ii)									50.36(c)(2)									50.73(a)(2)(vii)									<input checked="" type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A)																							
									20.406(a)(1)(iii)									50.73(a)(2)(i)									50.73(a)(2)(viii)(A)									50.72(b)(2)(ii)																							
									20.406(a)(1)(iv)									50.73(a)(2)(ii)									50.73(a)(2)(viii)(B)																																
20.406(a)(1)(v)									50.73(a)(2)(iii)									50.73(a)(2)(x)																																									
LICENSEE CONTACT FOR THIS LER (12)																																																											
NAME Roger W. Ouellette, Associate Engineer - Licensing															TELEPHONE NUMBER 7 1 0 4 3 1 7 1 3 1 - 7 5 1 3 1 0																																												
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)																																																											
CAUSE					SYSTEM					COMPONENT					MANUFACTURER					REPORTABLE TO NPDOS					CAUSE					SYSTEM					COMPONENT					MANUFACTURER					REPORTABLE TO NPDOS														
SUPPLEMENTAL REPORT EXPECTED (14)																																																											
YES (If yes, complete EXPECTED SUBMISSION DATE)															<input checked="" type="checkbox"/> NO																																												
															EXPECTED SUBMISSION DATE (15)																																												
															MONTH DAY YEAR																																												

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

After declaring an Unusual Event at 2145 hours on June 12, 1985, due to unidentified Reactor Coolant (NC) System leakage, Reactor Power was reduced to 15%. At this power level, the feedwater flow path was swapped from the lower feedwater nozzles to the upper Auxiliary Feedwater nozzles. During this plant evolution, a low suction flow trip of Main Feedwater (CF) Pump B occurred, causing an auto-start of both Auxiliary Feedwater motor driven pumps and Main Feedwater isolation. The Reactor was subsequently manually tripped from 6% power as required by the Loss of S/G Feedwater Abnormal Procedure.

The CF pump trip occurred during a flow reduction due to a normal plant shutdown sequence. The CF pump B recirculation valve was not capable of modulating quickly enough to provide adequate pump minimum flow. Therefore, this incident is classified as a Design Deficiency. This incident is reportable pursuant to 10 CFR 50.73, Section (a)(2)(iv), and 10 CFR 50.72, Section (b)(2)(ii).

8507260023 850712  
PDR ADOCK 05000413  
S PDR

JE 22  
1/1

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/85

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Catawba Nuclear Station, Unit 1	0500041385	—	041	—	00	02 OF 04

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

Technical Specification 3.4.6.2.b requires that Reactor Coolant (NC) System unidentified leakage be limited to 1 GPM. This has to be demonstrated by an NC System water inventory balance at least once per 72 hours. If NC leakage is greater than 1 GPM, the Action Statements of Technical Specification 3.4.6.2, and Abnormal Procedure AP/1/A/5500/10, Reactor Coolant Leak, require a reduction of unidentified leakage to within allowable limits within four hours, or to be in Hot Standby within six hours and Cold Shutdown within the following thirty hours.

When it becomes necessary to reduce reactor power because of an NC System leak, Procedure OP/1/A/6100/03, Controlling Procedure for Unit Operation, is used to reduce reactor power to 15%, at which point OP/1/A/6100/02, Controlling Procedure for Unit Shutdown, is implemented. During performance of OP/1/A/6100/03, and at 15% power, the feedwater flow path to the S/G's is swapped from the Lower Main Feedwater (CF) nozzles to the Upper Auxiliary Feedwater (CA) nozzles, with the feedwater regulating valves still automatically controlling S/G level. CF pump recirculation control valves (1CF6 and 1CF13 for pumps A and B respectively) modulate to maintain CF pump minimum flow of 4000 GPM by directing pump discharge to the condenser when a condition of high system head reduces CF flow. The CF pumps will trip on a low suction flow of 3000 GPM. The CF pump flow rate at 16% power is 4500 GPM.

At 1735 hours on June 12, 1985, a Reactor Coolant System leakage calculation was completed to fulfill Technical Specification Surveillance Requirement 4.4.6.2.1d. At this time, the calculation yielded greater than the allowable 1 GPM unidentified NC leakage. AP/1/A/5500/10, Reactor Coolant Leak, was entered and an investigation to find the source of the leak was begun. Personnel were unsuccessful in finding the leak, and at 2135 hours, the 4 hour time limit of Technical Specification 3.4.6.2, Action Statement b, had elapsed. At 2145 hours, the Shift Supervisor declared an Unusual Event due to the NC leakage, and the following procedures were entered:

RP/0/A/5000/02, Notification of Unusual Event

RP/0/B/5000/13, NRC Notification Requirements

At 2218 hours, Reactor power was at an initial power level of 64%. During the next 4 hours, Reactor power was decreased to approximately 16%, and Main Feedwater pump A was secured per OP/1/A/6100/03. Also, because of decreasing Reactor power, there was less xenon burn-up, causing increased xenon levels and a consequential power reduction. Therefore, the Reactor was shutting itself down faster than Operations could perform the applicable plant evolutions. To slow the power reduction, from 2355 hours on June 12, 1985, to 0203 hours on June 13, 1985, Operations intermittently added a total of 800 gallons of non-borated water to the Volume Control Tank to dilute the Reactor Coolant boron concentration.

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/85

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
Catawba Nuclear Station, Unit 1	0500041385	04	1	0	03	OF 04

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

Because of the rapid power reduction, Steam Generator (S/G) levels remained slightly high. Operating S/G level is ramped with power level, increasing with increased power level and decreasing with decreased power level. S/G levels slightly lagged behind the decreasing power level. Therefore, the feedwater regulating valves, which are modulated to maintain design S/G level, were in a throttled position to reduce feedwater flow.

At approximately 0228 hours on June 13, 1985, while at 15% Reactor power, Operations began swapping feedwater flow from the lower CF nozzles to the upper CA nozzles, as required by OP/1/A/6100/03. During this evolution, CF pump B tripped at 0228:15:101 hours due to low suction flow. Immediately following this, the turbine tripped, the CA motor driven pumps auto started, and Main Feedwater isolation occurred. At 0228:20 hours, the Generator Breakers tripped. At 0228:37 hours, Pressurizer Power Operated Relief Valves (PORV's) NC32B and NC36B auto opened, and closed within two seconds. Reactor power began decreasing due to automatic control rod insertion, and Operations entered the following procedures:

AP/1/A/5500/06, Loss of S/G Feedwater  
AP/1/A/5500/02, Turbine/Generator Trip

Also, at 0230:14 hours, 1SV7 (S/G C PORV) opened, and remained open for approximately 1.5 minutes. Although the steam pressure exceeded the PORV opening setpoint of 1125 psig in all four S/G's, only the PORV for S/G C opened. However, the Coded Safety Relief Valves were available to relieve any pressure excursions caused by the PORV's not opening. The Coded Safety Relief Valves did not open.

At 0232:21 hours, the Nuclear Control Operator (NCO) secured the CA pumps. The NCO re-started CF pump B, but it tripped at 0233:34:278 hours due to low suction flow, and the CA motor driven pumps auto started again. At 0233:45:301 hours, and at a power level of 5.9%, the NCO initiated a manual Reactor trip as required by AP/1/A/5500/06, and then entered the following procedures:

EP/1/A/5000/01, Reactor Trip or Safety Injection  
EP/1/A/5000/01A, Reactor Trip Response

Prior to the CF pump trip, CF flow was reduced due to the additional head created by swapping from the CF to the CA nozzles, and by the throttling of the Feedwater regulating valves. However, this should not have caused a trip of CF pump B, as the CF pump B recirculation valve, 1CF13, should have been able to handle the flow transient, and modulated to provide minimum pump flow.

1CF 13 did not provide pump minimum flow due to "controller wind-up", which occurred due to the excessively large process range. Maximum CF flow is about 18,000 GPM. At this flow, 20 psig air pressure is supplied to the air operator for 1CF13. The valve does not respond to changes in CF flow until actual flow crosses the setpoint, 4000 GPM. At this point,

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/85

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 8 5	—	0 4 1	—	0 0 0 4	OF 0 4

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

the controller for LCF13 begins to vent air pressure in an attempt to modulate. However, the valve does not begin to open until air pressure is decreased to 15 psig, making the valve slow to respond, and incapable of handling rapid flow transients. This valve did not respond quickly enough when flow was swapped from the CF to the CA nozzles, thereby allowing pump flow to drop below the low suction flow setpoint, 3000 GPM. Therefore, this incident is classified as a Design Deficiency.

A similar deficiency involving the response of LCM-127, CM-CF Cleanup Flow Control, was identified in LER 413/84-17. In that incident, the CF pumps tripped on emergency low suction flow after an evolution where feed-water flow to S/G 1C was rapidly decreased. As a corrective action, a Station Problem Report was initiated to install a solenoid on the operator of LCF13 (CF pump B) and LCF6 (CF pump A) to rapidly vent air pressure at CF pump flow of 4000 GPM, thereby failing the valves in the open position to provide adequate CF pump flow. This modification had not been implemented at the time of occurrence of this incident.

CORRECTIVE ACTION

- 1) Following an attempted restart of CF pump B and auto-start of the CA motor driven pumps, the NCO initiated a manual Reactor Trip as required by AP/1/A/5500/06.
- 2) Work Requests were initiated to investigate the failure of the PORV's for S/G's A, B, and D to open. S/G B PORV was found to be 60 psig out of calibration, and was recalibrated. S/G D PORV was found to be 45 psig out of calibration, and was recalibrated. S/G A PORV was found to open only 15 psig from its setpoint which is within allowable tolerance. Steam pressure in S/G A did not exceed 1140 psig during this incident, so it should not have opened.
- 3) As an interim solution to the sluggish response of LCF6 and LCF13, steps will be added to procedure OP/1/A/6100/03 to provide guidelines for manual control of these valves during a swap to the CA nozzles, thereby ensuring CF Pump minimum flow.

SAFETY ANALYSIS

S/G levels were higher than programmed level throughout this incident. However, this ensured adequate heat removal capability. The CA motor driven pumps auto started as designed to replace any reduction in water inventory. 1SV7, S/G C PORV, and the pressurizer PORV's briefly opened as designed to relieve the pressure increase due to temporary loss of heat sink (Turbine trip). The S/G Coded Safety Relief Valves were available to mitigate any pressure excursions. The health and safety of the public were not affected by this incident.



**DUKE POWER COMPANY**

P.O. BOX 33189  
CHARLOTTE, N.C. 28242

HAL B. TUCKER  
VICE PRESIDENT  
NUCLEAR PRODUCTION

July 12, 1985

TELEPHONE  
(704) 373-4531

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 413/85-41 concerning a Main Feedwater pump trip which resulted in ESF actuations and a manual reactor trip. 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 / BT*

Hal B. Tucker

RWO:slb

Attachment

cc: Dr. J. Nelson Grace, Regional Administrator  
U. S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, NW, Suite 2900  
Atlanta, Georgia 30323

Palmetto Alliance  
2135½ Devine Street  
Columbia, South Carolina 29205

Mr. Jesse L. Riley  
Carolina Environmental Study Group  
854 Henley Place  
Charlotte, North Carolina 28207

Robert Guild, Esq.  
P. O. Box 12097  
Charleston, South Carolina 29412

American Nuclear Insurers  
c/o Dottie Sherman, ANI Library  
The Exchange, Suite 245  
270 Farmington Avenue  
Farmington, CT 06032

M&M Nuclear Consultants  
1221 Avenue of the Americas  
New York, New York 10020

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

NRC Resident Inspector  
Catawba Nuclear Station

*1E22  
1/1*