

Duke Power Company  
Catawba Nuclear Station  
P.O. Box 256  
Clover, S.C. 29710

(803) 831-3000



**DUKE POWER**

March 1, 1990

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

Subject: Catawba Nuclear Station  
Docket No. 50-413  
LER 413/89-21, Rev. 1

Gentlemen:

Attached is Licensee Event Report 413/89-21, Revision 1, concerning TECHNICAL SPECIFICATION REQUIRED POWER REDUCTION DUE TO FAILURE OF TWO REFUELING WATER STORAGE TANK LEVEL CHANNELS CAUSED BY LIGHTNING STRIKE.

This event was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Tony B. Owen  
Station Manager

keb\LER-NRC.TBO

xc: Mr. S. D. Ebnetter  
Regional Administrator, Region II  
U. S. Nuclear Regulator Commission  
101 Marietta Street, NW, Suite 2900  
Atlanta, GA 30323

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

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

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

Mr. K. Jabbour  
U. S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
Washington, D. C. 20555

Mr. W. T. Orders  
NRC Resident Inspector  
Catawba Nuclear Station

E22  
11

LICENSEE EVENT REPORT (LER)

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

TITLE (4) Technical Specification Required Power Reduction Due To Failure of Two Refueling Water Storage Tank Level Channels Caused By Lightning Strike

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)
07	27	89	89	021	01	03	02	90	N/A		0 5 0 0 0
0 5 0 0 0											

OPERATING MODE (9) 1

POWER LEVEL (10) 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)

<input type="checkbox"/> 20.402(b)	<input type="checkbox"/> 20.406(c)	<input type="checkbox"/> 50.73(a)(2)(iv)	<input type="checkbox"/> 73.71(b)
<input type="checkbox"/> 20.406(a)(1)(i)	<input type="checkbox"/> 50.36(c)(1)	<input type="checkbox"/> 50.73(a)(2)(v)	<input type="checkbox"/> 73.71(e)
<input type="checkbox"/> 20.406(a)(1)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)
<input type="checkbox"/> 20.406(a)(1)(iii)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	
<input type="checkbox"/> 20.406(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(ii)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.406(a)(1)(iv)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME R.M. Glover, Compliance Manager	TELEPHONE NUMBER AREA CODE: 803, NUMBER: 831-3236
---	--

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
C	CIB	XIT	W12	Y					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)  NO

EXPECTED SUBMISSION DATE (15)

MONTH	DAY	YEAR

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

On July 27, 1989, Unit 1 was in Mode 1, Power Operation, at 100% power. Thunderstorms were occurring in the vicinity of Catawba Nuclear Station. At 1949 hours, Unit 1 Refueling Water Storage Tank (FWST) low level computer alarms were received on channels 1 and 4. Channel 1 was indicating off scale high and channel 4 was indicating off scale low. At 2006 hours, channels 1 and 4 of the FWST level instrumentation were declared inoperable per Technical Specification 3.3.2 and the Unit entered Technical Specification 3.0.3 due to 2 of 4 channels being inoperable. A priority 1 work request was issued for Instrumentation and Electrical (IAE) to investigate and repair the inoperable channels. At 2103 hours, the Control Room Operators (CROs) began power reduction to comply with Technical Specification Action Item 3.0.3. At 2150 hours, channel 1 was recalibrated and returned to service and Unit 1 exited Technical Specification 3.0.3 after reducing power to 89%. Unit 1 was subsequently returned to 100% power, and channel 4 was declared operable on July 28, 1989 at 1717 hours, after the level transmitter was replaced. The simultaneous failure of the two FWST level channels is believed to have been caused by a lightning strike on or near the FWST.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)  Catawba Nuclear Station, Unit 1	DOCKET NUMBER (2)  0500041389	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		89	021	01	02	OF 05

TEXT (If more space is required, use additional NRC Form 306A's) (17)

BACKGROUND

The Refueling Water [EIIS:CB] (FW) System provides borated water for use during refueling and during a postulated Loss of Coolant Accident (LOCA). The Refueling Water Storage Tank [EIIS:TK] (FWST) contains sufficient borated water capacity to assure:

- \* The volume of borated refueling water needed to increase the boron concentration of initially spilled water to a point that assures no return to criticality with the Reactor [EIIS:AC] at cold shutdown and all control rods [EIIS:ROD], except the most reactive rod cluster control assembly, inserted in the core.
- \* A volume sufficient to refill the Reactor Vessel [EIIS:VSL] above the nozzles [EIIS:NZL] after a LOCA.
- \* A sufficient volume of water in the Containment sump to permit the initiation of recirculation.
- \* Sufficient volume to allow the station operator adequate time to complete manual valve alignment required to complete switchover from the injection mode following a LOCA to the Containment sump recirculation mode.

The FWST is located in the protected area yard adjacent to the Auxiliary Building [EIIS:NF] and is surrounded by a concrete missile barrier designed to contain the contents of the FWST in the event of a tank puncture due to projectiles that might be produced during a postulated tornado event. The four FWST level transmitters are located 90 degrees apart between the FWST and the FWST missile barrier. Since the FWST is exposed to the outdoor environment, it is equipped with electrical heat trace elements and tank heaters [EIIS:EHTR].

Four level transmitters [EIIS:XT] monitor level in the FWST. A two out of four low level signal on the FWST coincident with a safety injection signal automatically initiates realignment of the Residual Heat Removal [EIIS:BP] (ND) Pump [EIIS:P] suction to the recirculation mode after a LOCA by opening the Containment sump isolation valves [EIIS:V] and isolating the ND Pump suction valves from the FWST. The remaining Emergency Core Cooling System pumps are manually aligned for Containment Sump Recirculation by the Control Room Operator. The FWST level transmitters also provide Control Room indication of FWST level, annunciators [EIIS:ANN] and computer alarms.

Technical Specification 3.3.2, Engineered Safety Features Actuation System Instrumentation, specifies that at least three of the four FWST level channels are in the operable condition and that the inoperable channel shall be placed in bypass to meet the conditions for continued operation. Technical Specification 3.0.3 requires that if a limiting condition for operation cannot be met that within 1 hour, action shall be initiated to place the Unit in a mode where the Technical Specification does not apply by placing the Unit, as applicable, in:

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)  Catawba Nuclear Station, Unit 1	DOCKET NUMBER (2)  0 5 0 0 0 4 1 3 8 9	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		8 9	0 2 1	0 1	0 3	OF 0 5

TEXT (If more space is required, use additional NRC Form 306A's) (17)

- a) Mode 3, Hot Standby, within the next 6 hours
- b) Mode 4, Hot Shutdown, within the following 6 hours
- c) Mode 5, Cold Shutdown, within the subsequent 24 hours.

Technical Specification 3.3.2 is applicable in Modes 1, 2, 3 and 4.

The Station Grounding [EIIS:FC] (EVA) System reduces potential gradients between all structures and equipment associated with the Station and the earth to reduce capacitive and inductive coupling between power conductors [EIIS:CON] and control cables and equipment.

EVENT DESCRIPTION

On July 27, 1989, Unit 1 was operating in Mode 1, Power Operation, at 100% power and thunderstorms were occurring in the vicinity of Catawba Nuclear Station. At 1949 hours, the Control Room received FWST Low Level computer alarms on channels 1 and 4. Channel 1 was indicating off scale high and channel 4 was indicating off scale low. Channels 2 and 3 were indicating approximately 95% level, as all 4 channels had been indicating prior to the failure of channels 1 and 4. Operations personnel contacted Instrumentation and Electrical (IAE) personnel to ensure that no work was in progress which could have caused the loss of channels 1 and 4. At 2006 hours, the Shift Supervisor declared channels 1 and 4 inoperable per Technical Specification 3.3.2 and placed Unit 1 in Technical Specification 3.0.3. At 1955 hours, Priority 1 Work Request 51143 OPS was issued for IAE to investigate and repair the failed level transmitters. At 2103 hours, the Control Room Operators (CROs) began power reduction at a rate to permit entry to Mode 3 in the following six hours in order to comply with Technical Specification 3.0.3. At 2150 hours, channel 1 was recalibrated and returned to service and Unit 1 exited Technical Specification 3.0.3. Power reduction was suspended at 89% and the Unit was subsequently returned to 100% power while meeting the limiting conditions for operation for the inoperable channel 4 FWST level transmitter.

IAE determined that the channel 4 level transmitter would have to be replaced due to the output signal remaining constant throughout the level transmitter calibration span. The channel 4 level transmitter was replaced and declared operable at 1717 hours on July 28, 1989.

CONCLUSION

The channels 1 and 4 FWST level instruments failed at the same time during an electrical storm, therefore it is assumed that the failure of the FWST level channels was caused by a lightning strike at or near the FWST. Since there was no evidence of arcing or burns on the damaged equipment, it is believed that a breakdown of electronic components may have occurred due to electromagnetic fields generated by a lightning strike in the vicinity of the level transmitters. The termination boxes for the level transmitters are properly connected to the station ground system and the power supply shields to the level

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)  Catawba Nuclear Station, Unit 1	DOCKET NUMBER (2)  0 5 0 0 0 4 1 3 8 9	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		8 9	0 2 1	0 1	0 4	OF 0 5

TEXT (If more space is required, use additional NRC Form 308A's) (17)

transmitters are grounded to the instrument grounds at the power supply. Visual inspection of the FWST has not been able to identify any ground cable connected directly to the FWST, therefore Work Request 0096 CPL was initiated to determine if the FWST is properly grounded. Work Request 96 CPL was voided after it was found that it was impractical to determine proper tank grounding since the ground cables may be buried in concrete. Therefore, Work Requests 2030 MES and 2031 MES were initiated to ground the Unit 1 and Unit 2 FWSTs, respectively. Work Request 2031 MES was completed on December 7, 1989 after the Unit 2 FWST ground cables were located and MES determined that the Unit 2 FWST is grounded per the grounding details. The Unit 1 FWST is scheduled to be grounded per the grounding details per Work Request 2030 MES. Since grounding cables on the Unit 1 FWST may be embedded in concrete, proper grounding cannot be verified, however grounding cables will be attached to the Unit 1 FWST to insure the tank is connected to the station ground.

It should be noted that the power supply for each of the affected level transmitters originates from different locations in the Reactor Protection System [EIIS:JC] cabinets and the affected level transmitters were 180 degrees apart, on opposite sides of the FWST. The investigation into this incident has been unable to identify any common link that would explain why only channels 1 and 4 were affected.

Work Request 4288 SWR was completed to insure the FWST missile barrier sump pump level switches are functioning properly. The electrical heat tracing for the FWST was also verified to be operating properly per Work Request 5410 SWR, which is done annually during the Autumn season. These measures were taken to ensure these components, in the vicinity of the FWST, were not damaged.

A review of the Operating Experience Program Data Base does not reveal any equipment failures over the past 12 months due to lightning, therefore this failure does not meet the Duke Power Company definition of a recurring event or recurring problem. A review of previous work requests and the NPRDS Data Base produced only one previous failure of an FWST level transmitter that was attributed to a lightning strike. This failure occurred on June 19, 1989 on the Unit 1, channel 1 level transmitter. The level transmitter was replaced on Work Request 50838 OPS on June 21, 1989 and the work request failure description noted that the failure had occurred during a lightning storm. The failure on June 19, was not reportable since only one channel of FWST level indication was affected.

CORRECTIVE ACTION

SUBSEQUENT

- 1) Operations declared channels 1 and 4 of FWST level instrumentation inoperable and issued a priority 1 work request to repair the failed channels.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)  Catawba Nuclear Station, Unit 1	DOCKET NUMBER (2)  0 5 0 0 0 4 1 3 8 9	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		8 9	0 2 1	0 1	0 5	OF 0 5

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

- 2) Operations began power reduction to comply with Technical Specification action 3.0.3.
- 3) IAE recalibrated FWST level channel 1, and Operations declared channel 1 operable, and Technical Specification action 3.0.3 was exited.
- 4) IAE replaced the channel 4 FWST level transmitter, and it was returned to operable status per Work Request 51143 OPS.
- 5) Work Request 0096 CPL has been issued by Compliance to determine whether the FWST is properly connected to the station ground system.
- 6) The Unit 2 FWST was verified to be grounded per Work Request 2031 MES.
- 7) This report has been revised to report the results of Work Request 0096 CPL which was written to determine whether the FWST is grounded per the design drawings.

PLANNED

- 1) A ground will be added to the Unit 1 FWST to insure the tank is properly grounded per Work Request 2030 MES.

SAFETY ANALYSIS

Following the loss of channels 1 and 4 of FWST level instrumentation, the Operators appropriately followed the actions required by Technical Specifications and initiated corrective action to return the failed channels to operable status. In this event only one channel failed low, therefore only one of the remaining two operable channels would have been required to actuate on an actual low level to provide the automatic alignment to Containment sump recirc.

In a worst case scenario, the two level channels would have failed low and coincident with a Safety Injection signal. In this scenario, the Operators may have difficulty recognizing that the ND Pump suction had swapped to the Containment sump without adequate inventory for sump recirculation due to the alarms associated with the Safety Injection. In this case, Operator action would have been required to prevent damage to the ND pumps due to loss of suction. Emergency Procedure, EP/1/A/5000/01, Reactor Trip or Safety Injection, directs the Operator to verify ND pump flow in the subsequent actions. It is therefore possible that the Operator would have the opportunity to recognize the lack of ND flow and secure the ND pumps before pump damage occurred. The Operator would then realign ND to the FWST and restart the ND pumps after resetting the automatic Containment sump recirculation interlock. During the time period, injection flow would be maintained to the core from the FWST through the charging pumps and safety injection pumps.

Throughout this incident the health and safety of the public were unaffected.