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

(803)831-3000

DUKE POWER

January 31, 1991

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

Subject: Catawba Nuclear Station
Docket No. 50-413
LER 413/91-01

Gentlemen:

Attached is Licensee Event Report 413/91-01, concerning BOTH TRAINS OF RESIDUAL HEAT REMOVAL AND AUXILIARY CONTAINMENT SPRAY INOPERABLE DUE TO DEFECTIVE PROCEDURES AND INAPPROPRIATE ACTION.

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

Very truly yours,

J W Hampton

J. W. Hampton
Station Manager

ken:LER-NRC.JWH

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

R. E. Martin
U. S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation
Washington, D. C. 20555

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

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

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

IE22
1/1

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 1	0 5 0 0 0 4 1 3	1 OF 0 8

TITLE (4) Both Trains of Residual Heat Removal and Auxiliary Containment Spray Inoperable Due to Defective Procedures and Inappropriate Action

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)
										CNS, Unit 2	0 5 0 0 0 4 1 4
1 1	1 2	9 0	9 1	-	0 0 1	- 0 0	0 1	3 0	9 1		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)		20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
1 0 0		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)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
C. L. Hartzell, Compliance Manager	8 0 3 8 3 1 - 3 6 6 5

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)

In October 1990, Performance became aware of a McGuire Nuclear Station incident that rendered both trains of the Residual Heat Removal (ND) System inoperable while stroke testing valves NI136B, NS38B, and NS43A. With any of these valves open during a Loss of Coolant Accident, ND injection flow could be degraded. These valves have been tested quarterly at Catawba since unit startup. Performance revised test procedures for NS38B and NS43A to close downstream valves so that quarterly testing could continue. While reviewing the Final Safety Analysis Report (FSAR), Performance misinterpreted information related to the auxiliary containment spray headers and allowed the test to be completed without declaring ND/NS inoperable. On November 12, with Unit 1 in Mode 1, Power Operation, 1NS38B was tested with Train A ND inoperable; thereby, rendering both trains of auxiliary containment spray inoperable. This incident is attributed to Defective Procedures that allowed quarterly testing of NI136B, NS38B, and NS43A without regard to possible degraded ND injection flow. The auxiliary containment spray headers were inoperable due to an Inappropriate Action due to misinterpreted information in the FSAR. Corrective actions include rescheduling tests for cold shutdown and FSAR enhancements.

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	9 1	— 0 0 1	— 0 0	0 2 OF 0 8

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

BACKGROUND

The Emergency Core Cooling System (ECCS) provides emergency cooling to the Reactor core in the event of a break in either the Reactor Coolant [EIIS:AB] (NC) or Main Steam [EIIS:SB] (SM) Systems. Several systems work in conjunction to provide ECCS functions, including the Safety Injection [EIIS:BQ] (NI) Residual Heat Removal [EIIS:BP] (ND), Refueling Water [EIIS:CB] (FW), and Chemical and Volume Control [EIIS:CB] (NV) Systems. ECCS alignment changes over time after initiation, with different phases characterized by the water source and flow path utilized. The immediate, automatic response following actuation is referred to as the injection phase. During the injection phase, the effort is directed toward preventing or minimizing core damage by supplying borated water from the FWST to the NC System cold legs. For cold leg injection, the NV pumps [EIIS:P], NI pumps, and ND pumps provide high, intermediate, and low pressure pumping capability, respectively. The actual flow delivered by each flow path will depend on NC System pressure. When the FWST supply is depleted, the Containment [EIIS:NH] Recirculation Sump provides the water supply for what are referred to as the recirculation phases. During recirculation, emergency cooling water is supplied to either the NC cold legs or hot legs to continuously remove decay heat from the core over an extended period of time. Valves [EIIS:V] 1(2)ND28A, ND Supply to NV & 1(2)A NI Pumps, and 1(2)NI136B, ND Supply to NI Pump 1(2)B, are located on 8 inch lines off the discharge of ND Heat Exchangers [EIIS:HX] (NDHX) 1(2)A and 1(2)B, respectively. These valves are normally closed during standby alignment and the ECCS injection phase.

The Containment Spray [EIIS:BE] (NS) System is an engineered safeguard feature which serves to remove thermal energy from containment in the event of a Loss of Coolant Accident (LOCA). The heat removal capability of the system maintains containment pressure below the design value after ice condenser depletion when steam generated in the core continues to enter containment. The NS System consists of two trains of redundant equipment including six spray headers located in upper containment. Two headers are supplied by each NS pump and the remaining two (auxiliary containment spray) are supplied by separate ND pumps. Auxiliary containment spray is initiated only if the ECCS is in the recirculation mode and at least 50 minutes have passed since the incident was initiated. Electric Motor [EIIS:MO] Operated (EMO) valves 1(2)NS38B, ND Pump 1(2)B to Cont Spray Hdr, and 1(2)NS43A, ND Pump 1(2)A to Cont Spray Hdr, are provided to isolate each auxiliary containment spray header from its respective ND pump. In addition, manual valves 1(2)NS42, ND 1(2)B/NS Spray Nozzle Isol, and 1(2)NS47, ND 1(2)A/NS Spray Nozzle Isol, are located downstream (and inside containment) of NS38B and NS43A to provide another method of isolating each auxiliary containment spray header.

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	9 1	— 0 0 1	— 0 0	0 3 OF 0 8

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

Technical Specification (T/S) 3.5.2 states that during Mode 1, Power Operation, Mode 2, Startup, and Mode 3, Hot Standby, two independent ECCS subsystems shall be operable with each subsystem comprised of one centrifugal charging (NV) pump, one operable safety injection (NI) pump, one operable residual heat removal heat exchanger (NDHX), one operable residual heat removal (ND) pump, and an operable flow path capable of taking suction from the FWST on a safety injection signal and automatically transferring suction to the containment sump during the recirculation phase of operation. Action is required with one ECCS subsystem inoperable to restore the inoperable subsystem to operable status within 72 hours or be in at least Hot Standby within the next 6 hours and in Hot Shutdown within the following 6 hours. In addition, T/S 3.5.3 requires one ECCS Subsystem (excluding the NI pump) to be operable during Mode 4, Hot Shutdown. T/S 3.5.2/3.5.3 do not address operability of the auxiliary containment spray components.

Station Directive 4.2.1, Development, Approval, and Use of Station Procedures, requires each procedure and procedure change issued to have a 10CFR50.59 evaluation completed. The 10CFR50.59 evaluation is performed using a checklist that requires the user to answer specific questions related to Technical Specifications and the Final Safety Analysis Report (FSAR). If any question in Section 4, Screening for 10CFR50.59 Applicability, is answered "YES", the evaluation and procedure is required to be forwarded to the Nuclear Safety Review Board (NSRB) for review. This review occurs after procedure changes have been implemented.

EVENT DESCRIPTION

Prior to Unit Startup at Catawba, the Performance group established the Pump and Valve Inservice Testing Program to implement the requirements of ASME Section XI for inservice testing of Code Class 1, 2, and 3 components. At that time, valves 1(2)ND28A, 1(2)NI136B, 1(2)NS38B, and 1(2)NS43A were designated as requiring quarterly stroke testing per Subsection IWV-3400. Since startup, each valve has been stroked on a quarterly basis during various modes of operation, including Modes 1, 2, 3, and 4.

On July 31, 1989, the test frequency for 1(2)ND28A was changed from quarterly to cold shutdown. This change was made because opening this valve during operation provides a flow path from the FWST (containing 2000-2100 ppm borated water) to the suction of operating centrifugal charging (NV) pumps, which could result in a plant transient due to an increase in Reactor Coolant System boron inventory.

In October 1990, the Catawba Performance group became aware of Licensee Event Report (LER) 369/90-22 written at McGuire Nuclear Station involving both trains of Residual Heat Removal being inoperable during quarterly valve stroke testing of valves 1(2)NI136B, 1(2)NS38B, and 1(2)NS43A. Investigation by Performance revealed that Catawba was also testing these valves quarterly, including times

during Modes 1, 2, 3, and 4 when the ECCS is required operable. Later investigation also revealed that 1(2)ND28A was tested quarterly until July 31, 1989, when it was rescheduled for cold shutdown. With any of these valves open during a Large Break LOCA, ND injection phase flow could be diverted from the intended ECCS flow path, thereby reducing total injection phase flow to the core. At this time, Performance initiated efforts to review the stroke testing of 1(2)NI136B, 1(2)NS38B, and 1(2)NS43A and to implement changes to prevent ND or ECCS operability concerns during future testing.

Applicable test procedures and system drawings were reviewed to determine if there was an alternate method of testing these valves on a quarterly schedule while maintaining ECCS operability. No alternate method was identified for 1(2)NI136B; therefore, a decision was reached to reschedule this valve for cold shutdown. However, it was noted that manual valves NS42 and NS47 (downstream of NS38B and NS43A) could be closed during each respective train-related stroke test. With the manual valve closed during the test, the concern of diverting ECCS injection flow would be eliminated. Performance then conducted a review of the Final Safety Analysis Report (FSAR), Technical Specifications, and System Descriptions to determine if closing NS42 or NS47 would impact ND/ECCS operability. In addition, Design Engineering was contacted to determine if any piping overpressure concerns existed. Performance concluded that no operability concern existed, and Design Engineering confirmed that overpressurization would not occur. Therefore, on November 6, Performance revised PT/1,2/A/4200/26, NS Valve Inservice Test - Quarterly, to revise the test method for stroking NS38B and NS43A to include closing NS42 and NS47 for isolation purposes. The required 10CFR50.59 evaluations were completed, and since Section 4 was checked "YES", copies were forwarded to the NSRB.

On November 7, Unit 2 valves 2NS38B and 2NS43A were stroke tested per PT/2/A/4200/26. During these tests, the method of closing valves 2NS42 and 2NS47 was utilized. Each header was tested separately, that is, 2NS42 was closed, 2NS38B was stroked, and 2NS42 was reopened. Then 2NS47 was closed, 2NS43A was stroked, and 2NS47 was reopened. Therefore, only one train-related auxiliary containment spray header was isolated at a time.

On November 12 at 0540 hours, the Unit 1 Train A ECCS was declared inoperable and listed in the Technical Specification Action Item Log (TSAIL) due to maintenance work on Train A of the Component Cooling [EIIS:CC] (KC) System.

On November 12 at approximately 1230 hours, with Unit 1 in Mode 1, Performance initiated work on PT/1/A/4200/26 for the stroke test of Unit 1 valves 1NS38B and 1NS43A. The test method of closing 1NS42 and 1NS47 was utilized, and each header was tested separately as previously described. The test was completed at approximately 1625 hours.

On November 13 at 0938 hours, the Unit 1 Train A ECCS was declared operable and removed from the TSAIL.

On December 10, correspondence was forwarded to Performance from the NSRB questioning the procedure changes for PT/1,2/A/4200/26 which allowed manual valves NS42 and NS47 to be closed while testing NS38B and NS43A. As a result, Performance initiated Problem Investigation Report (PIR) 0-C90-0372 to address operability concerns for the auxiliary containment spray function during the November 7 and November 12 tests.

On January 3, 1991, Performance/General Office reviewed McGuire LER 369/90-22 as part of the Operating Experience Program. It was determined that the concern of diverted injection phase flow while testing NI136B, NS38B, and NS43A (with manual isolation valves open) was applicable to Catawba. As a result, PIR 0-C91-0001 was initiated.

CONCLUSION

Valves 1(2)NI136B, 1(2)NS38B, and 1(2)NS43A have been stroke tested on a quarterly basis since unit startup at Catawba. In addition, 1(2)ND28A was stroke tested quarterly until July 31, 1989, when it was rescheduled for cold shutdown due to NC System reactivity concerns. These valves have been tested in various Modes, including Modes 1, 2, 3, and 4 when ECCS operability is required. Per Design Engineering, with these valves open, a portion of ECCS injection flow could be diverted from its intended flow path if a Large Break LOCA occurred. Since both ND trains are cross-connected, stroking any of these valves could render both trains of ND/ECCS inoperable. This aspect of the incident is attributed to Defective Procedures in that the IWV Manual and implementing procedures required quarterly stroke testing of the subject valves but did not properly consider flow diversion concerns. Valves 1(2)NI136B have been rescheduled for testing during cold shutdown and valves 1(2)NS38B and 1(2)NS43A are in the process of being rescheduled for cold shutdown. In addition, as a result of McGuire LER 369/90-22, Design Engineering will conduct a review of valves included in the McGuire IWV program to determine if previously unidentified concerns exist relative to valve stroke testing. The results of this Design Study will be communicated to Catawba Performance for action, if necessary, by Performance, General Office. Also, Design Engineering performed a review specifically for Catawba of other valves whose testing during normal operation could render ND inoperable. This review did not reveal any additional concerns.

On November 7, Unit 2 valves 2NS38B and 2NS43A were stroke tested with their respective isolation valves (NS42 and 47) closed. Each header was tested separately such that only one manual isolation valve was closed at a time. Per Design Engineering, having NS42 or 47 closed renders the respective auxiliary containment spray header inoperable. Although personnel were in the area for

manipulation of these valves, no specific compensatory measures were in place to ensure that the valves would be opened if an accident had occurred. As a result, each auxiliary containment spray header was sequentially rendered inoperable; however, no TSAIL entries were made because it was not realized that closing these valves rendered ND/NS inoperable. No other TSAIL entries related to ECCS, ND, or NS existed during this test, and the test was completed in less than the 72 hour limit specified in T/S 3.5.2 (Action Statement for one train of ECCS inoperable). On November 12, Unit 1 valves 1NS38B and 1NS43A were stroke tested separately with their respective manual isolation valves closed. During these tests, Train A ECCS was inoperable due to KC System work. Therefore, when 1NS42 was closed to facilitate testing 1NS38B, both auxiliary containment spray headers were inoperable.

This aspect of the incident is attributed to an Inappropriate Action due to misinterpreted information in the FSAR during the 10CFR50.59 evaluation process. Performance personnel appropriately reviewed sections of the FSAR that address the auxiliary containment spray function; however, the information was interpreted to mean that these spray headers were provided if needed, but were not required for accident mitigation. The FSAR description of the auxiliary spray function indicates that it is available for operator initiation, if needed, during the latter phase of a LOCA. It does not clearly indicate that the function is required to meet FSAR assumptions. Therefore, contributing to this aspect of the incident is a Design Deficiency due to deficient documentation. As a result of the misinterpretation that existed during this incident, Design Engineering will clarify FSAR sections that address the auxiliary containment spray function. In addition, Catawba Compliance will issue a Technical Specification Interpretation to provide guidance in the future for auxiliary containment spray operability concerns. Also, it is likely that the FSAR text in question was provided by Westinghouse; therefore, a Nuclear Network entry will be generated to advise other utilities of concerns noted in this LER.

A review of the Operating Experience Program (OEP) database did not reveal any incidents during the past 24 months involving ND System inoperabilities due to defective procedures. In addition, no incidents were identified that involved defective IWV procedures. A review was also performed for inappropriate actions due to misinterpreted data or improper 10CFR50.59 evaluations, which did not reveal any previous incidents. Also, no incidents occurred that involved inoperable auxiliary containment spray headers. Therefore, these are not recurring problems.

CORRECTIVE ACTION

SUBSEQUENT

1) Test procedures were revised to reschedule 1(2)NI136B for stroke testing during cold shutdown.

2) Design Engineering performed a review of other valves whose testing during normal operation could render ND inoperable. No additional concerns were noted.

PLANNED

1) Test procedures will be revised to reschedule 1(2)NS38B and 1(2)NS43A for stroke testing during cold shutdown.

2) Performance - General Office will ensure that information generated by the Design Study per McGuire LER 369/90-22 is communicated to Catawba.

3) Performance will implement necessary changes to the IWV program as recommended by Design Engineering.

4) Design Engineering will clarify FSAR sections that address the auxiliary containment spray function.

5) Compliance will issue a Technical Specification Interpretation to provide guidance in the future for auxiliary containment spray operability concerns.

6) Operational Nuclear Safety Assurance will generate a Nuclear Network entry to advise other utilities of concerns noted in this LER.

SAFETY ANALYSIS

Valves 1(2)NI136B, 1(2)NS38B, and 1(2)NS43A have been stroke tested quarterly during Modes 1, 2, 3, and 4 at Catawba since unit startup. 1(2)ND28A was tested quarterly until July 31, 1989 when it was rescheduled for testing during cold shutdown. With any of these valves open during a postulated Large Break LOCA, a portion of ND injection phase flow could be diverted from the intended ECCS flow path to the core. With NS38B or NS43A open, flow could be diverted to the auxiliary containment spray headers and into the containment atmosphere through associated spray nozzles. With NI136B or ND28A open, flow could be diverted to the suction of operating NI and/or NV pumps. Although these pumps are also part of the injection flow path, total flow to the core could be reduced by an amount equal to the flow rate of the operating pump(s) due to ND pump discharge pressure being greater than FWST head pressure. In either case, total flow to the core could be reduced below minimum values assumed in the FSAR. Both ND trains would be affected by this incident since standby alignment requires ND crossover valves to be open.

The test sequence for the subject valves consists of timing each valve from "closed" to "open" and from "open" to "closed". All valve manipulations are performed by Control Room Operators (CROs). The stroke time for each valve is required to be less than or equal to 10 seconds.

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	9 1	— 0 0 1	— 0 0	0 8 OF 0 8

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

Therefore, the total time for each test is very short and would only involve momentary opening of the valve. The probability of a LOCA occurring during this time period is extremely low. Valves are tested separately; therefore, only one diversion flow path would exist at any time during testing. In addition, CROs perform valve manipulations and are aware of valve position during each test. If a LOCA did occur during a test, emergency procedures require CROs to verify proper ECCS valve alignment. Hence, operator action to mitigate the effects of diverted flow would be expected.

Subsequent testing of 1(2)NS38B and 1(2)NS43A was performed with each valve's respective manual isolation valve, 1(2)NS42 and 1(2)NS47, closed. Valve 1NS38B was tested while ND/ECCS Train A was inoperable, which resulted in both auxiliary containment spray headers being inoperable during the test. Train A was inoperable due to maintenance on KC system pumps; therefore, ND Train B components were intact and mechanically capable of functioning during this time period. The auxiliary containment spray function is required during the ECCS recirculation phase to assist in maintaining peak containment pressure below the design limit. The test was conducted by closing the manual valve (1NS42), stroking 1NS38B in both directions, then reopening 1NS42. The period of inoperability existed from the time the manual valve was closed until it was reopened. During this time, Control Room Operators were clearly aware of the test and that each auxiliary containment spray header was being sequentially isolated (an operator was inside containment). If a LOCA had occurred during this time, this awareness would have provided early identification of the inoperable status of either auxiliary containment spray header. An alternate auxiliary containment spray flowpath from the operable Train B ND system, through ND crossover valves, to the operable Train A spray header existed. Although the operators are directed to close the ND crossover valves during the recirculation phase, management approvals available during emergency conditions could have authorized the opening of these valves to prevent the maximum containment pressure from being exceeded. Auxiliary containment spray is not initiated until at least 50 minutes have passed after Reactor trip, and ice bed meltout does not occur until 70 minutes into the incident. Therefore, ample establishing auxiliary containment spray. Again, the total time of this test was very short and the probability of a LOCA occurring during this time period is extremely low.

During this incident both trains of ND/ECCS and auxiliary containment spray were rendered inoperable for short periods of time. Due to the low probability of a LOCA occurring during these short time periods and operator awareness of testing in progress, a low level of safety significance is associated with this incident.

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