NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION

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EXPIRES: 5/31/95
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Catawba Nuclear Station, Unit 1	05000413	1 of 10

TITLE (4)
Failure to Perform T/S Surveillances Due to Unanticipated Interaction of Systems

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 NAME	DOCKET NUMBER(S)
											Unit 2	05000 414
07	27	95	95	-	003	-	1	09	08	95		05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (Check one or more of the following) (11)											
POWER LEVEL (10)	100		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)				
			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)	X	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	
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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		09	08	95

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

ABSTRACT

On July 27, 1995, with Units 1 and 2 in Mode 1, Power Operation, an accident scenario was discovered during a self assessment that had not been considered when containment integrity boundaries were established. Piping downstream of valves 1(2)KC310, 1(2)KC311, and 1(2)KC312 could fail during this scenario and adversely effect containment integrity. Not having these valves closed with power removed violates Technical Specification (T/S) 4.6.1.1a, Containment Integrity. This event is attributed to Design Analysis due to unanticipated interaction of systems. A Non-Licensed Operator (NLO) was dispatched to verify the valves closed and isolate air supply to prevent spurious actuation. While verifying valve positions, the NLO found 1KC311 open. The scenario would not change with 1KC311 open, because it assumed a spurious opening of the valve. The periodic test procedures were revised. Additional vent and drain valves and their associated caps on a similar penetration were identified during the investigation that should have also been considered when containment integrity boundaries were established. Planned corrective action is to review all penetrations to determine if similar situations exist where valves may have been omitted from the development of containment integrity boundary. The final safety analysis indicates that the health and safety of the public would not have been affected..

BACKGROUND

The Component Cooling System (KC) [EIIS:CC] acts as a closed loop treated water system to dissipate waste heat from motor [EIIS:MO] coolers [EIIS:CLR] and intersystem heat exchangers [EIIS: HX] serving various systems supporting plant startup, normal, and shutdown activities. This system serves as a boundary between the Reactor Coolant System (NC) [EIIS:AB] and the Nuclear Service Water System (RN) [EIIS:BI]; reducing the probability of radioactivity leakage into the environment.

Valves [EIIS: V] 1(2)KC310, Excess Letdown Heat Exchanger Vent, serves as a vent isolation for the shell side of the Excess Letdown Heat Exchanger; 1(2)KC311, Excess Letdown Heat Exchanger Vent to KC Drain Sump, serves as a diversion path to the KC drain sump for the shell side of the Excess Letdown Heat Exchanger; 1(2) KC312, Excess Letdown Heat Exchanger Drain, serves as a drain isolation for the shell side of the Excess Letdown Heat Exchanger; 1(2)KC305B, Excess Letdown Heat Exchanger Supply Containment Isolation Valve, serves to isolate the inlet shell side of the Excess Letdown Heat Exchanger; and 1(2)KC315B, Excess Letdown Heat Exchanger Return Containment Isolation Valve, serves to isolate the outlet shell side of the Excess Letdown Heat Exchanger.

KC System supply to the Excess Letdown Heat Exchanger is unique in that the outside containment isolation valves 1(2)KC305B and 1(2)KC315B are both "B" train valves. With no "A" train valves, application of the single failure criterion is part of the scenario where an open flow path affecting Containment Integrity could exist. The outside containment isolation valves are motor operated and close upon receipt of an St signal to perform their containment isolation function during a design basis event.

The Reactor Coolant Drain Tank Subsystem (NCDT) collects all deareated recyclable liquids with entrained fission gases generated from components in the Reactor Building (RB) [EIIS:NH] sources.

- Reactor Coolant Pumps #2 and #3 seal leakoffs.
- Piped up valve leakoffs.
- Excess letdown HX effluent generated during start-up.
- Miscellaneous equipment drains.

The NCDT HX is cooled by KC water on the shell side and is designed to maintain the NCDT fluid at 170 degrees Fahrenheit or less and cool the contents of the pressurizer relief tank from 200 degrees Fahrenheit to 120 degrees Fahrenheit.

Technical Specification (T/S) 3.6.1.1 states that primary containment integrity shall be maintained during Modes 1 (Power Operation), 2 (Startup), 3 (Hot Standby), and 4 (Hot Shutdown). The T/S states that without containment integrity, action is required to restore containment integrity within one hour or be in at least Hot Standby within the following six hours and in Cold Shutdown (Mode 5) within the following thirty hours. Procedure PT/1(2)/A/4200/02B, Cold Shutdown Inside Containment Integrity Verification, is used to verify the position of containment integrity valves inside the Reactor Building[EIIS:NH].

EVENT DESCRIPTION

July 27, 1995

During the KC Self Initiated Technical Audit (SITA), it was discovered that an accident scenario existed which could affect containment integrity.

1120 hours A Technical Specification Operability Notification Sheet (TSONS) was issued declaring valves 1(2)KC310, 1(2)KC311, and 1(2)KC312 inoperable because 1(2)KC311, 312 were not included in the periodic test procedure for verifying containment integrity. Valves 1(2)KC310, 1(2)KC311, and 1(2)KC312 were also not being verified secured; therefore, valve position and control power status was unknown. Operations approved the TSONS and dispatched a Non-Licensed Operator (NLO) to tag 1(2)KC305B, 315B, Excess Letdown HX containment Isolation Valves, closed with power removed to ensure containment integrity per T/S action statement.

July 28, 1995

The Operations procedure group revised OP/1(2)/A/6100/01, Controlling Procedure For Unit Startup, to verify 1(2)KC310, 1(2)KC311, and 1(2)KC312 closed with power removed.

An NLO was dispatched to verify valves were closed and to isolate power from the valve operators. While verifying position for the unit 1 valves the NLO found 1KC311 open. The valve was immediately closed.

Power was restored and tags removed to valves 1(2)KC305B and 1(2)KC315B after containment integrity was verified per the operating procedure.

2315 hours KC system containment penetrations [EIIS:PEN] to the Excess Letdown Heat Exchanger lines for Unit 1 and 2 were declared operable.

CONCLUSION

The root cause of this event is Design Analysis due to unanticipated interaction of systems. During a KC SITA a scenario was discovered for which the subject KC valves would be part of the containment integrity boundary. The scenario is the failure of the Class G piping downstream of 1(2)KC311, 312 during a seismic event coupled with a loss of offsite power, a B train Diesel Generator (D/G) failure, spurious actuation of 1(2)KC311, 312 because of non-safety controls, and having KC aligned to the Excess Letdown HX. In this scenario an open path from the containment atmosphere to outside of containment could exist. The T/S Surveillance of 1(2)KC310, 311, and 312 has not been performed because it was not recognized that the subject valves were needed for containment integrity. When the NLO went to verify the valves closed, 1KC311 was found open. The scenario does not change with 1KC311 being found open. This condition (failure to verify the valves closed and secured) has existed since the initial development of the containment integrity verification procedures.

During the investigation additional vent and drain valves were identified that should have been considered when containment integrity boundaries were established. Seventeen vent and drain valves on the KC supply to the NCDT HX should have been included in the periodic test procedure for verifying containment integrity. A review of operating procedures OP/1(2)/A/6400/05, Component Cooling System, indicates that all of the vents and drains were verified closed prior to the end of the last refueling outage on each unit. Planned corrective action is to include all the vent and drain valves identified during the investigation in the periodic test procedures for verifying containment integrity.

Even though the subject valves were not included in the test procedure there was no containment by-pass leakage path from inside containment to outside atmosphere. However, the potential existed under certain conditions for a by-pass leakage path to develop.

Planned corrective action is to review all penetrations to determine if similar situations exist where valves may have been omitted from the containment integrity boundary. In addition, Operations revised PT/1(2)/A/4200/02B, Cold Shutdown Inside Containment Integrity Verification, to include verifying that 1(2)KC310, 311, and 312 are closed with the air supply to their actuators isolated.

A review of the Operating Experience Program database for the 24 months prior to this event indicates missed T/S surveillances is a recurring problem. Licensee Event Report (LER) 414/94-004 involved missed T/S surveillances where the surveillance existed in the test program but the time interval for the surveillance had been exceeded. Corrective actions were identified to address the recurring problem. This event occurred because the equipment had not been included in the test

program. Due to this difference no additional corrective actions are needed to address a recurring problem.

CORRECTIVE ACTION:

Subsequent

1) Operations verified that 1(2)KC305B, 315B, inlet and outlet valves to the Excess Letdown Heat Exchanger, were closed with power removed to comply with T/S.

2) Operations revised OP/1(2)/A/6100/01, Controlling Procedure For Unit Startup, to include steps to verify the KC vent and drain valves closed and secured. This was a interim measure that will be used until the periodic test procedures for verifying containment integrity are revised.

3) Operations revised procedures PT/1(2)/A/4200/02B, Cold Shutdown Inside Containment Integrity Verification, to include the KC vent and drain valves.

4) An NLO was dispatched to verify 1(2)KC310, 311, and 312 closed and isolate air to prevent spurious actuation.

Planned

1) Operations and System Engineering will review all penetrations to determine if similar situations exist where valves may have been omitted from the containment integrity boundary.

2) Operations will revise procedures PT1(2)/A/4200/02B, Cold Shutdown Inside Containment Integrity Verification, to include the KC vent and drain valves associated with NCDT HX.

SAFETY ANALYSIS:

The first part of this Safety Analysis will address the containment integrity concerns related to the Component Cooling Water System (KC) piping for the excess letdown heat exchanger. The second part of the analysis will discuss the containment integrity concerns associated with the KC piping for the Reactor Coolant Drain Tank (NCDT) heat exchanger.

The excess letdown heat exchanger process piping inside containment was designed to be protected from pipe break interaction effects and as such was considered to be a closed system inside containment (See attachment A for simplified sketch). This piping system was therefore only provided with a single containment isolation valve located outside of containment on the supply and the return piping to the heat exchanger. This piping system is normally not in service and the containment isolation valves are closed. The recent Component Cooling Water System (KC) Self Initiated Technical Audit (SITA) identified a deficiency with respect to this piping system in that the drain piping located downstream of the heat exchanger vent and drain valves was Duke Class G piping. Duke Class G piping is non-safety related piping and has not been designed to be seismically qualified nor has it been evaluated for High Energy Line Break interactions. The KC SITA Team concluded that the valves which separate the safety related piping from the non-safety piping inside containment should have been included in PT/1(2)/A/4200/02B, Cold Shutdown Inside Containment Integrity Verification, which satisfies the surveillance requirements of Technical Specification 3.6.1.1. The excess letdown heat exchanger vent and drain valves (KC310, KC311, KC312) are fail as-is valves which have non-safety related controls. These controls are located at an elevation which may experience flooding following a postulated Loss of Coolant Accident. The position of these valves therefore cannot be assured and therefore for purposes of this analysis will be assumed to be open.

A review of the containment integrity implications of safety class of these valves has identified that a containment integrity concern does exist for these valves under a very limited set of postulated design basis accidents and single failures. This preliminary safety analysis has identified that if a Design Basis Earthquake coincident with a LOCA may be postulated to also result in a Loss of Offsite Power and a loss of Lake Wylie the non-safety related portion of the Ultimate Heat Sink. For purposes of this Preliminary Safety Analysis a failure of the B Train Diesel Generator on the LOCA unit is assumed. Additionally, it will be assumed that the non-LOCA unit B Train Diesel Generator is not available. The excess letdown heat exchanger, which is rarely in service will be assumed to be in service to ensure development of a limiting preliminary safety analysis. The non-safety related KC drain piping inside containment will be assumed to fail.

Under this postulated accident scenario, the two excess letdown heat exchanger containment isolation valves (KC305B and KC315B) will remain open following the accident due to the postulated failure of the LOCA unit B train D/G. These are gate valves which have been provided with a separate sealing system, Containment Valve Injection Water System (NW), which is designed to maintain the pressure between the wedges of the gate valve above the Containment Peak Accident Pressure, thus preventing containment leakage through these valves. Due to the postulated failure of the LOCA unit B train D/G, which causes the unavailability of the LOCA unit B train RN pump, and the assumed unavailability of the non LOCA unit B train RN pump, no B train RN pumps would be available to provide assured makeup water to the NW system, rendering it unavailable. The potential

unavailability of the NW system could create another leak path for KC or containment atmosphere. However, the NW lines to valves KC305B and KC315B have two check valves in series which are tested each outage to ensure backflow isolation. The NW check valves for these KC isolation valves have an excellent leakage history and therefore do not create a credible significant leakage path. There is also a test vent located between the NW check valves and KC305B and KC315B. Each test vent is provided with an isolation valve and pipe cap which is verified closed and the cap installed per the Containment Valve Injection Water System procedure.

This arrangement is considered to provide adequate containment isolation capability, and would normally be considered exempt from Type C testing under ANSI N56.8, 1994, if it were a vent or drain on a containment penetration. Therefore, no adverse effects associated with the NW system would result if KC305B and KC315B were open at the time of the postulated accident.

All containment isolation valves are verified to be in the closed position early in the Catawba Emergency Operating procedures. If a containment isolation valve is not in the correct position, steps will be taken to attempt to place it in the correct position. The excess letdown heat exchanger containment isolation valves are located inside the mechanical penetration rooms which are postulated under the design basis dose analysis to have significant post accident dose rates. Therefore, credit will not be taken for operator action to locally close these valves.

The KC piping arrangement for the supply and return piping outside of containment has been reviewed. This piping is safety related and seismically supported and can therefore be assured to function following this postulated sequence of events. This review also indicates that each supply and return line has a "loop seal" arrangement present in the piping. An analysis of this piping arrangement has shown that for both the large break and small break LOCA conditions, a "loop seal" water leg of sufficient size would remain in the supply and return piping to provide a barrier against the leakage of containment atmosphere into the auxiliary building via the KC surge tanks. Therefore, no adverse effects would result if the excess letdown heat exchanger vent and drain valves which isolate the safety related Duke Class B piping from the non-safety related Duke Class G piping were open during this postulated accident.

The KC piping for the NCDT heat exchanger was also considered to be a closed system inside containment based on the same evaluation criteria as that used for the excess letdown heat exchanger KC piping. The NCDT heat exchanger KC piping was however provided with a motor operated containment isolation gate valve (KC320A) and a check valve (KC322) on the supply side penetration. It was also designed with two electric motor operated containment isolation gate valves (KC332B and KC333A) on the return side penetration. In addition, a check valve (KC280) and its associated piping was provided for thermal relief of the piping between valves KC332B and KC333A.

Because the KC piping for the NCDT heat exchanger was classified as a Seismic Category I closed system inside containment, check valves KC322 and KC280 were considered exempt from Type C testing.

The containment integrity problem discovered for the NCDT KC piping is similar to that of the excess letdown heat exchanger KC piping with the exception that none of the vent and drain valves on the NCDT piping have actuators installed on them (they are all manually operated valves). The postulated accident scenario which creates the potential containment integrity concern is as follows:

- A Seismic event occurs of such magnitude to cause 1) A Loss of Offsite Power 2) The Loss of Lake Wylie and 3) The failure of the non-safety related KC drain piping inside containment.
- A LOCA (either small or large break) has occurred coincident with the Seismic event.
- A failure of the A train Diesel Generator (D/G) on the LOCA unit occurs.
- The A train pump of the Nuclear Service Water System (RN) on the non LOCA unit is unavailable.

If the scenario stated above were to occur, containment integrity could not be assured due to the fact that 1) The vents and drains on the NCDT heat exchanger are connected to Duke Class G piping which may fail during the seismic event. 2) The vent and drain valves and their associated pipe caps between KC322 and KC332B are not in the Inside Containment Surveillance procedure which is necessary to satisfy the surveillance requirements of Technical Specification 3.6.1.1. 3) Since KC322 and KC280 are not Type C tested, leakage past these check valves is not quantified and are therefore assumed to leak. Leakage past these valves could then migrate through the KC piping to the KC surge tank vents and out into the Auxiliary Building since KC333A and KC320A would be open and if it is assumed that a vent or drain on the NCDT heat exchanger piping was open.

The discussion and conclusions associated with the excess letdown heat exchanger KC piping regarding the NW system, and access to manually close the failed open containment isolation gate valves also applies to the NCDT heat exchanger KC piping due to the same design parameters and configurations.

Even though the vent and drain valves between KC322 and KC332B are not in the Inside Containment Surveillance procedure, these vent and drain valves are verified closed prior to coming out of each scheduled refueling outage. If one of these vent or drain paths were left open, it would be detected by a loss of KC inventory and an increase in containment sump levels with nitrites present in

the sump chemistry samples (nitrite is a major component of the KC system water chemistry). Based on the fact that the vent and drain valves are verified closed and there has been no indication of KC leakage in containment, it is reasonable to assume that an adequate barrier exists to prevent the leakage of containment atmosphere into the Auxiliary building. In addition, even though KC322 and KC280 are not Type C tested, there is no reason to believe that these check valves would not close and provide at least some barrier to the release of containment atmosphere.

In summary, this safety analysis indicates that the health and safety of the public would not be adversely affected should the KC vent and drain valves on the excess letdown heat exchanger or the piping between KC322 and KC332B on the NCDT heat exchanger KC piping be open during the limiting design basis event scenarios described in this analysis.

ATTACHMENT A