NRC FORM 366
U.S. NUCLEAR REGULATORY COMMISSION
(4-95)

LICENSEE EVENT REPORT (LER)

APPROVED OMB NO. 3150-0104
EXPIRES: 04/30/98
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.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Catawba Nuclear Station Unit 2	05000414	1 of 6

TITLE (4)
Violation of Technical Specification 3.6.5.3 due to Inoperable Ice Condenser Lower Inlet Doors Caused by Ice/Frost Buildup Restricting Door Movement

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)
9	06	1998	1998	-	005	-	00	10	06	1998		

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (Check one or more of the following) (11)			
POWER LEVEL(10)	000	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)	X 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	
G.A. Copp, Regulatory Compliance	(803)	831-3622

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	

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 September 6, 1998 with Unit 2 shut down in Mode 5, Engineering personnel discovered frost/ice buildup on the support beam coolers and associated glycol lines in the ice condenser while performing the initial visual inspection of the ice condenser. Each bay of the ice condenser has one beam cooler located inside the ice condenser above the inlet doors. The frost/ice was built up sufficiently thick in 22 of the 24 bays to create an obstruction which impaired the opening of the inlet doors. This is a violation of Technical Specification 3.6.5.3 since this condition also existed while the unit was in operation. The cause was an inadequate design that allowed frost buildup to impede inlet door opening. The frost/ice will be cleared from the coolers and associated glycol lines and insulation installed to prevent future buildup problems.

BACKGROUND

The ice condenser [EIIS:COND] is a passive safety system containing borated ice that is utilized to absorb thermal energy in the event of a Loss of Coolant Accident (LOCA) or a main steam line break inside containment. Steam is condensed and containment pressure is thereby reduced which assures containment integrity. The ice condenser is divided into 24 bays with 81 baskets of borated ice in each bay.

The ice condenser has a refrigeration subsystem [EIIS:BC] which serves as a central heat sink for ambient heat in the ice condenser. A circulating system of ethylene glycol solution carries the heat from the various heat transfer surfaces in the ice condenser to chiller packages [EIIS:CHU]. These heat transfer surfaces include 30 air handling units [EIIS:AHU] and the ice condenser Floor Cooling Subsystem.

The Floor Cooling Subsystem consists of carbon steel piping [EIIS:PSP] filled with ethylene glycol which is embedded in the floor of each bay of the ice condenser. The Floor Cooling subsystem keeps the lower ice condenser floor cold to minimize heat conduction from the lower containment into the ice condenser. The floor cooling glycol flow also provides cooling for the lower support structure of the ice baskets [EIIS:BSKT] by passing through surface mounted beam cooler cooling coils [EIIS:CCL]. Additionally, the Floor Cooling subsystem reduces the temperature differential between the lower ice condenser and the ice bed. This reduces ice sublimation by reducing air circulation which is driven by this temperature differential.

The ice condenser has inlet doors [EIIS:DR] which form the barrier to air flow through the inlet ports of the ice condenser for normal unit operation. In the event of a LOCA or steam line break causing a pressure increase in lower containment, the doors open, venting air and steam relatively evenly into all sections of the ice condenser. The ice condenser inlet doors are designed to open with a one pound per square foot differential pressure between lower containment and the ice condenser lower plenum. The doors will open approximately 90 degrees during design basis accident conditions.

TS 3.6.5.3 Limiting Condition for Operation (LCO) requires that:

"The ice condenser inlet doors . . shall be closed and OPERABLE."

TS 4.6.5.3.1.b.2 requires that each inlet door be demonstrated operable by:

> "Verifying that each door is capable of opening automatically in that it is not impaired by ice, frost, debris, or other obstruction."

MP/0/A/7150/006, Ice Condenser Lower Inlet Doors Testing and Corrective Maintenance, contains steps and acceptance criteria to verify that the doors can be opened and are unobstructed.

EVENT DESCRIPTION

April 18, 1997
Ice condenser inlet door testing was completed per MP/0/A/7150/006 during the Unit 2 End of Cycle 8 refueling outage (2EOC8). All acceptance criteria were met. Frost/ice buildup that was present did not prevent or interfere with the doors opening.

September 6, 1998
During the initial visual inspection of the lower ice condenser at the start of 2EOC9 refueling outage, the beam coolers and associated glycol lines were observed to have extensive frost/ice buildup. It was concluded that the frost/ice buildup would impair full opening of the inlet doors.

September 7, 1998
Work Request 98041368 was written to measure and document the as-found opening capability of the inlet doors.

September 14, 1998
Testing and measurement of door opening capability was completed. Results showed that two of the 48 doors opened without contacting any obstruction. The remaining 46 doors opened between 3/4 inch and 25 inches with an average opening distance of approximately 5 inches as measured from the outside of the door to the door frame prior to contacting frost/ice buildup on the beam cooler.

CONCLUSION

The cause of this event was an inadequate design that allowed frost buildup to impede inlet door opening. The beam coolers are not insulated and are colder than their surroundings. Thus, frost and ice will build up on this

colder surface. Engineering and Maintenance personnel were both aware that frost had been on these coolers and glycol lines for some time, however, this was not viewed as abnormal. These components were not cleaned because of concerns that frost cleaning activities would damage the glycol coolers and/or glycol lines and create glycol leaks. It was not recognized that the frost/ice buildup could eventually interfere with door opening since the frost buildup was not seen as a concern. The frost/ice buildup did not impact the beam cooling function.

It was determined that with the frost/ice buildup on the beam coolers that the ice condenser inlet doors were inoperable. This did not present an immediate operablity issue since the unit was in Mode 5 with Reactor Coolant System [EIIS:AB] temperature and pressure at 195 degrees F and 315 psig, respectively, at the time of the event. The inlet doors are only required to be operable in Modes 1 through 4. However, at some time between April, 1997 and September, 1998 the ice buildup became thick enough to impair opening of the inlet doors. The ice buildup was sufficient such that TS 4.6.5.3.1.b.2 would not have been met for some indeterminate period of time while the unit was operated in Modes 1 through 4 during Cycle 9. Thus, the unit was operated in violation of TS LCO 3.6.5.3 which requires the doors to be operable. Action a. of this TS allows the inlet doors to be inoperable for up to 14 days as long as they are capable of opening automatically; however, the obstruction existed for greater than this 14 day period. Failure to comply with the TS or the associated Action is reportable pursuant to 10CFR 50.73(a)(2)(i)(B) as an operation or condition prohibited by Technical Specifications.

A review of operating experience at Catawba revealed only one previous event involving the ice condenser. This was Licensee Event Report 413/98-015 which involved a problem with ice buildup in ice condenser flow passages resulting in the shutdown of Unit 1. Therefore, this event is considered to be non-recurring. A similar event did occur at McGuire Nuclear Station, in that the inlet doors were impaired. However, this was due to ice condenser floor upheaval movement which caused interaction with the flashing below the inlet doors. This caused the flashing to interfere with the ability of some inlet doors to open (LER 370/97-03).

There were no EPIX reportable failures as a result of this event.

CORRECTIVE ACTIONS

Immediate
Since Unit 2 was in cold shutdown, there were no immediate corrective actions. Engineering verified that this condition did not exist on Unit 1 since extensive cleaning of the Unit 1 ice condenser was performed as part of followup corrective action to the problems noted in LER 413/98-015.

Planned
1) Frost/ice will be cleaned and insulation will be installed on the beam coolers and associated glycol lines during the current refueling outage.

2) Lower inlet doors will be tested after installation of insulation and prior to entering Mode 4 to verify compliance with TS.

3) Insulation will be installed on the beam coolers and associated glycol lines on Unit 1 during the next refueling outage (1EOC11). During the interim period prior to the refueling outage, a remote visual inspection will be done to confirm the absence of frost buildup that could interfere with door operation.

SAFETY ANALYSIS
The ice condenser must be capable of handling the blowdown load from a high energy line break in order to maintain peak containment pressure below the design limit of 15 psig. To accommodate this blowdown energy, some fraction of the ice condenser inlet doors must open. For a small pipe break, the ice condenser inlet doors must be capable of opening at a relatively low pressure to prevent steam from bypassing the ice condenser to upper containment.

The blowdown load from a large break LOCA bounds that of small break LOCAs as well as that from steam line and feedwater line breaks. The pressure differential across the inlet doors following a large break LOCA will be substantially greater than that required by the TS. Even though the frost/ice buildup would have restricted the door opening, it is expected that the inlet doors would have still opened since the amount of frost/ice buildup that would have impacted the doors was generally less than 1" below the level of the top inlet door frame. This buildup would have either been swept away by the force of the door opening, and/or would have quickly melted due to the steam entering the ice condenser lower plenum following a large break LOCA.

For small pipe breaks, the inlet doors will open in proportion to the applied pressure. For small breaks which do not generate sufficient pressure differential to open the inlet doors, the Containment Spray System [EIIS:BE] can absorb the energy of any steam leakage which bypasses the ice condenser. The inlet doors would have opened a sufficient amount for small pipe breaks to assure that containment design pressure would not be exceeded. The TS Bases recognize that impairment of door opening by ice, frost or debris causes the door to be inoperable but still ". . capable of opening automatically since these type conditions will result in a slightly greater torque necessary to open the doors or a slight delay in door opening."

Thus, although the ice condenser was degraded due to the inlet door impairment, the ice condenser was still capable of performing its safety function of maintaining containment pressure within design limits for all postulated accidents. The health and safety of the public were not affected by this event.