NRC Form 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), 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)
Cook Nuclear Plant Unit 1	05000-315	1 of 4

TITLE (4)
Ancillary Equipment Installed in Ice Condenser Not Designed to Withstand Design Basis Accident/Earthquake Loads

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: D.C. Cook Unit 2	DOCKET NUMBER: 05000-316
08	14	1998	1998	-- 050 --	00	12	16	1998	FACILITY NAME	DOCKET NUMBER

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

OPERATING MODE (9)	5	20.2201 (b)	20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)	000	20.2203(a)(1)	20.2203(a)(3)(i)	X	50.73(a)(2)(ii)		50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)		50.73(a)(2)(iv)		OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or n NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Mr. Jay Kovarik, Electrical Instrumentation and Controls Engineering	(616) 697-5689

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 15 single-spaced typewritten lines) (16)

On July 24, 1998, during ice condenser refurbishment activities, System Engineering identified that the Public Address (PA) equipment located inside the Unit 1 and Unit 2 ice condensers was not installed to withstand a Design Basis Accident (DBA) and/or Design Basis Earthquake (DBE) condition. Specifically, the mountings for the electrical conduits and other ancillary equipment, such as amplifier boxes, speakers and cabling, could potentially fail and impede the ice condenser from performing its design function. This condition is reportable under 10CFR50.73(a)(2)(ii)(B), for a condition that resulted in the plant being in an unanalyzed condition.

The root cause for this condition is lack of established design criteria for the ice condenser ancillary equipment. A design change has been developed to upgrade the supports/restraints for certain large or concentrated areas of electrical equipment located inside the ice condenser. Installation of the design change will be completed prior to plant restart.

Although the potential exists for the ancillary equipment to become dislodged during accident conditions and impede the ice condenser from performing its design function, based on analysis, the likelihood is considered remote. Therefore, it is unlikely that the identified condition could degrade or prevent the ice condenser from performing its design function during a DBA or DBE event, and the health and safety of the public would not be jeopardized.

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FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Cook Nuclear Plant Unit 1	05000-315	1998	-- 050 --	00	2 of 4

TEXT *(If more space is required, use additional copies of NRC Form (366A)* (17)

Conditions Prior to Event

Unit 1 was in Mode 5, Cold Shutdown
Unit 2 was in Mode 5, Cold Shutdown

Description of Event

On July 24, 1998, during ice condenser refurbishment activities, System Engineering identified that the Public Address (PA) equipment located inside the Unit 1 and Unit 2 ice condensers was not installed to withstand a Design Basis Accident (DBA) and/or Design Basis Earthquake (DBE) condition. Specifically, the mountings for the electrical conduits and other ancillary equipment, such as amplifier boxes, speakers and cabling, could potentially fail and impede the ice condenser from performing its design function.

A review of the original design change documentation which installed the PA system concluded that the design did not consider whether the equipment would remain in place when subjected to DBA and/or DBE loads. On August 18, 1998, Engineering performed a visual inspection of a representative sample of the electrical equipment supports installed in the Unit 1 ice condenser. Results of the inspection determined that the electrical conduits and other ancillary equipment were not supported in a manner that would prevent the equipment from becoming a missile, if dislodged, during a DBA event. Because the Unit 2 ice condenser has the same PA system design as Unit 1, it can be assumed that similar conditions exist in the Unit 2 ice condenser.

Cause of Event

The root cause for this condition is lack of established design criteria for the ice condenser ancillary equipment. The original design for the primary ice condenser structure and equipment was supplied to AEP by the original design contractor. However, the design criteria for the ancillary equipment was not defined. Because of the lack of established design criteria and the non-safety related function of the ancillary equipment, AEP designed and installed the ancillary equipment using balance of plant design criteria without considering the unique aspects of the ice condenser's design basis function.

Analysis of Event

This LER is submitted in accordance with 10CFR50.73(a)(2)(ii)(B), for a condition that resulted in the plant being in an unanalyzed condition.

The primary function of the ice condenser system is to absorb the thermal energy released inside containment and limit peak containment pressure during a Loss of Coolant Accident (LOCA) or Main Steam Line Break (MSLB). The ice condenser system consists of a completely enclosed annular compartment which is located circumferentially around approximately 300 degrees of the perimeter of the containment. The annular compartment of the ice condenser consists of 24 bays containing 81 cylindrical ice baskets per bay, positioned in a vertical array of columns. The vertical array of baskets is supported by lattice frames, which are located every 6 feet over the 48 foot height of the bed. The ice baskets are arranged to promote heat transfer between the thermal energy released (steam) and the ice during a LOCA or MSLB. The lower portion of the ice condenser has a series of hinged doors (lower inlet doors) exposed to the atmosphere of the lower containment compartment. The top of the ice condenser consists of another set of doors (upper doors) which are exposed to the atmosphere of the upper compartment. Intermediate deck doors, located below the top deck doors, form the floor of a plenum at the upper part of the ice condenser.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Cook Nuclear Plant Unit 1	05000-315	1998	-- 050 --	00	3 of 4

TEXT *(If more space is required, use additional copies of NRC Form (366A)* (17)

In the event of a LOCA or steam line break, the door panels located below the operating deck open due to the pressure rise in the lower compartment. This allows the air and steam to flow from the lower compartment into the ice condenser. The resulting pressure increase within the ice condenser causes the intermediate deck doors and the door panels at the top of the ice condenser to open, which allows the air to flow out of the ice condenser into the upper compartment. The ice condenser condenses the steam as the steam enters the ice condenser compartment, thus limiting the peak pressure in the containment.

With respect to flow passage blockage, the containment pressure analysis assumes a uniform 15 percent maximum blockage of the most restrictive area in the ice bed, and conservatively assumes that this reduced area exists over the entire 48 foot height of the ice bed. The most restrictive area of the bed is the lattice frames. The open area at the lattice frames is approximately 41 square feet and is well distributed across the plane. The total area of each bay is approximately 100 square feet. Because the open area is well distributed across each bay, a limit of 15 percent of the total bay area, or 15 square feet, can be applied to determine flow passage blockage. This limit is conservative because the blockage would occur at a plane located underneath the ice bed, and not over the entire ice bed as assumed in the containment pressure analysis.

In certain bays towards the center of the ice condenser, the total surface area of electrical equipment exceeds 15 square feet. Although extremely unlikely, it is theoretically possible that all this equipment could migrate from its location to the underside of the lower support structure (beneath the ice baskets) during a DBA. This scenario would result in greater than 15 percent blockage of the 100 square foot bay area. However, the 15 square foot containment pressure analysis criteria is conservative because the blockage only exists at the underside of the ice bed, and not over the entire 48 foot height of the ice bed. The amount of electrical conduit in these areas is not nearly enough to block the entire 48 foot of the ice bed. Additionally, it is not reasonable to assume, even if there were sufficient amounts of material, that this equipment could become dislodged and strategically fall in such a configuration that it would block the entire 48 foot length of the bed.

Additional vulnerabilitites in the lower ice condenesers include the lower inlet doors and shock absorbers. Equipment in the vicinity of these doors could theoretically block the doors from opening during an accident, if the equipment supports were to fail during a seismic event. However, DBA loads are not considered critical because the equipment inside the ice condenser would not experience these loads until after the doors have opened, and it is not credible for the electrical equipment to cause these doors to close once opened.

There is very little equipment installed in the vicinity of the lower inlet doors. The equipment consists primarily of electrical conduits. For this equipment to become a missle which could threaten the opening of the lower inlet doors, several events must occur for this condition to be probable. Initially, the supports for the electrical conduits must break under seismic load, followed by the conduit and electrical cables either severing along their length or coming loose at their junction/terminal box or other equipment. The dislodged equipment must then fall and land in a configuration that would create a wedge between the lower inlet doors and structural steel, or other equipment in the area. While theoretically possible, the likelihood of these circumstances occuring is considered remote.

Vulnerabilities in the upper ice condenser include the intermediate and top deck doors. Equipment in this area could potentially block these doors from opening if the equipment supports fail during a seismic event. Accident loads are not considered critical in this area because the equipment will not see these loads until after the doors have opened, and it is not credible for the electrical equipment in the area to cause these doors to close once opened.

The majority of equipment located in the upper ice condenser is solidly supported and contained against the containment and crane walls. An unimpeded path to the intermediate deck doors and top deck doors generally does not exist due to intervening equipment and structures. The equipment which is not solidly supported could potentially fall under seismic loading and migrate to the intermediate doors. However, the total weight of the equipment would be small and the fallen

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	
Cook Nuclear Plant Unit 1	05000-315	1998	--	050	--	00	4 of 4

TEXT *(If more space is required, use additional copies of NRC Form (366A)* (17)

equipment would be well distributed within the ice condenser. Also, the lifting forces the deck doors experience during an accident would be large and likely would be able to overcome the additional weight added by the fallen equipment.

Based on the above analysis, it is unlikely that the identified condition could degrade or prevent the ice condenser from performing its design function during a DBA or DBE event. Therefore, the health and safety of the public were not jeopardized.

Corrective Actions

A design change has been developed to upgrade the supports/restraints for certain large or concentrated areas of electrical equipment located inside the ice condenser. Installation of the design change will be completed prior to plant restart.

Design criteria have been developed for the ice condenser ancillary equipment. The criteria will be incorporated into the Updated Final Safety Analysis Report.

Previous Similar Events

None