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AEP
INDIANA
MICHIGAN
POWER

February 21, 2000

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Operating Licenses DPR-58 and DPR-74
Docket Nos. 50-315 and 50-316

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled Licensee Event Report System, the following report is being submitted:

LER 315/2000-001-00, "Stress Loads for the Ice Condenser Basket Assembly Greater Than Allowed by Safety Analysis Report".

The following commitment was identified in this submittal:

- An evaluation will be performed to document the acceptability of the minimum ice weight requirement in accordance with plant procedures, which includes the performance of a 10CFR50.59 safety evaluation. These evaluations will be completed prior to Mode 4.

If you have any questions, please contact Mr. Robert C. Godley, Director, Regulatory Affairs, at 616/465-5901, extension 2698.

Sincerely,

M. W. Rencheck
Vice President – Nuclear Engineering

/mbd
Attachment

c: J. E. Dyer, Region III
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IE02

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

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

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TITLE (4)

Stress Loads for the Ice Condenser Basket Assembly Greater Than Allowed by Safety Analysis Report

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
									D.C. Cook Plant Unit 2	05000-316
09	02	1999	2000	001	00	02	21	2000	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	defuel	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
POWER LEVEL (10)	n/a		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
			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 in 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)
M.B. Depuydt, Regulatory Compliance	(616) 465-5901 X1589

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 September 2, 1999, during re-evaluation of the structural design analyses for the ice condenser ice baskets, Westinghouse determined that the vertical dynamic load factor of 1.0 used in the original design analyses for the ice baskets was non-conservative. Specifically, the analyses did not consider dynamic load forces that could be imparted on the slotted clevis bracket configuration during a Design Basis Accident (DBA) and Design Basis Earthquake (DBE) event. Upon completion of the evaluation of this condition for other ice condenser plants, Westinghouse issued a Nuclear Safety Advisory Letter (NSAL) on January 17, 2000, regarding the clevis bracket gap effects. Subsequent review of the NSAL by Donald C. Cook Nuclear Plant determined this condition to be reportable to the NRC on January 24, 2000. As previously reported in LERs 315/98-007 and 015, individual occurrences of gross ice basket weights of less than 800 pounds had been found in both Unit 1 and Unit 2. Because these ice baskets were resident in the ice condenser during periods when the Units were operating, this LER is being submitted in accordance with 10CFR50.73(a)(2)(ii)(B) for a condition outside the design basis of the plant.

The apparent cause is lack of design documentation control by Westinghouse during the initial design of the ice condenser system and components. A non-conforming condition evaluation will be performed to document the acceptability of the change in the design requirements in accordance with plant procedures. No physical hardware changes are required as a result of this condition because the Technical Specification minimum ice weight per basket is greater than the minimum ice weight required by the Westinghouse analysis.

The potential safety significance of this condition is bounded by the analysis described in LER 315/98-006-02. The reanalysis performed by Westinghouse concluded that the ice condenser structure would prevent any basket from exiting the ice condenser. Therefore, the load effect on the slotted ice basket bottom brackets has minimal safety significance.

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

Conditions Prior To Event

Unit 1 Defueled

Unit 2 Defueled

Description Of The Event

On September 2, 1999, during re-evaluation of the structural design analyses for the ice condenser ice baskets [EIIS:BC-BSKT], Westinghouse determined that the vertical dynamic load factor (DLF) of 1.0 used in the original design analyses for the ice baskets was non-conservative. Specifically, the analyses did not consider the combined dynamic load forces that could be imparted on the clevis bracket configuration during a Design Basis Accident (DBA) and Design Basis Earthquake (DBE) event. The clevis bracket, which attaches the ice basket bottom assembly to its lower support structure, has an elongated hole, or slot, that aids attachment of the bracket to the support bar of the lower support structure. When the bracket is installed, a clevis pin is inserted into the slot and positioned approximately in the center of the slot. With the pin in this position, a nominal 0.214-inch gap exists between the bottom of the clevis pin and the bottom of the slot. During a DBA, flow through the ice condenser could lift the basket upward, causing the bottom of the slot to impact the pin and rebound.

Upon completion of the evaluation of this condition for other ice condenser plants, Westinghouse issued a Nuclear Safety Advisory Letter (NSAL) on January 17, 2000, regarding the clevis bracket gap effects. The NSAL established new design loads and load combinations, which include the effects of the 0.214-inch vertical travel of the slot bottom. In addition, a minimum ice weight was established as a structural design limit. The analysis concluded that any in-service basket which had a gross weight (weight of the basket plus weight of the ice) of less than 1381 pounds would be overstressed if subjected to the loads resulting from a combined DBA and DBE, as stated in the Donald C. Cook (CNP) Safety Analysis Report. Upon subsequent review of the NSAL by CNP, on January 24, 2000, this condition was determined to be reportable to the NRC. As previously reported in LER 315/98-007-00 and LER 315/98-015-00, individual occurrences of gross ice basket weights of less than 800 pounds (gross weight) had been found in both Unit 1 and Unit 2. Because these ice baskets were resident in the ice condensers during periods when the Units were operating, this condition resulted in the plant being outside its design basis. Therefore, this LER is submitted in accordance with 10CFR50.73(a)(2)(ii)(B) for a condition outside the design basis of the plant.

Cause Of The Event

The apparent cause is lack of design documentation control by Westinghouse during the initial design of the ice condenser system and components. The initial conceptual design for the clevis brackets included a round hole for the bottom bracket attachment pin. This design used a vertical DLF of 1.0, which is consistent with a configuration that does not permit vertical basket movement. During the final design process, the bracket design was changed from a round hole to a slotted configuration to accommodate assembly tolerances in the lower ice condenser support structure. However, the vertical DLF was not changed to account for the effects of potential upward travel of the ice baskets when subjected to DBA loads.

Analysis of Event

The primary function of the safety-related ice condenser system is the absorption of thermal energy released abruptly in the event of a Loss of Coolant Accident (LOCA) or Main Steam Line Break (MSLB) inside containment, to limit the initial peak containment pressure. The system consists of a completely enclosed annular compartment covering an arc of approximately 300 degrees of the perimeter of the containment. The annular compartment consists of 24 bays containing 81 cylindrical ice baskets per bay, 1,944 baskets total, positioned in a vertical array of columns. Each ice basket is approximately 12 inches in diameter and 48 feet long, filled vertically with borated ice.

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

The design function of the ice baskets is to contain the borated ice and to provide a means to absorb the thermal energy resulting from a LOCA or MSLB in the containment structure [EIIS: NH]. The baskets are arranged to promote heat transfer from the steam to the ice during and following these accident scenarios. The ice baskets also function to provide structural support for the ice and to maintain its geometry for heat transfer during and following worst case loading conditions, since ice condenser performance is dependent upon the quality and distribution of the ice mass within the baskets. The total ice mass provides sufficient heat removal capability to condense the steam released during a LOCA or a MSLB event. The ice condenser plays no role in the normal operation of the plant.

To perform their design basis function, the ice baskets are required to withstand design loads and are restrained to ensure they do not eject upward out of the ice bed during DBA blowdown forces. Upward movement of the baskets has the potential to open bypass flow routes, impact and damage other ice condenser equipment, or cause basket ejection out of the ice condenser, thus becoming a missile inside containment. Basket restraint is achieved by a bracket bolted to the ice basket bottom assembly. The bracket attaches the ice basket to the structural steel grid of the lower support structure.

The increased design loads resulting from the Westinghouse reanalysis of the dynamic considerations resulted in a decrease in the amount of margin in the structural design of the ice basket. Stresses were identified to increase as the total ice basket weight decreased so that a limiting minimum total ice basket weight of 1381 pounds is required for an ice basket to be structurally qualified as designed.

Specific potential failure scenarios for a basket column with a total weight less than the recommended minimum were not examined by Westinghouse. However, if such a failure scenario were to occur, it would likely initiate with failure of the basket material in the mid-span region of a 48-foot long basket column or failure of the end-welds on the holddown bar of the basket bottom assembly. These two potential failure areas are at locations of higher internal stresses within the basket structure versus the yield strength of the individual basket components. These potential failures could result in an ice basket or portion of a basket being ejected out of the ice bed. The postulated ejecting ice basket could travel upward striking the intermediate deck structure, or pass through the intermediate deck doors, potentially striking air handling units or the top deck structure. The displaced basket(s) could also result in the ice bed geometry being in an unanalyzed configuration due to changes in the heat transfer characteristics of the ice condenser.

Based on existing margins in the ice condenser design and prior evaluations performed to determine the adequacy of ice basket sheet metal screws, if an ejection were to occur, the resultant configuration would not prevent the ice condenser from performing its intended design function. The prior evaluations included testing of full ice basket coupling sections to failure; examination of net design basis LOCA uplift tensile forces acting on the ice basket column as a function of time; and determination of a minimum number of sheet metal screws to prevent the basket column or any basket connection from separating under LOCA conditions.

Although it is considered improbable that an ice basket would separate and be ejected from the ice bed, a previous analysis by Westinghouse concluded that the ice condenser structure would prevent any basket column or basket from exiting the ice condenser. The results of this analysis were reported in LER 315/98-006-02, which identified a potential condition where up to 60 unpinned ice baskets could potentially be ejected. This analysis is also the bounding analysis for ice basket damage and deficiencies, such as insufficient number of sheet metal screws at the coupling connections, torn/missing ligaments, dents and folds, as well as damaged or defective bottom assembly welds. As such, the potential effects of increased loads on the clevis bracket assembly are also bounded by this analysis.

In conclusion, based on this analysis, the potential effects of increased loads on the ice basket clevis bracket assembly would not prevent the ice condenser from performing its design function even with ice basket weights as low as those found and reported in LER 315/98-007-00 and LER 315/98-015-00. Therefore, this condition has minimal safety significance.

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Corrective Actions

No physical hardware changes are required as a result of this condition because the Technical Specification (TS) 3.6.5.1 minimum ice weight per basket is greater than the minimum ice weight required by the Westinghouse analysis. The ice baskets are in the process of being reloaded to an ice weight in accordance with the requirements of TS 3.6.5.1.

CNP has reviewed and accepted Westinghouse calculation CN-EMT-99-186, Rev.1, "D.C. Cook Ice Condenser Ice Basket Design." The purpose of this calculation was to compile and update the contents of the documents that constitute the design basis and structural qualification of the Unit 1 and Unit 2 ice baskets.

An evaluation will be performed to document the acceptability of the minimum ice weight requirement in accordance with plant procedures, which includes the performance of a 10CFR50.59 safety evaluation. These evaluations will be completed prior to Mode 4.

As part of the Restart effort, system and programmatic assessments were performed during the Expanded System Readiness Reviews to reestablish and document the plant's design and licensing basis. In CNP's response to AEP:NRC:1260GH, "Enforcement Actions 98-150, 98-151, 98-152 and 98-186 Reply to Notice Of Violation October 13, 1998," dated March 19, 1999, which identified programmatic weaknesses in the plant design and licensing basis, the Engineering Leadership Plan established a new design control process and a configuration management program to control plant design changes. This included the implementation of a design verification process, design document control and an owner's acceptance review process for vendor technical documentation.

Similar Events

LER 315/98-032-00