Indiana Michigan
Power Company
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AEP
INDIANA MICHIGAN POWER

May 24, 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 315/99-006-01, "Fuel Crane Loads Lifted Over the Spent Fuel Pool Could Impart Impact Energies Greater Than Technical Specification Limits"

The following commitments were identified in this submittal:

- A calculation will be performed to determine the design basis maximum permissible impact energy, taking into account the effects of buoyancy, that can be imparted on the Holtec spent fuel racks due to a dropped fuel assembly. Upon completion of the calculation, CNP will submit a TS amendment request to the NRC to revise the TS 3.9.7 impact energy limit.
- An Engineering procedure will be developed to ensure that the design change process will be implemented when mechanical changes are made to the fuel assemblies, including fuel assembly weights, during core reload design activities. This will ensure that a dropped combined fuel assembly plus RCCA over the spent fuel racks could not impart impact energies greater than the TS limit. This action will be completed by August 31, 2000.

This condition was originally determined to be reportable on February 23, 1999. Due to questions raised regarding the reportability of this event, the interim LER was not submitted to the NRC until April 16, 1999, to allow for resolution of these questions. At that time, it was recognized that the submittal of the interim LER exceeded the 30-day requirement of 10 CFR 50.73. A Condition Report was written and corrective actions have been taken to prevent recurrence.

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

Sincerely,

M. W. Rencheck
Vice President – Nuclear Engineering

RGN-001

IE22

/bwo

Attachment

c: J. E. Dyer, Region III
R. C. Godley
D. Hahn
W. J. Kropp
R. P. Powers
R. Whale
Records Center, INPO
NRC Resident Inspector

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

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TITLE (4)

Fuel Crane Loads Lifted Over Spent Fuel Pool Could Impart Impact Energies Greater Than Technical Specification Limits

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
01	15	1999	1999	--	006	--	01	05	24	2000	D.C. Cook, Unit 2	05000-316
											FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)					
POWER LEVEL (10)	00	20.2201 (b)	20.2203(a)(2)(v)	X	50.73(a)(2)(i)	50.73(a)(2)(viii)	
		20.2203(a)(1)	20.2203(a)(3)(i)		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)
Ms. Brenda W. O'Rourke, Compliance Engineer	(616) 465-5901, x2604

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 January 15, 1999, a discrepancy was identified between the Unit 1 and 2 Technical Specification (TS) 3.9.7 impact energy limit of 24,240 inch-pounds (in-lbs) and TS 4.9.2 surveillance procedure, which permits fuel assemblies to be lifted 15 inches above the spent fuel pool racks. On February 23, 1999, a review of fuel assembly and Rod Cluster Control Assembly (RCCA) weights identified that a combined dry fuel assembly and RCCA weight of 1619 lbs had been lifted over the spent fuel racks. Based on this weight and a lift height of 15 inches, a calculated impact energy of 24,285 in-lbs could be imparted on the fuel racks in the event the fuel crane dropped its load. This resultant impact energy is greater than the TS limit of 24,240 in-lbs. On February 23, 1999, per 10CFR 50.73(a)(2)(i)(B), this condition was determined to be reportable for a condition prohibited by plant TS and an interim LER was submitted on April 16, 1999.

The root cause is an inadequate TS surveillance program. A contributing cause is inadequate design change process. On March 17, 1999, a maximum fuel weight limit was imposed on all future fuel shipments to ensure combined fuel assembly plus RCCA weights would not exceed the design limit of 1616 lbs. In addition, a calculation was performed which determined the maximum height which Unit 1 and 2 fuel assemblies currently resident in the cores and spent fuel pool, could be lifted without exceeding the TS impact energy limit of 24,240 in-lbs. This limit has been incorporated into the appropriate TS surveillance procedures. A procedure is being developed to ensure that the design change process will be implemented when mechanical changes are made to the fuel assemblies, including fuel assembly weights, during core reload design activities. A calculation will be performed to determine the design basis impact energy limit for the Holtec racks. Upon completion of the calculation, a TS Amendment request will be submitted to the NRC.

Based on recent impact energy calculations which take into consideration the effects of buoyancy of the fuel and the resultant Holtec analysis impact energy value of 55,800 in-lbs, this condition has no safety significance.

Conditions Prior to Event

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

Description of Event

On January 15, 1999, Operations identified a discrepancy between the Unit 1 and 2 Technical Specification (TS) 3.9.7 impact energy limit of 24,240 inch-pounds (in-lbs) and procedure 12 OHP 4030.STP.046, "New and Spent Fuel Crane Operability Verification and Functional Tests," which permits spent fuel assemblies to be lifted to a height of 15 inches above the spent fuel pool racks. On February 23, 1999, a review of fuel assembly and Rod Cluster Control Assembly (RCCA) weights identified that a combined fuel assembly and RCCA weight of 1619 lbs had been lifted over the spent fuel racks. Based on this weight, in the event the fuel crane dropped its load from a maximum height of 15 inches, a calculated impact energy of 24,285 in-lbs (1619 lbs x 15 in) could be imparted to the top of the spent fuel pool racks. This resultant impact energy is greater than the TS limit of 24,240 in-lbs. As such, on February 23, 1999, in accordance with 10 CFR 50.73(a)(2)(i)(B), this condition was determined to be reportable for a condition prohibited by plant TS and an interim LER was submitted on April 16, 1999. This supplement replaces the original LER in its entirety.

Investigation identified that the impact energy limit of 24,240 in-lbs was incorporated into the TS in 1979 when the original Westinghouse spent fuel pool racks were replaced with Exxon racks. No previous TS impact energy limit existed for the Westinghouse spent fuel racks. This TS limit was based on the safety evaluation for the Exxon racks which determined that an impact energy limit 24,240 in-lbs could be imparted to the top of the fuel racks without damage to the active fuel region of the fuel assembly. This limit was based on a maximum fuel assembly dry weight of 1467 lbs, and a maximum RCCA dry weight of 149 lbs, for a combined maximum design weight of 1616 lbs. To meet this limit, the maximum lift height of any fuel assembly plus RCCA over the spent fuel racks was limited to a height of 15 inches (24,240 in-lbs/1616 lbs=15 in).

A review of Unit 1 and Unit 2 fuel assembly and RCCA weights from 1979 to present identified that fuel assembly and RCCA weights greater than 1616 lbs had been resident in the spent fuel pool due to new fuel designs. Results of this review identified the heaviest combined dry fuel assembly plus RCCA weight was 1678 lbs, which occurred during Unit 1 refueling cycles 15 and 16. This could have resulted in a calculated impact energy of 25,170 in-lbs. Additional instances were also identified where impact energies greater than allowed by TS could have occurred.

Cause of Event

The root cause of the identified condition is an inadequate TS surveillance program. From 1979 to 1984, no TS surveillance procedure existed which ensured that the TS impact energy limit of 24,240 in-lbs was not exceeded in the event the fuel crane dropped its load over the spent fuel racks. In 1984, procedure 12 MHP 4050.FDF.043, "New and Spent Fuel Crane Hoist Height Interlock Operability Verification," was implemented to satisfy the TS 4.9.7.2 requirement to verify the potential impact energy for each fuel crane load being lifted over the spent fuel racks. However, the procedure was inadequate because it did not require the fuel assembly plus RCCA weight to be verified prior to lifting the load over the spent fuel pool racks. The procedure was cancelled in 1990 and replaced with OHP 4030.STP.046 to satisfy TS 4.9.7.2 requirements. While this procedure required recording of the weight of the fuel assembly plus RCCA, it did not require calculation of the potential impact energy.

A contributing cause is an inadequate design change process. In 1993, the Exxon racks were replaced with higher-density spent fuel storage racks manufactured by Holtec. These racks were analyzed to withstand impact energies of up to 55,800

in-lbs. However, at the time the design modification to install the Holtec racks was performed, the TS and related design basis documentation were not revised to reflect the new impact energy limit of 55,800 in-lbs.

Also, the lack of verification of the weight of the fuel and RCCA received from the fuel vendor contributed to heavier than expected fuel crane loads being lifted over the spent fuel pool.

Analysis of Event

UFSAR Section 9.7 states that the Fuel Handling System provides a safe and effective means of transporting and handling fuel from the time it is loaded into the reactor core until the irradiated fuel is moved to the spent fuel pool storage racks. Each unit has its own fuel handling equipment within its containment and an independent fuel transfer mechanism.

The high-density spent fuel storage racks are designed to provide storage locations for up to 3613 fuel assemblies. They are designed to maintain the stored fuel in a safe, coolable, and subcritical configuration during normal discharge, full core offload storage, and postulated accident conditions. Borated water in the spent fuel pool also ensures that the stored fuel remains in a subcritical condition.

The safety evaluation performed for the Exxon racks, which were installed in 1979, used dry fuel assembly weights when determining the potential impact energy that could be imparted to the top of the spent fuel racks if a fuel assembly plus RCCA weight of 1616 lbs dropped from a height of 15 inches. This resulted in a design impact energy limit of 24,240 in-lbs. This 15-inch limit would result in local crushing of the first 2.5 inches of the fuel rack, which is well above the active fuel region of the fuel assembly.

A dropped fuel assembly accident was also analyzed for the Holtec racks, which were installed in 1993. The analysis used a dry fuel assembly weight plus RCCA weight of 1550 lbs, dropped from a height of 36 inches above the spent fuel racks. This was a more severe condition than postulated for the Exxon racks. The resultant impact energy was determined to be 55,800 in-lbs, which is significantly greater than the TS limit of 24,240 in-lbs. Results of the analysis showed that local deformation of the first 5.34 inches of the fuel racks would occur, but would be confined to a region above the active fuel area.

To support Unit 1 and 2 fuel core off-load in July 1999, calculation SD-990708-001, "Drop Heights for Unit 1 and 2 Fuel Assemblies," was performed to determine the maximum height at which the fuel assemblies, currently resident in the cores and spent fuel pool, could be lifted without exceeding the TS impact energy limit of 24,240 in-lbs. These heights, which are based on dry fuel assembly plus RCCA weights, were determined to be 14.4 inches for Unit 1, and 14.9 inches for Unit 2.

In August 1999, calculation DC-D-3053S-488, "Investigate Impact Energy From a Dropped Fuel Assembly in the Spent Fuel Pool," was performed to determine the potential impact energy of the heaviest fuel assembly plus RCCA dropped from a height of 15 inches above the spent fuel racks, taking into account the effects of buoyancy. This method had previously been approved in NRC Safety Evaluation Report, "Auxiliary Building Crane Travel Load Block Drop Analysis," where the consequences of dropping a 4.25-ton fuel crane hook/block assembly into the spent fuel pool were analyzed. Based on the August 1999 calculation, which used a conservative buoyancy factor of 0.9 provided by Westinghouse, the resultant impact energy was 22,653 in-lbs. This value is less than the TS limit of 24,240 in-lbs.

While fuel assembly plus RCCA weights greater than the design weight limit of 1616 lbs are resident in the spent fuel racks, based on the consideration of buoyancy in determining calculated impact energies for the previous Exxon racks and the Holtec dropped fuel assembly analysis resultant impact energy of 55,800 in-lbs, this condition has no safety significance.

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

Corrective Actions

On March 17, 1999, CNP placed a limit on the maximum weight of each fuel assembly shipped from the fuel vendor. The weight limit for Unit 1 and Unit 2 is 1450 lbs and 1467 lbs, respectively. These fuel weights, when combined with the weight of each RCCA, do not exceed the design limit of 1616 lbs. This will ensure that no fuel crane loads will be lifted over the spent fuel pool which could result in impact energies greater than allowed by TS.

Calculation DC-D-3053S-488 was performed to determine the impact energy of a dropped fuel assembly, taking into account the effects of buoyancy. The calculation determined that the maximum impact energy that could be imparted to the top of the spent fuel racks resulting from dropping the heaviest fuel assembly plus RCCA weight of 1678 lbs was less than the TS limit of 24,240 in-lbs.

Procedure 12 OHP 4030.STP.046 has been revised to incorporate a maximum lift height of 14 inches based on the results of Calculation SD-990708-001. Given the maximum dry fuel assembly plus RCCA weight of 1678 lbs, the 14-inch height ensures that in the event a fuel assembly is dropped while being moved over the spent fuel pool racks, the potential impact energy will not exceed the TS 3.9.7 limit of 24,240 in-lbs.

A calculation will be performed to determine the design basis maximum permissible impact energy, taking into account the effects of buoyancy, that can be imparted on the Holtec spent fuel racks due to a dropped fuel assembly. Upon completion of the calculation, CNP will submit a TS amendment request to the NRC to revise the TS 3.9.7 impact energy limit.

An Engineering procedure will be developed to ensure that the design change process will be implemented when mechanical changes are made to the fuel assemblies, including fuel assembly weights, during core reload design activities. This will ensure that a dropped combined fuel assembly plus RCCA over the spent fuel racks could not impart impact energies greater than the TS limit. This action will be completed by August 31, 2000.

As previously stated in correspondence AEP:NRC:1260GH, dated March 19, 1999, "Enforcement Actions 98-150, 98-151, 98-152 and 98-186, Reply to Notice of Violation Dated October 13, 1998," a comprehensive review of the adequacy of TS surveillance test procedures was committed to be performed. The review, which is being tracked as Restart Action Plan #001, "Programmatic Breakdown in Surveillance Testing," has been completed. On March 31, 2000, the NRC completed their evaluation of the adequacy of the corrective actions taken and planned, and has recommended closure of this action to the NRC 0350 Restart Panel.

Previous Similar Events

None