Indiana Michigan
Power Company
Cook Nuclear Plant
One Cook Place
Bridgman, MI 49106
616-465-5901

INDIANA
MICHIGAN
POWER

October 10, 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 315/98-034-01, "Flow Rates to Containment Spray Headers Lower Than Design Basis Values."

There were no commitments identified in this submittal.

Should you have any questions regarding this correspondence, please contact Mr. Wayne J. Kropp, Director Regulatory Affairs, at 616/697-5056.

Sincerely,

Joseph E. Pollock
Plant Manager

/bwo
Attachment

c: J. E. Dyer, Region III
D. Hahn
B. A. McIntyre
T. P. Noonan
A. C. Bakken III
R. P. Powers
R. Whale
NRC Resident Inspector
Records Center, INPO

IE22

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)
Donald C. Cook Nuclear Plant Unit 1	05000-315	1 of 4

TITLE (4)

Flow Rates to Containment Spray Headers Lower Than Design Basis Values

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 Unit 2	05000-316
06	23	1998	1998	--	034	--	01	10	10	2000	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)							
			20.2201 (b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)	0%		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)
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 June 23, 1998, the results of a computerized re-analysis of Containment Spray (CTS) System performance yielded minimum CTS flow rates less than those assumed in the accident analysis of record. The re-analysis, which was based on a detailed model of the CTS system using as-built system piping parameters, predicted worst-case flow rates of 1786 gallons per minute (gpm) for the upper East, and 1793 gpm for the upper West spray headers. These flow rates were lower than the design basis upper spray flow rate of 2136 gpm that was previously calculated to support the 1994 Donald C. Cook steam generator tube plugging containment analysis. As a result, on June 23, 1998, an ENS notification was made at 1530 hours for the plant being in an unanalyzed condition. On July 21, 1998, LER 315/98-034-00 was submitted to the NRC in accordance with 10 CFR 50.73. This LER supplement is being submitted based on completion of the root cause evaluation, and replaces LER 315/98-034-00 in its entirety.

The cause for the identified condition was an inadequate design calculation process combined with a lack of a questioning attitude by those personnel involved in performing earlier CTS system performance calculations. At the time this condition was identified, additional conditions existed that would have affected Emergency Core Cooling System, ice condenser and containment performance during an accident. Analysis of the combined effects of these conditions concluded that there was no challenge to the integrity of the containment pressure boundary during an accident or the ability of the CTS system to perform its design basis accident function. Therefore, this condition had minimal safety significance. In September 1999, a calculation was performed to establish the bounding CTS minimum and maximum design basis flow rates. No revision to the current accident analysis is required because the new flow rates are bounded by the current analysis. As part of the Unit 2 Restart effort, programmatic weaknesses in control of plant design and licensing bases, and the training and qualification of plant personnel were identified. Engineering Leadership Plans were implemented which established a new design control process and training for personnel performing engineering activities.

FACILITY NAME (1)	DOCKET NUMBER(2)	LER NUMBER (6)					PAGE (3)
		YEAR	SEQUENTIAL NUMBER			REVISION NUMBER	
Donald C. Cook Nuclear Plant Unit 1	05000-315	1998	--	034	--	01	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 June 23, 1998, the results of a re-analysis of Containment Spray (CTS) System performance yielded minimum CTS flows less than those assumed in the containment integrity accident analysis of record. The re-analysis, which was based on a detailed computer model of the CTS system using as-built system piping parameters, predicted worst-case flow rates of 1786 gallons per minute (gpm) for the upper East spray header, and 1793 gpm for the upper West spray header. These flow rates were lower than the design basis upper spray flow rate of 2136 gpm that was previously determined by the calculation performed to support the 1994 Donald C. Cook (CNP) steam generator tube plugging containment analysis. As a result, on June 23, 1998, an ENS notification was made at 1530 hours in accordance with 10 CFR 50.72(b)(2)(i) for the plant being in an unanalyzed condition. On July 21, 1998, LER 315/98-034-00 was submitted to the NRC in accordance with 10 CFR 50.73. This LER supplement is being submitted based on completion of the root cause evaluation, and replaces LER 315/98-034-00 in its entirety.

An investigation of the difference between the computer model flow rates and the CTS flow rates calculated in 1994 identified that non-conservative input assumptions had been used in the previous design basis calculations. The original 1973 calculation for CTS system performance used a simple model of the distribution header based upon elevation and head loss of the nozzles. Flow losses were not modeled for the distribution header piping because the head losses were assumed to be negligible. Due to concerns identified during the 1992 CTS Safety System Functional Inspection, another calculation was performed. This calculation took into account the flow-dependent pressure drops associated with the CTS spray nozzles and the static head of the Refueling Water Storage Tank (RWST). However, like the 1973 calculation, head losses downstream of the CTS distribution headers were not considered. A review of the 1994 calculation identified that, while more detailed modeling of the CTS system configuration was used to better determine header piping losses, the impact of the flow restrictors installed in the CTS piping system was not considered.

As a result of the use of non-conservative calculation input assumptions and simplified modeling techniques in previous calculations to determine CTS system performance, the minimum CTS flow rate determined by the re-analysis was less than the minimum flow rate previously used in the accident analyses.

Cause of Event
The cause for the identified condition was an inadequate design calculation process. At the time the original CTS system performance calculation was prepared, no calculation procedure existed to provide guidance on the preparation, review and approval of calculations. Initial calculation procedures focused more on calculation numbering and handling of records, versus the quality attributes of the calculation being performed, such as the need to document the basis for input assumptions used.

An additional cause was the lack of a questioning attitude by plant personnel regarding calculation methods and input assumptions. The CTS piping and distribution header were not modeled as a system resistance because of simplified assumptions made in the original calculation that the head losses were negligible. The basis for this assumption was never adequately supported or questioned by plant personnel, and was used as the basis for not modeling other portions of the CTS distribution system.

Analysis of Event
Updated Final Safety Analysis Report (UFSAR) Section 6.3 states that the purpose of the Containment Spray System is to spray cool water into the containment atmosphere to prevent containment pressure from exceeding its design value of 12 pounds per square inch (psig), and to remove radioactive iodine from the containment atmosphere in the event of a Loss of

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

Coolant Accident (LOCA). Each Unit's CTS system consists of two redundant trains. Each train consists of one CTS pump and one set of spray headers in each of the lower and upper containments. In addition, for each train, there is a set of spray headers in the upper containment that can be supplied by the pump from the corresponding Residual Heat Removal (RHR) train. The RHR spray headers can be used to supplement the CTS system during the recirculation phase of a LOCA.

At the time the non-conservative input assumptions used in CTS system calculations were identified, additional conditions existed that would have affected Emergency Core Cooling System, ice condenser, and containment performance during an accident (Reference: LER 315/97-011-02, "Operation Outside Design Bases for ECCS and Containment Spray Pumps for Switchover to Recirculation Sump Suction," LER 315/98-015-01, "Ice Weight Requirements Potentially Not Met Due to Non-conservative Assumption in Software Program," and LER 315/98-027-01, "Debris Found in Containment Spray and Residual Heat Removal System Spray Headers"). In March 1999, an analysis was performed using the licensing basis design basis accident (DBA) computer code to evaluate the impact these combined conditions had on containment pressure and control room habitability. For the worst case postulated DBA scenario, several conservative input assumptions were removed to account for as-found plant conditions, such as CTS and RHR system spray blockage, a reduction in RWST vent capacity due to potential blockage from the RWST overflow piping drip catch, and the maldistribution of ice in the ice condenser baskets.

Results of the analysis indicated peak containment pressure would be 13.85 psig, which is above the current design basis of 12 psig but below its ultimate pressure capability of 36 psig. While 13.85 psig is above the licensing and technical specification basis of 12 psig, it is less than the 16.1 psig pre-operation containment integrity test to which both units were subjected. Therefore, analysis concluded that the containment would have remained functional even if potentially subjected to pressures as high as 13.85 psig (Reference: LER 315/98-014-03, "Response to High-High Containment Pressure").

With respect to dose consequences, the March 1999 analysis concluded that these combined effects would not have resulted in a significant increase in radiological consequences to control room personnel or the public. The analysis determined that the combined effects would have resulted in a net three percent reduction in lower containment spray flow rate. Because the removal of airborne radioactive iodine is proportional to containment spray flow rate, a three percent reduction in spray flow would result in a three percent increase in radioactive releases. In the calculation of dose consequence, credit is taken for normal CTS spray only. No credit is taken for supplemental RHR spray to upper containment. With no other changes in the analysis, this increase in the amount of radioactive release is projected to result in a three-percent increase in offsite and control room thyroid doses. With a three-percent increase in dose, for a given unfiltered air inflow rate, there would be a reduction in the amount of filtered air inflow rate. This reduction in filtered inflow is considered inconsequential with regard to consequences to whole body dose. These results conclude that offsite and control room personnel doses would remain below the limits set forth in 10 CFR Part 100 and 10 CFR Appendix A General Design Criterion (GDC) 19.

In conclusion, there was no challenge to the integrity of the containment pressure boundary due to the potential increase in containment pressure during an accident. While these combined effects potentially resulted in a three percent reduction in spray flow from the Unit 1 and 2 CTS spray headers, they did not impact the ability of the system to perform its design basis accident function, and the radiological consequences would have remained within 10 CFR Part 100 and GDC 19 limits. Therefore, this condition had minimal safety significance.

Corrective Actions

A new calculation was performed in September 1999 to establish the new bounding CTS minimum and maximum design basis flow rates. CNP's UFSAR Chapter 14 accident analysis does not require revision because the new design basis flow rates determined by the September 1999 calculation were bounded by the current analysis.

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

As part of the Unit 2 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 March 19, 1999, response to NRC letter, "Enforcement Actions 98-150, 98-151, 98-152 and 98-186 Reply to Notice Of Violation October 13, 1998," which identified programmatic weaknesses in the plant design and licensing basis, and the training and qualification of plant personnel, CNP established an Engineering Leadership Plan to develop new design control processes that encompassed design input and verification, calculations, design document control and vendor technical information. A Training Leadership Plan was established to reinforce a "nuclear safety culture" for site personnel. This training included human error reduction and conservative decision making during the performance of engineering activities. These plans in combination will help to preclude similar events from occurring in the future.

An extent of condition evaluation was performed to determine the adequacy of other analytical system models that provide input assumptions to the UFSAR Chapter 14 accident analysis. The review concluded that most input values used in the accident analysis were readily and conservatively determined and were not based on analytical models. For those remaining input values, conservative modeling had been established or a specific evaluation was performed to validate the basis for the conservative input assumptions.

Previous Similar Events
None