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February 1, 2001

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 315/98-027-02: "Debris Found in Containment Spray and Residual Heat Removal System Spay Headers"

The following commitment has been deleted from the subject submittal due to the Containment Spray System (CTS) no longer being vulnerable to boric acid plate out in the CTS ring headers.

- Engineering is developing an inspection program for those areas of the Unit 1 and 2 CTS/RHR spray header piping likely to collect borated water and/or boric acid plateout. Inspections will be performed during the next two refueling outages, and after two consecutive inspections where the CTS and RHR piping are found clean, the frequency of inspection will be extended to once every five years. Program development will be completed by February 1, 2001

Should you have any questions regarding this correspondence, please contact Mr. Ronald W. Gaston, Manager, Regulatory Affairs, at 616/465-5901, extension 1366.

Sincerely,

Joseph E. Pollock

Joseph E. Pollock
Plant Manager

/jlm
Attachment

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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)

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TITLE (4)

Debris Found in Containment Spray and Residual Heat Removal System Spray Headers

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 Plant Unit 2	DOCKET NUMBER: 05000-316
05	05	1998	98	027	02	02	01	2001	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9): 5

POWER LEVEL (10): 00

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)
	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)
Johnny L. Mathis, Regulatory Compliance	(616) 465-5901 X1578

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 May 5, 1998, an inspection of the Unit 1 lower West Containment Spray (CTS) header and piping was conducted to determine if boric acid plate out was present, due to concerns identified during a 1998 CTS system inspection. At that time, the visual inspection identified no boric acid plate out; however, a quantity of debris was found inside the header. Inspections were also performed for the Unit 1 upper West CTS header, the upper and lower East CTS headers, the upper East and West Residual Heat Removal (RHR) spray headers and nozzles, and low points in the system piping. Inspection results identified varying amounts of construction-related debris and boric acid deposits in the Unit 1 CTS and RHR spray headers and nozzles. The debris was assumed to have existed while Unit 1 was in operation, and could have potentially resulted in the CTS and RHR system not being unable to perform their design function. On August 7, 1998, limited inspections of the Unit 2 CTS and RHR spray headers and nozzles also identified varying amounts of construction-related debris. On March 1, 2000, LER 315/98-027-01 was submitted to the NRC based on the completion of the root cause investigation. This supplement is being submitted to the NRC to provide additional information regarding corrective actions.

The cause for the construction-related debris is inadequate cleanliness inspections performed during initial plant construction. The most probable cause for the boric acid deposits/blockage in the Unit 1 East RHR spray piping is inadequate inspection of RHR system piping after a 1979 inadvertent spray actuation. Inspection and cleaning of the Unit 1 and 2 CTS and RHR piping and spray headers was completed on November 20, 1998, and January 10, 2000, respectively.

While the debris present in the Unit 1 and 2 CTS and RHR spray headers would have potentially resulted in a slight reduction in spray flow, it would not have challenged containment integrity during an accident. Likewise, radiological consequences would have remained within 10CFR Part 100 guidelines. Therefore, this condition was determined to be of minimal safety significance.

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Conditions Prior To Event

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

Description Of The Event

On May 5, 1998, an inspection of the Unit 1 lower West Containment Spray (CTS) header and associated piping was conducted to determine if boric acid plate out was present. This inspection was performed as a result of concerns identified during the 1998 CTS Safety System Functional Inspection (SSFI) which identified leakage from the lower CTS spray header nozzles. At that time, the visual inspection identified no boric acid plate out; however, a quantity of debris was found in the header. The identification of the debris resulted in an ENS notification at 1545 hours EDT the same day. The notification was made in accordance with 10CFR50.72(b)(2)(i), for any event found while the reactor is shutdown, that, had it been found while the reactor was in operation, would have resulted in the nuclear plant, including its principle safety barriers, being in an unanalyzed condition. On June 2, 1998, an interim LER was submitted in accordance with 10CFR50.73(a)(2)(ii), for a condition that resulted in the plant being outside its design basis. On March 1, 2000, LER 315/98-027-01 was submitted to the NRC based on the completion of the root cause investigation. This supplement is being submitted to the NRC to provide additional information regarding corrective actions.

Based on the identification of debris in the Unit 1 lower West CTS header, boroscope inspections were completed on July 16, 1998, for the Unit 1 upper West CTS header, the upper and lower East CTS headers, the upper East and West Residual Heat Removal (RHR) system spray headers and nozzles, and at low points in the system piping likely to collect debris. Results of the inspection identified varying amounts of construction-related debris in both the CTS and RHR spray headers and nozzles. Minimal boric acid deposits were identified in the upper East and West CTS, and the upper West RHR spray headers and nozzles, while moderate to heavy boric acid deposits/blockage was identified in the upper East RHR system spray piping. The construction-related and boric acid debris was assumed to have existed while Unit 1 was in operation, and could have potentially resulted in the Unit 1 CTS and RHR system not being unable to perform their design function.

On August 8, 1998, limited visual inspections of the Unit 2 upper East and West CTS spray headers were performed that identified minor construction-related debris in both spray header piping and nozzles, which was assumed to have existed while Unit 2 was in operation. Based on the results of the limited inspections, the Unit 2 CTS and RHR system spray headers, nozzles and piping were flushed on January 10, 2000. The debris collected from the flush of the lower CTS spray header and nozzles and the RHR spray header was minimal. Post-flush boroscope inspections of the upper CTS and RHR spray headers and nozzles identified minor construction-related debris remaining, while post-flush inspections of the lower spray header and nozzles identified lesser amounts of debris remaining in the system. Based on the amount of debris flushed from the system, and the amount remaining in the upper and lower spray headers and nozzles, there was no past impact on the Unit 2 CTS spray header or RHR spray performance.

Cause Of The Event

The cause for the construction-related debris is inadequate cleanliness inspections performed during initial plant construction. The evaluation concluded that the construction debris found in the Unit 1 and 2 CTS and RHR headers and piping was from original system installation. The cleaning/flushing guide that existed at the time required the piping to be velocity flushed with water and the spray headers to be pneumatically flushed. Cleanliness acceptance criteria allowed particles less than 1/4 of an

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inch to be left in the piping. This allowed items such as weld wires, drill bit chips, and metal fines to remain in the system piping. The limited boroscope inspections performed on the spray nozzles and limited portions of system piping may have allowed larger debris items such as tape and rags in the piping itself to go undetected.

The most probable cause for the boric acid deposits/blockage in the Unit 1 East RHR spray piping is inadequate inspection of RHR system piping after an inadvertent spray actuation during valve surveillance testing on the Unit 1 West RHR train in 1979. The inadvertent actuation was attributed to valve leakby, which resulted in the East RHR train being pressurized. Review of this event did not indicate whether an inspection of the RHR spray header was performed following the actuation. The surveillance test has subsequently been revised to perform the test with the RHR system depressurized

Analysis of Event

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 Coolant Accident (LOCA). The RHR system can be used to supplement the CTS system during the recirculation phase of a LOCA by providing flow to three RHR spray ring headers located in the upper containment.

Both unit's CTS systems consist of separate spray headers in the upper and lower containment which is supplied from the East and West CTS pumps. There are also separate headers located in upper containment which are supplied from the East and West RHR pumps. Each CTS train has four circular headers in upper containment and one main circular header with fifteen branch lines in lower containment. Each CTS train has a total of 91 nozzles in upper containment and a total of 72 nozzles in lower containment. Each RHR train has three separate headers with a total of 150 nozzles.

Unit 1
Boroscope inspections of the Unit 1 upper East and West CTS spray headers identified minimal boric acid deposits and no construction-related debris. The lower East CTS header contained a rag and partial boric acid blockage in two areas of the header. The presence of the rag in the header had the potential to block 1 nozzle. Inspection of the lower West CTS header identified a rag, tape, and boric acid deposits/blockage in various nozzles and in one area of the header. The construction-related debris had the potential to block up to 8 nozzles.

The Unit 1 upper East RHR header contained construction-related debris such as bags, a grinding wheel, and weld wire. Moderate to heavy boric acid deposits/blockage in various portions of the header and nozzles were identified. The presence of the construction-related debris has the potential to block 5 nozzles. Inspection of the upper West RHR header identified minimal boric acid deposits and construction-related debris which could potentially block 5 nozzles. The combined effect from the identified boric acid deposits/blockage in both the CTS and RHR system spray headers, nozzles, and associated piping resulted in a potential 3 percent reduction in total spray flow to containment.

Upon completion of the Unit 1 inspections, the CTS and RHR piping and nozzles were flushed and re-inspected. Results of the post-flush inspection of the CTS and RHR nozzles, and limited piping areas most likely to collect debris such as low points in the piping, concluded that the as-left condition was acceptable in accordance with the established cleanliness acceptance criteria.

The cleanliness acceptance criteria established for the flushing and inspection of the CTS and RHR spray headers and nozzles required: 1) continued spray nozzle high velocity flushing until flushing results exhibit no foreign particles larger than 1/16 inch in any dimension, except hair-like slivers less than 1/16 inch thick and 1/8 inch long, 2) no more than slight foreign particle speckling, and 3) no evidence of organic contamination in the effluent water or on the flush filter.

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Unit 2

After completion of limited visual inspections of the Unit 2 upper East and West CTS spray headers, both the Unit 2 CTS and RHR spray header system piping were flushed, and a 100 percent boroscope inspection of the spray header nozzles was performed. Post-flush inspection results concluded that the as-left condition of the lower spray headers and nozzles were acceptable in accordance with the established cleanliness acceptance criteria. The acceptance criteria used for Unit 2 cleanliness was the same as used for Unit 1. Based on an evaluation of the debris flushed from the system, and the remaining debris in the system, there was no impact on the past function of the lower spray headers.

Post-flush inspection of the Unit 2 upper East and West spray header and nozzles identified construction-related debris, such as metal fines, hair-like fibrous material, and wire, in approximately 80 out of 482 upper spray nozzles. Any debris which did not meet the cleanliness acceptance criteria was removed from the affected nozzles.

An engineering evaluation of the debris flushed from the Unit 2 system and the debris remaining in the upper spray headers concluded that there was no impact on the design function of the CTS and RHR systems. This was based on size of the debris found in the upper spray headers and the spray nozzle orifice diameter of 3/8 inch. The size of the debris observed in any given nozzle was typically less than 1/32 inch thick and approximately 1/8 inch long. Hence the debris was not likely to block the nozzle orifice. If some of this debris were to remain in the nozzles following system actuation, such debris would have been expected to pass through the nozzles with no impact on the flow requirements of the systems during an accident.

Analysis

At the time boric acid and construction-related debris were present in the Unit 1 and 2 CTS and RHR headers, additional conditions existed that would have affected the performance of the containment with respect to containment pressure and radiological consequences (reference: LER 315/97-011-02, "Operation Outside Design Bases for ECCS and Containment Spray Pumps for Switchover to Recirculation Sump Suction," and LER 315/98-015-01, "Ice Weight Requirements Potentially Not Met Due to Non-conservative Assumption in Software Program"). To determine the combined impact of these conditions, Westinghouse performed an analysis using the licensing basis LOTIC code to evaluate the effect on containment pressure as well as control room habitability. The model assumed a reduction in CTS spray flow and that RHR spray was inoperable to conservatively reflect the identified CTS and RHR blockage. At the time the analysis was performed, the Unit 1 inspections were complete, but only the results of the limited Unit 2 inspection were known. Therefore, even though the Unit 2 debris was later found not to impact system performance, the Westinghouse analysis generically assumed worst case conditions for both units.

Regarding containment pressure, the results of the analysis calculated peak containment pressure to 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 subject. 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").

The analysis concluded that these combined effects would not have resulted in a significant increase in radiological consequences to control room personnel and the health and safety of the public. Because the removal of airborne radioactive iodine is proportional to containment spray flow rate, a reduction in spray flow could result in higher thyroid doses both to the public and control room personnel. Analysis determined a potential 3 percent increase in radioactive dose consequence to the thyroid and no consequence to whole body dose due to changes in spray flow rates. This results in an increase the UFSAR, Chapter 14, thyroid dose rate from 154 to 158.6 rem for the 0-2 hour site boundary dose and from 134 to 138 rem for the 0-30 day low population zone boundary dose, which are both below the 300 rem thyroid dose limit set forth in 10CFR Part 100.

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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 the debris present in the Unit 1 CTS and RHR spray headers potentially resulted in a 3 percent reduction in spray flow; it did not impact the ability of systems to perform their design basis accident function. The analysis also concluded that radiological consequences would have remained within acceptance limits set forth in 10CFR Part 100. Based on the discussion above, the as-found condition had minimal safety significance.

Corrective Actions

Inspection and cleaning of the Unit 1 and Unit 2 CTS and RHR piping and spray headers were completed on November 20, 1998, and January 10, 2000, respectively. The as-left condition of the systems on both units met the established cleanliness criteria.

Plant procedures regarding system cleanliness standards and foreign material exclusion are currently in place to prevent foreign material from being left in plant systems.

Unit 1 and 2 are no longer vulnerable to boric acid plateout in the spray ring because of the following:

1. The bypass line, which connected the heat exchanger outlet circuits with the pump's mini-flow line back to the RWST was removed. This change eliminated one path of introducing water to the lower spray ring.

2. Procedure for the containment spray system operability test was revised to realigned the system with the heat exchanger outlet drain valves opened. This prevents water that could potentially leak past the inlet isolation valve and flow into the spray ring downstream of the heat exchanger.

Based on the aforementioned corrective action the spray ring is not vulnerable to the consequences of boric acid plating out in the spray rings. The piping network downstream of the heat exchanger will always remain dry, therefore there is no future needs to perform inspections for boric acid plateout.

Similar Events

None