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Indiana Michigan Power
Cook Nuclear Plant
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December 23, 2014

AEP-NRC-2014-101
10 CFR 50.73

Docket No.: 50-315

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike,
Rockville, MD 20852

Donald C. Cook Nuclear Plant Unit 1 and Unit 2
LICENSEE EVENT REPORT 315/2014-003-00
Manual Reactor Trip Due to Lake Debris Intrusion Causing Degraded Forebay Conditions

In accordance with 10 CFR 50.73, Licensee Event Report System, Indiana Michigan Power, the licensee for Donald C. Cook Nuclear Plant Units 1 and 2, is submitting the following report:

LER 315/2014-003-00: "Manual Reactor Trip Due to Lake Debris Intrusion Causing Degraded Forebay Conditions."

There are no commitments contained in this submittal.

Should you have any questions, please contact Mr. Michael K. Scarpello, Regulatory Affairs Manager, at (269) 466-2649.

Sincerely,

Samuel M. Partin
Plant Manager

JEN/amp

Enclosure

c: M. L. Chawla – NRC Washington, DC
J. T. King - MPSC
MDEQ – RMD/RPS
NRC Resident Inspector
C. D. Pederson – NRC Region III
A. J. Williamson - AEP Ft. Wayne, w/o enclosure

IE22
NRR

NRC FORM 366 (02-2014) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 01/31/2017

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to Infocollects.Resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

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4. TITLE

Manual Reactor Trip Due to Lake Debris Intrusion Causing Degraded Forebay Conditions

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	01	2014	2014	- 003	- 00	12	23	2014	Donald C. Cook Nuclear Plant Unit 2	05000316
									FACILITY NAME	DOCKET NUMBER
										05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
1	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☒ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
100	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Michael K. Scarpello, Regulatory Affairs Manager	(269) 466-2649

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
A	BA	P	Ingersoll-Rand	Y	X	IU	RLY	General Electric	Y

14. SUPPLEMENTAL REPORT EXPECTED	15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)* ☒ NO				

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

On November 1, 2014, at approximately 0249, Donald C. Cook Plant Unit 1 (U1) and Unit 2 (U2) reactors were manually tripped from 100 percent and 55 percent power, respectively, when high winds and high waves on Lake Michigan resulted in a heavy influx of dune grass and debris into the forebay which resulted in degraded forebay conditions, lowering forebay level, and damaged trash racks. Following the U1 trip, the U1 Turbine Driven Auxiliary Feed Pump (TDAFP) tripped unexpectedly three minutes following the automatic start. Following the U2 trip, the U2 Main Generator trip was performed manually when the automatic trip failed.

Corrective actions taken include cleaning and repair of damaged forebay trash racks and travelling water screens. Corrective maintenance also corrected the causes of the U1 TDAFP trip and the U2 Main Generator trip function. Planned corrective actions include revising plant procedures to provide a comprehensive approach to adverse lake conditions.

The manual Reactor Protection System actuation and the automatic Auxiliary Feedwater System actuation were reported in accordance with 10 CFR 50.72(b)(2)(iv)(B) and 10 CFR 50.72(b)(3)(iv)(A) (Event Notification 50587). The valid actuations are reportable as a Licensee Event Report (LER) in accordance with 10 CFR 50.73(a)(2)(iv)(A). The storm and lake conditions necessitating the reactor trips is reportable as an LER in accordance with 10 CFR 50.73(a)(2)(iii).

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NARRATIVE

Energy Industry Identification System codes are identified in the text as [XX].
The following information applies to both Unit 1 (U1) and Unit 2 (U2).

INTRODUCTION

On November 1, 2014, at approximately 0249, Donald C. Cook Plant U1 and U2 were manually tripped from 100 percent and 55 percent power, respectively, as directed by procedure, when a heavy influx of dune grass and debris caused degraded forebay [NN] conditions. One of the 14 Circulating Water System (CWS) [KE] Traveling Water Screens (TWS) [SCN][NN] was out of service at the time of the event. Major plant components functioned as designed with the following exceptions:

The U1 Turbine Driven Auxiliary Feed Pump (TDAFP) [BA][P] tripped unexpectedly approximately three minutes after it started. The Motor Driven Auxiliary Feed Pumps (MDAFP) [BA][P] provided the necessary flow to the Steam Generators (SG) [SG].

The U2 Main Generator [TB] did not trip automatically. Operators successfully actuated a manual trip of the Main Generator.

EVENT DESCRIPTION

With both U1 and U2 operating at 100 percent power, high winds, wave heights greater than 20 feet, and a two-foot level surge on Lake Michigan transported large amounts of dune grass and other debris to the plant circulating water intakes [NN]. The dune grass and debris impinged upon the trash racks causing failure of some of the racks, and subsequent rapid fouling of the TWS.

The following timeline describes the sequence of events on November 1, 2014 (times are approximate):

0015 With forebay level lowering due to buildup of debris on the trash racks [NN], operators on both U1 and U2 throttled main turbine condenser circulating water outlet valves [V] to lower total system flow in order to recover forebay level. Level did recover slightly, but after a very brief period level continued to lower.

0141 U2 Operators stopped one of the four U2 Circulating Water Pumps (CWP) [P] in an effort to recover forebay level. Level did recover slightly, but after a very brief period level continued to lower.

0154 Due to TWSs failing to maintain normal screen differential pressure (dp), U2 operators entered the procedure for screen house forebay degraded conditions and ensured that U1 operators also entered the procedure. Initial actions of the procedure are to monitor various forebay parameters.

0210 U2 Operators entered the procedure for rapid power reduction response and lowered power at four percent per minute to approximately 50 percent power to establish conditions to stop a second CWP.

0218 U2 Operators stopped the second of four CWPs in accordance with the degraded forebay procedure.

0242 U1 Operators stopped one of three CWPs in accordance with the degraded forebay procedure.

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0249 The forebay conditions degraded further and met procedure conditions directing removal of all CWPs from service; the procedure requires both units to trip their reactors, manually close the Steam Generator Stop Valves (SGSV), and then remove all CWPs from service. Both U1 and U2 performed these actions successfully.

0258 While performing actions of the Reactor Trip Response procedure, U2 Operators identified that the Main Generator [GEN] output breakers [BKR] did not automatically open as expected. The Operators manually tripped the generator in accordance with the procedure.

0300 U1 Operators, responding to the 'TDAFP Trip and Throttle Valve Unlatched' annunciator, noted that the TDAFP, which started automatically as expected following the reactor trip, had tripped for unknown reasons. The TDAFP was subsequently declared inoperable. Troubleshooting was completed and the U1 TDAFP was restored to operable on 11/3/2014 at 0017 hours.

0323 U1 Operators noted that the Number 1 SG pressure was low – approximately 980 psig – the expected pressure was approximately 1000 psig. Operators in the field noted three of the five SGSVs [RV] were leaking-by. Mechanical agitation of the safety valves was effective in seating all three valves. Number 1 SG pressure then increased and was being controlled by the SG Power Operated Relief Valve [PCV] at approximately 1000 psig as expected.

The Root Cause requiring the units to be taken off line was that the organization did not establish aggressive preventive methodologies to identify and mitigate risks associated with storm induced debris intrusion prior to changing forebay conditions or to prevent significant damage to the forebay structures.

EVENT ANALYSIS

Rough lake conditions (high winds causing 20-foot waves and a level surge of two feet) caused ingress of dune grass and debris into the forebay at a rate that challenged and damaged the trash racks, and subsequently the ability of the TWSs to continue to operate. As a result of the blockage, forebay level was lowering. Operators entered the procedure for degraded forebay conditions in an attempt to restore forebay level, but were not successful to allow for continued safe operation of U1 and U2. Both Units were manually removed from service, the main steam isolation valves were manually closed, and all CWPs were removed from service.

The reactors were manually tripped prior to any automatic reactor trip set-points being achieved. The reactor was operated well within Safety Limits and no Limiting Safety System Settings were challenged.

The safety systems maintained mitigation capability without degradation. Safety margins and redundancy of the Essential Service Water [BI] and Component Cooling Water systems were maintained throughout the event and after the event. There was no loss of safety functions of these systems.

In both U1 and U2, following the manual reactor trip, Main Feedwater [SJ] was unavailable due to closure of the Main Steam Isolation valves, and the Auxiliary Feedwater systems operated to supply makeup to all SGs as designed.

Following the U1 trip, the U1 TDAFP tripped 3 minutes following the automatic start. Both MDAFPs operated to provide makeup as designed throughout the event. U1 also experienced three of the five SGSVs on one SG lifting and simmering; mechanical agitation was effective to seat the valves. The apparent cause of the TDAFP trip was determined to be mechanical interference that affected the operation of the Trip and Throttle Valve. The interference has been corrected to preclude further interference.

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Following the reactor trip on U2, an automatic trip of the Main Generator did not occur as expected due to failure of a relay in the trip circuit. Operators were able to perform a manual trip. The failed relay has been replaced.

Based on a review of each of the control room (CR) logs, Plant Process Computer [CPU] information, and the post-trip review performed by operations, all other plant systems performed as designed to shut down the Units and remove decay heat. No further risk-significant equipment functions were affected or failed and no significant operator actions were required outside those required for normal trips.

Both Units required repair and cleaning of the common forebay trash racks and TWSs. Health and safety of the public were not compromised as a result of this event.

CORRECTIVE ACTIONS

Taken:

The CWS trash racks and TWS systems were cleaned and repaired.

Planned:

Corrective Actions to Preclude Repetition-

- Create a comprehensive, tiered approach for corrective and preventive actions for the determination of forecasted and current lake [Lake Michigan] condition's impact to CWS health, and incorporate into the Screen House Vulnerability Determination procedure.
- Formalize Significant Operating Experience Report, SOER 07-2 required Lake Threat Assessment. Perform assessment with representation from System Engineering and Environmental at a minimum, assessing new threats from the lake [Lake Michigan]. Initiate a corrective action to incorporate new threats into the Screen House Vulnerability determination procedure.

Additional Corrective Actions-

- Install instrumentation to provide indication in the CR of changing conditions across the trash racks.
- Develop a design calculation to determine maximum allowable differential pressure across the trash racks.
- Revise U1 and U2 CWS System Operation procedures to provide allowable CWP line-ups.

PREVIOUS SIMILAR EVENTS

A review of Licensee Event Reports for the past three years found no similar events.