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December 1, 2010

AEP-NRC-2010-75
10 CFR 50.73

Docket No. 50-316

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Unit 2
LICENSEE EVENT REPORT 316/2010-001-00
VALID ACTUATION OF AUXILIARY FEEDWATER SYSTEM IN RESPONSE TO
VALID STEAM GENERATOR LOW-LOW LEVEL SIGNALS

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

LER 316/2010-001-00: "Valid Actuation of Auxiliary Feedwater System in Response to Valid Steam Generator Low-Low Level Signals"

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,

Joel P. Gebbie
Site Vice President

JEN/jmr

Attachment

c: INPO Records Center
J. T. King – MPSC, w/o attachment
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MDNRE – WHMD/RPS, w/o attachment
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NRC Form 366 (10-2010) U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB: NO. 3150-0104 EXPIRES 10/31/2013
LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	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 Section (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.

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4. TITLE

Valid Actuation of Auxiliary Feedwater System in Response to Valid Steam Generator Low-Low Levels

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 05000
10	06	2010	2010	- 001 -	00	12	1	2010	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
3	☐ 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)
000	☐ 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 Specify in Abstract below or in NRC Form 366A
	☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Michael 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
X	BA	2	Agastat	Y	X	JI	TD	Fisher	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 October 6, 2010, at 0008 hours, a valid automatic actuation of the Unit 2 Turbine Driven Auxiliary Feedwater Pump (TDAFP) occurred as a result of two Steam Generator (S/G) levels reaching their low-low setpoint.

Prior to the event, at 0001, the reactor was manually tripped, in accordance with the Power Reduction Procedure, to begin a scheduled refueling outage. Following the trip, operators completed their immediate actions and adjusted Auxiliary Feedwater (AFW) flow in accordance with procedure.

While adjusting AFW flow, a cooldown of the Reactor Coolant System (RCS) was noted, however, the source was not immediately identified. The cooldown resulted in lowering S/G levels. Operators attempted to recover S/G levels but were not successful. The TDAFP started automatically as a result of two of four S/G levels reaching their low-low setpoint. Operators then began to restore normal S/G levels. The cause of the cooldown was two steam dump valves opening without a demand signal. The opening was due to an electro-pneumatic transducer (EPT) which was later found to be out of calibration. The EPT has been replaced.

In accordance with 10 CFR 50.72(b)(3)(iv)(A), Event Notification 46311 was submitted on October 6, 2010, to report the automatic start of the TDAFP. This event is also reportable as a Licensee Event Report in accordance with 10 CFR 50.73(a)(2)(iv)(A).

NARRATIVE

Conditions Prior to Event

Mode 3

Description of Event

On October 6, 2010, at 0008 hours, a valid automatic actuation of the Unit 2 Turbine Driven Auxiliary Feedwater Pump [P] (TDAFP) occurred as a result of two of four Steam Generator [SG] (S/G) levels reaching their low-low level setpoint.

At 0001, in preparation for the start of the scheduled refueling outage, the Unit 2 reactor [RCT] was manually tripped in accordance with the Power Reduction normal operating procedure. The East and West Motor Driven Auxiliary Feedwater Pumps had been started immediately prior to the reactor trip in order to maintain flow to the S/Gs per procedure. Following the reactor trip, the operators completed their immediate actions and adjusted Auxiliary Feedwater (AFW) [BA] flow in accordance with procedure. Transition was then made to the Reactor Trip Response procedure to stabilize the plant.

The first step of the Reactor Trip Response procedure directs the operators to determine if a Reactor Coolant System [AB] (RCS) cooldown is in progress. Operators initially determined that no cooldown was evident based on control board indication. Subsequently, as operators were adjusting AFW flow, a cooldown of the RCS was noted, but the source of the cooldown was not immediately identified. Operators believed that the cooldown was due to high AFW flow, so they began to throttle AFW flow.

At 0008, the TDAFP started automatically as a result of two of four S/G levels reaching the low-low level setpoint. The cause of the cooldown was later determined to be primarily due to steam flow through the Steam Dump system [JI]. Malfunction of the Steam Dump system was determined to have resulted from an out-of-calibration electro-pneumatic transducer (EPT).

The following conditions contributed to the lowering generator water levels. First was operators throttling AFW Flow in an attempt to arrest the RCS cooldown. Second was the loss of mass due to the steam flow through the Steam Dump system. An additional contributor was level in S/G 4 lowering when the AFW valve for S/G 1 failed to automatically throttle upon receipt of the flow retention signal, diverting flow from S/G 4.

Approximately one minute after the start of the TDAFP, Permissive [69] P-12 cleared. The clearing of P-12 blocks closed the Steam Dump valves. With the Steam Dump valves blocked closed, the primary contributor to the RCS cooldown was stopped. The TDAFP was stopped approximately nine minutes after it auto-started.

At 0052, per procedure direction, the Steam Dump system was transferred from T-Avg Mode to Steam Pressure Mode. This removed the out-of-calibration component from the circuit, and the Steam Dump system operated as designed to maintain RCS temperature.

There were no structures, systems or components known to be inoperable at the start of the event that contributed to the event.

Cause of Event

The automatic start of the TDAFP was a result of two S/G levels lowering to the low-low level setpoint.

Levels were lowering due to an RCS cooldown and loss of secondary system mass caused by steam flow through the Steam Dump System. An out-of-calibration EPT in the Steam Dump control system resulted in two Steam Dump valves remaining partially open with no demand signal. This flowpath resulted in sufficient steam flow to the Main Condenser [SG] to cool down the RCS. This cooldown and loss of secondary system mass resulted in S/G levels lowering to the setpoint for automatic start of the TDAFP.

The diagnosis of RCS cooldown was delayed, allowing two S/Gs to reach their low-low level, due to a malfunctioning AFW supply valve for S/G 1. Rather than throttling automatically upon receipt of a flow retention signal, the valve remained full open until operators manually operated the valve to throttle flow. This resulted in operators focusing initially on high AFW flow as the source of the cooldown, thus delaying the diagnosis of the steam flow through the Steam Dump system.

NARRATIVE

Troubleshooting and functional testing of the S/G 1 AFW supply valve and control circuitry resulted in the components and circuitry operating properly. The cause of S/G 1 AFW supply valve operating incorrectly could not be conclusively determined.

Analysis of Event

An assessment of this event determined that it is bounded by the existing accident analysis associated with unplanned reactor trips (i.e., transient) with the main condenser (i.e., ultimate heat sink) available. The change in risk with respect to core damage and large early release frequency due to an out-of-calibration electro-pneumatic transmitter in the Condenser Steam Dump system, and subsequent minor RCS cooldown, have been qualitatively assessed and judged to be no different than any other planned reactor trip with the main condenser available. This assessment is based on the following considerations:

1. The automatic plant responses to Steam Generator water level and the P-12 setpoint, caused by the EPT out-of-calibration condition, functioned as expected. Operators took procedurally directed actions and responded to the transient in an appropriate and timely manner, resulting in a safe and stable plant configuration. Automatic post-trip features functioned dependably with the exception of the S/G 1 AFW valve not throttling closed following the trip. The latter condition is judged to not have had a significant impact on the plant transient.

2. The unexpected minor RCS cooldown, caused by the EPT out-of-calibration condition, does not contribute to the increased likelihood of any initiating events.

3. Neither the EPT out-of-calibration condition nor the S/G 1 AFW valve not moving to its throttled position degraded any system used to mitigate core damage, assure containment integrity, or maintain defense-in-depth and safety margins.

Based upon an examination of the event, the risk significance associated with the RCS cooldown following the planned October 6, 2010, Unit 2 trip is assessed as non-risk significant.

Corrective Actions

Completed Corrective Actions

The electro-pneumatic transducer found out of calibration has been replaced.

Although no cause for the incorrectly operating AFW valve could be conclusively determined, an action was taken to replace the time delay relay in the associated circuitry as this was determined to be the most likely cause. Functional testing following relay replacement identified that the circuitry is functioning properly.

Planned Corrective Actions

An action has been generated to change the Preventive Maintenance activity for the EPT found to be degraded in this event. The Preventive Maintenance activity will direct replacement of the EPT, rather than calibration, if the as-found condition of the EPT is outside a specified tolerance. This is being performed because the EPT has been found to drift out of tolerance sooner if calibrated from outside the specified tolerance.

An action has been generated to add the lessons learned from this event to the Pre-Job Brief data base for planned plant shutdown evolutions.

Previous Similar Events

Licensee Event Reports for the past 10 years were reviewed. Below is the only LER identified that was initiated as a result of a similar type of an unanticipated actuation of the auxiliary feedwater system.

LER 05000-316-2002-004-02, Unanticipated Start of the Turbine Driven Auxiliary Feedwater Pump:
In preparation for a Unit 2 refueling outage, operators performed a manual reactor trip of Unit 2 from 22 percent power. Shortly thereafter, an automatic start of the TDAFP occurred as a result of valid low-low levels in two of four Steam Generators. The reactor trip setpoint had been selected to avoid challenging ESF equipment (i.e., auto start of the TDAFP). As such, the automatic start of the TDAFP was not specifically called out as an expected occurrence after manual reactor trip from 22 percent power.

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NARRATIVE

While this previous event was similar in that the TDAFP started automatically, the previous TDAFP automatic start was attributed to tripping the reactor from a power level of 22 percent rather than due to RCS cooldown caused by equipment malfunction. To address this issue, the procedure was changed to trip from 14 percent.