Exelon Generation®

Oyster Creek
Route 9 South
P.O. Box 388
Forked River, NJ 08731

10 CFR 50.73

RA-17-041

June 23, 2017

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk or O-8B1
One White Flint North
11555 Rockville Pike
Rockville, MD 20852

Oyster Creek Nuclear Generating Station
Renewed Facility Operating License No. DPR-16
NRC Docket No. 50-219

Subject: Licensee Event Report (LER) 2016-002-01, "Control Rod Drive Cooling Water System Isolation Scram Time Testing Was Not Performed"

Enclosed is LER 2016-002-01, "Control Rod Drive Cooling Water System Isolation Scram Time Testing Was Not Performed"

This event did not affect the health and safety of the public or plant personnel. This event did not result in a safety system functional failure. There are no regulatory commitments made in this LER submittal.

Should you have any questions concerning this report, please contact Michael McKenna, Regulatory Assurance Manager, at (609) 971-4389.

Respectfully,

Michael F. Gillin

Michael F. Gillin
Plant Manager
Oyster Creek Nuclear Generating Station

Enclosure: NRC Form.366, LER 2016-002-01

cc: Administrator, NRC Region I
NRC Senior Resident Inspector - Oyster Creek Nuclear Generating Station
NRC Project Manager - Oyster Creek Nuclear Generating Station

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NRR

NRC FORM 366 (04-2017) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 03/31/2020

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

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4. TITLE

Control Rod Drive Cooling Water System Isolation Scram Time Testing Was Not Performed

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
									N/A	N/A
03	16	16	2016	- 002	- 01	06	23	17	FACILITY NAME N/A	DOCKET NUMBER N/A

9. OPERATING MODE	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*			
N	☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
	☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
	☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
	☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
10. POWER LEVEL	☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
	☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
	☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(1)
100	☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(i)
	☐ 20.2203(a)(2)(vi)	☒ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(ii)
		☐ 50.73(a)(2)(i)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A	

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT	TELEPHONE NUMBER *(Include Area Code)*
Gary Flesher, Regulatory Assurance Manager	609-971-4232

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
E	AA	SEAL	G080	N	N/A	N/A	N/A	N/A	N/A

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 03/16/2016, it was identified that isolating or reducing cooling water to the Hydraulic Control Units (HCUs) for three control rods should have been considered a modification since it had the potential to impact the scram times of the control rods. Even though scram time penalties were applied for the three control rods where the cooling water flow was either isolated or reduced, the control rods should have been scram time tested, as directed by the Generic Electric (GE) Service Information Letter (SIL) 173, Supplement 1, Revision 1.

By not completing scram time testing for the control rods whose cooling water was isolated or reduced, the station was in violation of the requirements of Technical Specifications Section 3.2, since the issue was not identified previously and the affected control rods were not declared inoperable and isolated.

This event resulted in an Operation or Condition that was Prohibited by the Plant's Technical Specifications (TS) and is therefore being reported under 10CFR50.73(a)(2)(i)(B).

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Description of Event

On 03/16/2016, the NRC identified that scram time testing had not been performed following the isolation of cooling water flow to control rods 18-47 and 42-27, and the reduction in cooling water flow to control rod 30-03 as a result of a failed isolation valve to fully open. The valves were isolated as a compensatory action to mitigate leakage from the Control Rod Drive Mechanism (CRDM) seals that was being quantified as unidentified leakage within the drywell. The isolated, or reduced, cooling water results in a hot CRDM condition that is expected to impact scram times as documented in Generic Electric (GE) Service Information Letter (SIL) 173, Supplement 1, Revision 1, "***Control Rod Drive High Operating Temperature.***"

Technical Specification (TS) Section 4.2.C.2. states that:

"For specifically affected individual control rods following maintenance on or modification to the control rod or control rod drive system which could affect the scram insertion time of those specific control rods in accordance with either "a" or "b" as follows:

a.1 Specifically affected individual control rods shall be scram time tested with the reactor depressurized and the scram insertion time from the fully withdrawn position to 90% insertion shall not exceed 2.2 seconds, and

a.2 Specifically affected individual control rods shall be scram time tested at greater than 800 psig reactor coolant pressure prior to exceeding 40% power.

b. Specifically affected individual control rods shall be scram time tested at greater than 800 psig reactor coolant pressure."

The isolation of cooling water flow to a control rod, while it does not affect the operability or functionality, does reduce the flow to the CRDM and can impact the scram time. Accordingly, scram time testing should have been performed per the TS due to a system modification that could impact the scram time. Since the testing was not performed, TS. 4.0.1 was also applicable as a surveillance requirement that was not met. In accordance with this TS section, if the surveillance requirements are not satisfied, this would require entry into the appropriate LCO as described under TS Section 3.2.B.4, which would have required the control rods be declared inoperable, fully inserted, and isolated. Additionally, TS Sections 3.2.A.2 and 3.2.A.3 are also applicable and would require a determination that adequate shutdown margin would be maintained within six hours of declaring the rods inoperable. Since this was not accomplished, this resulted in an Operation or Condition that was prohibited by the plant's TS.

Equipment Description

The control rod and drive mechanism provides control of reactor power, including the ability to provide a sufficiently rapid insertion of control rods (scram) so that no fuel damage results from any abnormal operating transient and limits fuel damage under accident conditions. The 137 control rods for the Oyster Creek reactor are located uniformly throughout the core. The control rods are operated by CRDMs. The hydraulic control units (HCUs) for the control rods supply and control the pressure and flow requirements to the Control Rod Drives (CRDs). The HCUs provide hydraulic power to be able to position control rods

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in the reactor core. HCU scram accumulators are designed with a limited nitrogen pressure and volume, which are sufficient to initiate control rod scram motion.

The CRD System supplies water to the CRD HCUs for manual control rod movement, scram, control rod mechanism cooling, and to the head spray cooling system. The system provides the operators the ability to control core reactivity through control rod movement, both manually and by scram.

On a control rod insertion, drive water flows up this riser to the under-piston area of the CRDM at a pressure high enough to drive the CRDM against reactor pressure. On a rod withdrawal, exhaust water at reactor pressure flows down this riser from the under-piston area of the CRDM. During periods of no rod motion, a small amount of cooling water continuously flows up this riser at just over reactor pressure. On a reactor scram, the scram inlet valve opens a flow path from the accumulator to the under-piston area of the CRDM via this header.

A cooling water flow of 0.3 gpm to the CRD provides protection for the graphitar seals and elastomer O-rings. The CRD will perform its design function without cooling water supplied, as described in the Updated Final Safety Analysis Report (UFSAR) Section 3.9.4.2.4.

Analysis of Event

When cooling water flow is isolated or reduced to an HCU, CRD Temp Hi (H-5-c) response to alarm procedure contains a step for Reactor Engineering to perform Surveillance Test (ST) 617.4.003, "Control Rod Insertion Time Test and Valve IST," to assess GE SIL 173, Supplement 1, Revision 1, scram time penalties.

At the time of discovery, there were three control rods that had scram time penalties applied: 18-47, 42-27, and 30-03. The scram time testing of these control rods had not been completed as required since the isolation of cooling water was not deemed to be a "modification" to the system since it was considered bounded under the UFSAR description as not impacting the operability of the control rod. While this is true, isolating the cooling water to the control rod still has an impact on the scram time of the rod as described in the GE SIL.

On 03/18/2016, control rods 18-47, 30-03 and 42-27 were scram time tested to evaluate their performance with elevated control rod drive temperature. GE SIL 173, Supplement 1, Revision 1, scram time penalties had previously been applied to the individual scram times for each of the three high temperature control rods. When the control rods were scram timed on 03/18/2016, both 30-03 and 42-27 had scram times that were faster than the previous times with the high temperature penalties applied. The scram time for control rod 18-47 was longer than the previous time with penalties applied.

Review of scram time data from the May 2015 reactor scram identified that the control rod 18-47 scram times were longer than the average of the times for the other control rods. This issue was not identified or evaluated at the time of the scram. Also, GE SIL 173 recommends that high temperature control rods be scram time tested at the next available opportunity. Although the GE SIL 173 high temperature control

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rod scram time penalties had been applied to the three high temperature rods, the scram time testing was not performed as recommended by the SIL.

Assessment of Safety Consequences

The isolation of the cooling water to a CRD does not directly affect the ability of a control rod to perform its design function; however, isolating or reducing cooling water will increase the control rod temperature and has the potential to degrade the scram time of a control rod.

UFSAR Section 4.6 states that rapid shutdown of the reactor is accomplished through actuation of the Reactor Protection System (or via manual scram) which opens the scram valves and permits water under pressure to be applied to the drive mechanism. The action exerts a pressure on the CRD piston mechanisms, and causes all rods to be fully inserted into the reactor core. Any control rod which is fully withdrawn will be fully inserted in approximately five seconds.

A control rod shall also be considered operable if the Control Rod is valved in service, can be moved with normal CRD pressure, and its accumulator is valved in service, with a minimum nitrogen tank pressure of 940 psig, fulfilling TS Section 3.2.B.4 requirements. The control rod moves at a normal speed with normal CRD system parameters.

Control rod 18-47 scram time testing was re-performed on 03/18/2016 and the times were slightly slower than the mean rod insertion times stated in the UFSAR, which is considered a degraded condition. The individual control rod scram time is an attribute of this component that is not controlled by TS. Control Rod 18-47 maintains its functionality since it is capable of performing its specified function of scramming and notching, as set forth in the Current Licensing Basis (CLB). The individual control rod scram feature of 18-47 remains functional since there is evidence that the possibility of a degrading scram time has increased, but not to the point of eroding confidence in the reasonable expectation that control rod 18-47 will continue to scram and notch as required.

A review of the TS Section 3.2 Bases was performed to ensure that the issue is not indicative of a common mode failure. In addition to this particular control rod being the only one that was exhibiting the behavior described above, collet housing/collet finger type failures were also researched. These types of failures would be demonstrated in either the control rod not inserting when the control rod is scrammed, or in the control rod not latching after movement. As control rod 18-47 was able to be scrammed, and able to being fully inserted to its 00 position, and stay at the 00 position, this was not indicative of failure of the collet housing.

TS Section 3.2.B.3 states the specifications for a core average scram time and scram times of the fastest 3-out-of-4 control rods within a 2x2 array. Individual control rod scram times themselves do not have specifications. The control rod would have to substantially degrade in individual scram time before it could affect the core average scram time.
Based on review of the recent data, previous performance data, equipment design, and a fleet technical call with Subject Matter Experts (SMEs) and GE representatives, reasonable assurance of future scram

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time continuing to support steady values could not be technically justified based on the observed condition. As result, control rod 18-47 was fully inserted and isolated.

Cause of Event

The apparent cause of the event was determined to be a lack of procedural guidance to perform CRD SCRAM Time testing when cooling water is isolated to a CRDM, as required per TS for any system modification that could impact SCRAM times.

The contributing cause of the event was determined to be the lack of performance monitoring guidance for control rods that exhibit a high temperature condition.

The following immediate actions were taken:

- On 03/18/2016 control rod 18-47 was inserted to its 00 position, valved-out of service and isolated.
- CRDM for control rod 18-47 was replaced during the planned maintenance outage that occurred in April of 2016.

Corrective Actions

- Revised CRD operating procedure 302.1 to require the performance of CRD SCRAM time testing when cooling water is isolated to a CRDM.
- Added procedural requirement to perform SCRAM time testing, during the 18 month required Surveillance of CRDs, that exhibit a high temperature condition
- Revised Engineering CRD Performance Monitoring Plan to require a review of surveillance test data obtained at the end of a refueling outage, as well as during 180-day scram testing, and full core scram data. The data is now required to be compared to the previous CRD SCRAM Time data to document any discrepancies into the Corrective Action Program.

Previous Occurrences

There have been no similar, previous events resulting from the isolation of cooling water to a CRD or failing to perform scram time testing at Oyster Creek.

Component Data

Component	IEEE 805 System ID	IEEE 803A Function
Control Rod Drive System	AA	SEAL