Exelon Generation.

10 CFR 50.73
10 CFR 21.21

RA-14-079

October 8, 2014

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

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

Subject: Licensee Event Report (LER) 2014-002-00, Technical Specification Prohibited Condition Caused by Two Electromatic Relief Valves Inoperable for Greater than Allowed Outage Time

Enclosed is LER 2014-002-00, Technical Specification Prohibited Condition Caused by Two Electromatic Relief Valves Inoperable for Greater than Allowed Outage Time. This report is submitted in accordance with 10 CFR 50.73(a)(2)(i)(B), any operation or condition prohibited by the plant's Technical Specifications; and 10 CFR 21.21 (d)(3)(ii) reporting of defects and noncompliance.

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 letter, please contact Michael McKenna, Regulatory Assurance Manager, at (609) 971-4389.

Respectfully,

Jeffrey P. Dostal
Plant Manager
Oyster Creek Nuclear Generating Station

Enclosure: NRC Form 366, LER 2014-002-00

cc: Administrator, NRC Region 1
NRC Senior Resident Inspector - Oyster Creek Nuclear Generating Station
NRC Project Manager - Oyster Creek Nuclear Generating Station

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NRC FORM 366 (01-2014) 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)

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

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4. TITLE

Technical Specification Prohibited Condition Caused by Two Electromatic Relief Valves Inoperable for Greater than Allowed Outage Time

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
08	25	2014	2014	- 002	- 00	10	08	2014	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)(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

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Michael McKenna, Regulatory Assurance Manager	(609) 971-4389

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
B	SB	RV	D245	Y	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		N/A	N/A	N/A

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

On June 20, 2014, during as-found testing of the Electromatic Relief Valve (EMRV) actuators removed from the plant in October 2012 during the 1R24 refueling outage, two ("B" and "D") of five EMRV actuators failed to operate. Subsequent inspection of these actuators found wear of the posts, springs and guides.

On August 25, 2014 the Root Cause Evaluation was completed and determined the most probable time of failure of the "B" and "D" EMRVs was between July 27, 2012 and October 22, 2012. These dates are based on July 27th being the last known date that the "D" EMRV functioned and October 22nd being the beginning of the refueling outage. Based on these dates, it is suspected that two of the five EMRVs would have been inoperable for longer than the Technical Specification Allowed Out of Service Time of 24 hours.

Therefore, this issue is reportable under 10 CFR 50.73(a)(2)(i)(B) as an Operation or Condition which was Prohibited by the plant's Technical Specifications. Additionally, this report constitutes a Part 21 notification per 10 CFR 21.21(d)(3)(ii), previously reported via ENS 50495 on September 25, 2014.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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Plant Conditions Prior To Event

Event Date: August 25, 2014
Unit 1 Mode: Run
Event Time: 1500 EDT
Power Level: 100%

Description of Event

The Electromatic Relief Valves (EMRVs) were installed during the original design and construction of Oyster Creek Nuclear Generating Station (OCNGS). The valves are Type 6" 1525-VX relief valves manufactured by Dresser Industries. They are installed on the two Main Steam Lines that carry steam from the reactor vessel to the Main Turbine. Actuation signals from either the Automatic Depressurization System or the individual EMRV pressure switches, as well as from the manual control switches will open the valves to relieve vessel pressure, thereby allowing the low pressure Core Spray System to provide makeup water to the reactor core during accident / transient conditions.

During each refueling outage, all 5 EMRV actuators are removed from the plant, refurbished, and reinstalled during the following refueling outage. By OCNGS process, the EMRV actuators are refurbished with new springs, posts, guides, and microswitches every 24 months during refueling outages due to the known wear of these parts. The actuator inspection/refurbishment frequency of 24 months is more frequent than the manufacturer's (i.e., Dresser Industries) recommended frequency of 36 months (per Vendor Manual VM-OC-0030, Installation and Maintenance Manual for Electromatic Relief Valves, Revision 1, Section VII, Ref. 4.5). In addition, in 2008, the station implemented the manufacturer's recommended material changes intended to minimize part wear, and prevent potential actuator failures.

During the 1R23 refueling outage (November 2010) the fully refurbished EMRV actuators were installed. Subsequently, the actuators were removed during refueling outage 1R24 (October 2012). As-found testing was performed on June 20, 2014, and two ("B" and "D") of five EMRV actuators failed to operate. Further inspection of these actuators found unexpected wear of the posts, springs and guides. On June 30, 2014, the "B" and "D" EMRV actuators failed bench testing. Failure analysis was performed on July 6, 2014 and could not identify a definitive cause of the failure. However, the analysis determined the damage observed on the components of all actuators removed from the plant in 2012 was consistent with fretting due to in service vibration.

Analysis of Event

Fully refurbished EMRV actuators were installed during refueling outage 1R23 (November 2010). On July 23, 2012, an automatic SCRAM due to Load Reject occurred, the Main Steam Isolation Valves closed, and, as designed, the "D" EMRV lifted due to a pressure spike above setpoint. On July 25, 2012 and July 27, 2012, the "D" EMRV was stroked per Surveillance 602.4.003. These events demonstrated the operability of the "D" EMRV. The set point for the "B" EMRV is higher than that of the "D"; therefore, the "B" EMRV did not operate during the July 2012 SCRAM, as expected. Inspection of the EMRV actuators found that the "D" actuator demonstrated the most severe wear as compared to the other four actuators, and remained functional for up to and including approximately 22 months while installed in the plant; therefore, it is reasonable to believe the "B" EMRV actuator, with less wear, was also operable up until this time.

On June 30, 2014, the "B" and "D" EMRV actuators, which were removed from the plant in October 2012, failed bench testing. The EMRV actuators installed in the plant had the same design and materials, and were rebuilt using the same procedural guidance as the "B" and "D" EMRVs that were removed in 2012. Since the capability of the EMRVs installed in the plant to perform their intended design function could not be determined without

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actuators' inspection, all EMRVs were conservatively declared inoperable. Subsequently, on July 7, 2014 OCNGS initiated a plant shutdown (1F34) (per Tech Spec 3.4.B) for EMRV actuator as-found testing and replacement. Prior to removal from the plant, all five EMRV actuators stroked satisfactorily during as-found testing, and were replaced with newly refurbished actuators. It was determined that the 5 currently installed EMRVs were fully operable and capable of performing their safety function. ENS 50261 of the inoperable EMRVs was retracted on July 11, 2014.

Operability Evaluation OC-2014-OE-0003 determined that considering the time dependent component wear (due to vibration induced fretting as a result of inadequate installation tolerances) there was reasonable assurance for the newly installed actuators to be able to perform their design function until a new design can be developed and installed during refueling outage 1R25 (September 2014). This conclusion was corroborated by the fact that "D" EMRV (V-1-176), which demonstrated the most severe wear, remained functional up to and including approximately 22 months while installed in the plant during Cycle 23 (2010-2012).

It was found during the Root Cause Evaluation that post to bushing misalignment caused the EMRV actuator to jam after approximately 22 months in an environment where the actuator is subject to vibration. The misalignment occurred during refurbishment because the maintenance procedure lacked the acceptance criteria for alignment of the posts to guides. Since the failure mechanism is introduced prior to installation in the plant it is not reasonable to expect that any of the EMRVs, other than B and D, were subject to failure at any time during the run cycle. Additionally, as part of as-found testing on June 20, 2014, the A, C, and E EMRV actuators stroked satisfactorily.

The Root Cause Evaluation was completed on August 25, 2014. Based on the failure mechanism, the most probable time of failure of the "B" and "D" EMRVs was between July 27, 2012 and October 22, 2012. These dates are based on July 27th being the last known date that the "D" EMRV functioned and October 22nd being the beginning of the refueling outage. Based on these dates, it is suspected that two of the five EMRVs would have been inoperable for longer than the Technical Specification Allowed Out of Service Time of 24 hours, with a maximum exposure time of 87 days.

Cause of Event

Upon completion of the Root Cause Evaluation, it was determined the design of the EMRV actuators was inadequate in that when placed in an environment where the actuator is subject to the vibration associated with plant operation, the allowed installation tolerances between posts and guides can create a condition where the springs can jam the actuator plunger assembly by wedging between the guides and the posts. During the refurbishment of the EMRV actuators, actions are necessary to ensure proper alignment of the plunger and spring guide posts to prevent fretting/binding. The potential for fretting is created due to the guide posts mounting on the solenoid brackets, and subsequent adjustment by bending to achieve proper alignment. If the EMRV actuators are set up in a condition where the posts are not optimally aligned, preferential wear of the post is observed due to interaction of the post, spring, and guide.

The vendor guidance for refurbishment of the EMRV actuator does not provide the necessary acceptance criteria for alignment of the posts to guides to ensure that the springs, posts, and guides do not interact in a way that causes preferential wear of the post allowing the jamming mechanism to exist. Post adjustment is a critical parameter for proper valve operation, since misalignment increases the risk of failure due to accelerated component wear by fretting. The maintenance procedure controlling the refurbishment of the EMRV actuators lacks guidance for acceptable post, guide, spring, and plunger wear, as well as component adjustment tolerances, and transportation and storage. Also, since the current as-found stroke testing is performed in the hot machine shop as part of the refurbishment, transportation from the drywell to the hot machine shop can have a negative impact, which must be mitigated through appropriate guidance.

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Immediate Actions

The installed EMRVs were conservatively declared inoperable, and on July 7, 2014 OCNGS initiated a plant shutdown, per Tech Spec 3.4.B, for EMRV actuator as-found testing and replacement. Prior to removal from the plant, all five ERMV actuators stroked satisfactorily during as-found testing, and were replaced with newly refurbished actuators. Failure analysis of the removed actuators and an operability evaluation were performed.

Corrective Actions

1. Changed the design of EMRV solenoid operators to prevent the degraded condition from recurring.
2. Installed newly designed EMRV solenoid operators during refueling outage 1R25. (September 2014)
3. Revised procedures for EMRV Solenoid Operator Removal Refurbishment and Installation to strengthen preventative maintenance quality (component wear and acceptance criteria, component adjustment tolerances, transportation guidance).

Previous Occurrences

None. The "B" and "D" EMRV actuator failure was a first time event during the operating history of Oyster Creek.

Component Data

Component	IEEE 805 System ID	IEEE 803A Component
Relief Valve	SB	RV

Part 21 Reporting Requirements

The following information is provided at this time to meet the requirements of 10 CFR Part 21.21 (d)(4)(i) through (viii):

(i) Name and address of the individual or individuals informing the Commission.

Jeffrey P. Dostal, Plant Manager
Exelon Generation
Oyster Creek Nuclear Generating Station
Post Office Box 388
Forked River, New Jersey 08731

(ii) Identification of the facility, the activity, or the basic component supplied for such facility within the United States which fails to comply or contains a defect:

Facility: Oyster Creek Nuclear Generating Station
Component: Electromatic Relief Valve Actuator, Dresser Valve Type 6" Model 1525-VX

(iii) Identification of the firm constructing the facility or supplying the basic component which fails to comply or contains a defect:

Dresser Industries.

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(iv) Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply:

Nature of the defect: Inadequate design of the EMRV actuators in that when placed in an environment where the actuator is subject to the vibration associated with plant operation, the allowed installation tolerances between posts and guides can create a condition where the springs can jam the actuator plunger assembly by wedging between the guides and the posts.

Safety hazard which could be created by such defect: Identified condition is a Substantial Safety Hazard since it could cause the EMRV to be inoperable, which could result in a loss of safety function.

(v) The date on which the information of such a defect or failure to comply was obtained.

September 22, 2014

(vi) In the case of a basic component which contains a defect or fails to comply, the number and location of all such components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to regulations in this part:

Number and Locations of All Defective Components: Two EMRVs located in the Drywell on the Main Steam piping.

(vii) The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action.

Corrective actions have been completed (see corrective actions above).

(viii) Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

Consider actuator design change if vibration conditions at the valve location results in unexpected wear of the EMRV actuators. Perform actuator as-found stroke testing before removal for refurbishment to determine in situ operability of the component. With current design, ensure posts are aligned such that preferential wear does not occur. Spring should be optimally centered on the guide and the post and guide should be equidistant around the full circumference of the bushing.