



10 CFR 50.73

LG-18-019
March 13, 2018

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

Limerick Generating Station, Unit 1
Renewed Facility Operating License No. NPF-39
NRC Docket No. 50-352

Subject: LER 2017-004-01, Core Spray Pump Failed to Start Resulting in Condition Prohibited by TS

Reference: R. Libra (Exelon), letter to NRC (Document Control Desk), "LER 2017-004-00, Core Spray Pump Failed to Start Resulting in Condition Prohibited by TS," dated December 4, 2017. (ML17338A041)

Enclosed is a supplemental Licensee Event Report (LER), 2017-004-01, for Limerick Generating Station, Unit 1, for LER-2017-004-00, as referenced. This report expands on the cause based on additional information received, as well as provides an additional corrective action, from what was submitted in the original referenced document.

This LER is being submitted pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(B), Operation or Condition Prohibited by Technical Specifications.

There are no commitments contained in this letter.

If you have any questions, please contact Robert B. Dickinson at (610) 718-3400.

Respectfully,

A handwritten signature in black ink, appearing to read "R. Libra".

Richard W. Libra
Vice President – Limerick Generating Station
Exelon Generation Company, LLC

cc: Administrator Region I, USNRC
USNRC Senior Resident Inspector, LGS



LICENSEE EVENT REPORT (LER)

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

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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 Information Services Branch (T-2 F43), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by 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.

1. FACILITY NAME

Limerick Generating Station, Unit 1

2. DOCKET NUMBER

05000352

3. PAGE

1 OF 4

4. TITLE

Core Spray Failed to Start Resulting in Condition Prohibited by TS

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
10	05	17	2017	- 004	- 01	03	13	18	FACILITY NAME	DOCKET NUMBER
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
1			<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)		<input type="checkbox"/> 50.73(a)(2)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(viii)(A)		
			<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(B)		<input type="checkbox"/> 50.73(a)(2)(viii)(B)		
			<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)		<input type="checkbox"/> 50.73(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(ix)(A)		
			<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(iv)(A)		<input type="checkbox"/> 50.73(a)(2)(x)		
10. POWER LEVEL 100			<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(A)		<input type="checkbox"/> 73.71(a)(4)		
			<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(B)		<input type="checkbox"/> 73.71(a)(5)		
			<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(v)(C)		<input type="checkbox"/> 73.77(a)(1)		
			<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)		<input type="checkbox"/> 50.73(a)(2)(v)(D)		<input type="checkbox"/> 73.77(a)(2)(i)		
			<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(vii)		<input type="checkbox"/> 73.77(a)(2)(ii)		
			<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> OTHER		Specify in Abstract below or in NRC Form 366A				

12. LICENSEE CONTACT FOR THIS LER

LICENSEE CONTACT

Robert B. Dickinson, Manager – Regulatory Assurance

TELEPHONE NUMBER (Include Area Code)

(610) 718-3400

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	BM	BKR	A576	Y	N/A	N/A	N/A	N/A	N/A

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

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

On October 5, 2017, when the 1C Core Spray pump breaker hand switch was placed in start, the breaker failed to close. The 1C Core Spray Pump was declared inoperable and Limiting Condition for Operation (LCO) Action 3.5.1.a.1 was entered. **An initial investigation identified that the breaker limit switch which energizes the closing springs charging motor became dislodged inside the control device. With the contact unable to complete the circuit, the charging motor could not energize to charge the closing springs. An Exelon Power Labs analysis identified the cause of the failure to be associated with welding of the limit switch contacts eventually resulting in displacement of the limit switch.** This condition existed since the last time the 1C Core Spray Pump was in service, July 17, 2017, until the discovery on October 5, 2017. Although this event was not considered to be within the Station's ability to foresee and correct, the LCO Actions were not completed in the required time frames provided in Technical Specification (TS). Therefore, an Operation or Condition Prohibited by TS existed and is reportable under 10 CFR 50.73(a)(2)(i)(B).

**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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		YEAR	SEQUENTIAL NUMBER	REV NO.
Limerick Generating Station, Unit 1	05000352	2017	- 004	- 00

NARRATIVE**I. Unit Conditions Prior to the Event**

Limerick Generating Station (LGS) Unit 1 was operating in Operational Condition (OPCON) 1 at 100 percent power at the time of the event. There were no other structures, systems, or components inoperable that contributed to the event.

II. Description of the Event

On October 5, 2017 at 03:45, LGS, Unit 1 commenced a Pump Valve and Flow (PV&F) test for 1A Core Spray [BM] in accordance with Technical Specifications (TS) Surveillance Requirement 4.5.1.b.1.

On October 5, 2017 at 04:00, when the 1C Core Spray pump breaker hand switch was placed in start, the breaker failed to close. Investigation at the breaker [BKR] showed that the closing springs on 1C Core Spray Pump did not indicate as charged. Therefore, the 1C Core Spray Pump was declared inoperable due to failure to start when demanded from the Main Control Room (MCR) hand switch and Limiting Condition for Operation (LCO) Action 3.5.1.a.1 was entered due to one Core Spray Subsystem (CSS) being inoperable.

On October 5, 2017 at 23:00 the LCO was exited when 1C Core Spray breaker was repaired and the PV&F test was completed.

Investigation of the 4KV breaker identified that the breaker closing springs were not fully charged which prevented the breaker from closing. A faulty control device was determined to be the cause and the device was replaced.

The 1C Core Spray pump was last in service on July 17, 2017 to support motor testing. It was determined that the 1C Core Spray pump had been inoperable from July 17, 2017 to the time of discovery of this condition on October 5, 2017. **Exelon Power Labs analysis revealed that during the previous operation of the breaker, on July 17, 2017, the breaker retaining spring became dislodged as a result of multiple breaker operations and welding action that was occurring with the limit switch contact closed.**

Although this event was not considered to be within the Station's ability to foresee and correct, the LCO Actions were not completed in the required time frames provided in TS. Therefore, an Operation or Condition Prohibited by TS existed and is reportable under 10 CFR 50.73(a)(2)(i)(B).

III. Analysis of the Event

When the breaker is initially racked into the switchgear, the closing springs will be discharged. As the breaker reaches the test position, 125 VDC is applied to the breaker control device and the closing springs charging motor will energize due to the closing springs limit switch being closed. After the closing springs are charged, the limit switch will open to de-energize the charging motor. The closing springs remain charged as the breaker is racked into the connected position. With the closing springs

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charged, the breaker is capable of closing on demand.

Any time the breaker is closed, the closing springs will discharge and as a result, the closing springs limit switch will re-close to energize the charging motor. This ensures the breaker is ready for a subsequent close signal after each breaker closing operation. In this event, the closing springs limit switch was not able to be made up and the charging motor was de-energized with the closing springs not fully charged thereby rendering the breaker unable to close.

The same control device on the failed 4KV breaker is used on all 2.3 KV, 4 KV and 13.2 KV breakers on site. These breakers are susceptible to the same failure as the 1C Core Spray breaker, which could result in the unavailability of any load powered from one of these sources. The available method to determine if the closing springs are charged on any of these breakers is to inspect the closing spring tabs on the front of the breaker. The tabs will extend from the front of the breaker as the closing springs are charged. For the 1C Core Spray Pump breaker, the closing springs tabs were not fully extended when observed in comparison to other breakers. The closing spring tabs for the 2.3 KV, 4 KV and 13.2 KV switchgear have been inspected and are all in the proper condition; therefore, there is not an immediate concern that other breakers have encountered the same failure.

4 KV Breaker Preventative Maintenance (PMs) include a 6-year clean and examine and a 12-year breaker overhaul. During the overhaul PM, the control device is disassembled and the contacts are removed to be cleaned and inspected. Following reassembly of the control device, undervoltage testing is conducted on the breaker charging motor circuit. This subjects the charging motor circuit to higher current which can adversely affect the limit switch contacts. This same undervoltage testing is not performed on the 2.3 KV breakers nor the 13.2 KV breakers.

IV. Safety Significance

The CSS is a primary source of emergency core cooling after the reactor vessel is depressurized and a source for flooding of the core in case of accidental draining. The CSS, together with Low Pressure Coolant Injection (LPCI) mode of Residual Heat Removal (RHR) System, is provided to assure that the core is adequately cooled following a loss of coolant accident and provides adequate core cooling capacity for all break sizes up to and including the double ended reactor recirculation line break, and for smaller breaks following depressurization by the Automatic Depressurization (ADS) System.

TS Action 3.5.1.a.1 states, "With one CSS subsystem inoperable, provided that at least two LPCI subsystems are OPERABLE, restore the inoperable CSS subsystem to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours."

Since 1C Core Spray was inoperable from July 17, 2017 – October 5, 2017, the above TS action to restore within 7 days was not met. There were minimal safety consequences associated with the condition since there were no events during this time period which required CSS. Additionally, at least two LPCI subsystems were operable at all times during this time period.

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During this period of time the other CSS subsystem was operable for a majority of the time period. The only time that the other CSS subsystem was inoperable was when 1B and 1D Core Spray were each separately inoperable for approximately 2 hours each to conduct PV&F tests. This is within the Action times for TS Action 3.5.1.a.2. which specifies that, with both CSS subsystems inoperable, be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the next 24 hours.

V. Cause of the Event

The cause of the breaker failure to close was due to the breaker closing springs being less than fully charged. The breaker was removed, the control device was disassembled for inspection, and it was determined that the charging motor limit switch was misoriented which prevented the switch from closing to energize the charging motor. The limit switch had contact damage associated with arcing. An Exelon Power Labs analysis identified the cause of the failure to be associated with welding of the limit switch contacts eventually resulting in the limit switch displacement. The cause of the welding is believed to be the result of undervoltage testing of the breaker charging motor circuit during preventive maintenance which subjects the limit switch contacts to higher than normal current.

VI. Corrective Actions Completed/Planned

The immediate action taken was to replace the 4KV Breaker control device and return the breaker to service. Additionally, the 2.3 KV, 4 KV and 13.2 KV switchgear breaker spring tabs have been inspected to verify tabs are fully extended as expected and have been verified to be in the proper condition.

Based on the damage to the contacts from arcing, the requirements for 4 KV Breaker Charging Motor Undervoltage Tests are being evaluated in order to revise the testing requirement to minimize impact of testing on the charging motor limit switch or eliminate the testing if determined to be not required.

VII. Previous Similar Occurrences

There have been no previous similar occurrences in the last 5 years of ECCS systems being inoperable for longer than the TS allowable times without following TS required actions. Additionally, there have not been any control device failures due to a misoriented limit switch in the last 5 years.

VIII. Component data

System: BM Low Pressure Core Spray System
Component: BKR Breaker
Component number: D13-BUS-06
Manufacturer: A576 ABB ATOM AB/ABB SWEDEN
Model number: 5HK250