Part 21 (PAR) Event # 51944

Rep Org:	NUCLEAR LOGISTICS INC	**Notification Date / Time:**	05/19/2016 19:17 (EDT)
Supplier:	NUCLEAR LOGISTICS INC	**Event Date / Time:**	05/18/2016 (CDT)
		Last Modification:	06/21/2016
Region:	4	**Docket #:**	
City:	FORT WORTH	**Agreement State:**	Yes
County:	TARRANT	**License #:**	
State:	TX		
NRC Notified by:	TRACY BOLT	**Notifications:**	GEOFFREY MILLER R4DO
HQ Ops Officer:	RICHARD SMITH		GEORGE HOPPER R2DO
Emergency Class:	NON EMERGENCY		PART 21/50.55 REACTORS EMAIL
10 CFR Section:			
21.21(a)(2)	INTERIM EVAL OF DEVIATION		
21.21(d)(3)(i)	DEFECTS AND NONCOMPLIANCE		

PART 21 INTERIM EVALUATION OF A DEVIATION - CONTACTOR FAILURE

The following was received via FAX:

On May 18, 2016, Nuclear Logistics INC. (NLI) determined that a contactor failure that occurred at the Shearon Harris plant had failed due to an auxiliary contact chatter present on the seal-in circuit for the coil voltage. The auxiliary contact chatter was caused by the loss of the shading coils. NLI will be submitting a full report on the issue to the NRC within 60 days.

The contactor that failed was a Size 4 Eaton Freedom Series with a special coil for degraded voltage condition.

Reference Number: P21-05192016

NLI reported that the following plants have these types of contactor's:

Region 2: Oconee, Turkey Point, Shearon Harris and North Anna

Region 4: Columbia and Waterford

* * * UPDATE AT 1832 EDT ON 06/20/16 FROM TRACY BOLT TO DANIEL MILLS * * *

The following is excerpted from the licensee submission:

"The specific part which fails to comply or contains a defect: The Contactor that failed in service is a Size 4 Eaton Freedom Series with an AZZ/NLI special coil for meeting specific degraded voltage conditions.

IE19
NRR

"Extent of condition: Size 3, 4 and size 5 Eaton Freedom Series contactors or starters with an NLI special degraded voltage coil that have been supplied by AZZ/NLI since December 2010.

"NLI procured the commercial grade contactors and installed the special coil that was required to achieve the specific degraded voltage condition. The units were qualified, dedicated and supplied for safety related applications. The contactors were commercially procured from Eaton, the Original Equipment Manufacturer (OEM).

"For contactors/starters utilized in continuous duty applications. the OEM shading coils on the contactor core ... have the potential to become loose and fall off. If the shading coils are not in the intended location on the core, there is the potential for excessive chatter to occur on the normally open auxiliary contacts that are closed when the contactor is energized.

"The safety function of the contactor is to reliably supply uninterrupted power (no contact chatter) to a load on demand. For special degraded voltage applications, the NLI supplied contactor is equipped with an NLI special coil that replaces the OEM coil.

"When the contactor/starters that have the special coil installed are utilized in a continuous duty operation (continuously energized greater than 60 minutes) the special coil reaches a higher temperature than the original manufacturer's coil. The increased heat is potentially causing degradation of the acrylic resin that is utilized by the manufacturer to hold the OEM shading coils onto the OEM core. After the acrylic resin is no longer providing a secure hold on the shading coils, the shading coils can then become loose from the iron core.

"Name and address of the individual or individuals informing the Commission.
"Tracy Bolt, Director of Quality Assurance
"Nuclear Logistics, Inc.
"7410 Pebble Drive
"Ft. Worth, TX 76118"

AZZ/NLI Part 21 Report No: P21-05192016, Rev. 0

Plants potentially impacted include Oconee, Shearon Harris, Columbia, Turkey Point, North Anna, and Waterford.

Notified R4DO (Rollins), R2DO (Musser) and Part 21/50.55 Reactors group (via email).

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Date: 6/20/2016

To:

FAX (301) 816-5151
Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

From:

Tracy Bolt
Director of Quality Assurance
AZZ|NLI Nuclear Logistics
7410 Pebble Drive
Fort Worth, Texas 76118

Subject:
10CFR Part 21 Notification Report for Size 4 Freedom Series Contactor with NLI Special Coil

Ref: P21-05192016

Total pages including this page: 7

Date: June 20, 2016

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Part 21 Report No: P21-05192016

Subject: 10CFR Part 21 Notification Report for Size 4 Freedom Series Contactor with NLI Special Coil

Pursuant to 10CFR 21.21 (d) (3) (ii), AZZ|NLI is providing formal written notification of the identification of a defect.

On the basis of our evaluation, it is determined that AZZ|NLI has sufficient information to determine if the subject condition has the potential to create a Substantial Safety Hazard if left uncorrected, as it relates to the subject plant applications.

The following information is required per 10CFR 21.21 (d) (4).

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

Tracy Bolt, Director of Quality Assurance
Nuclear Logistics, Inc
7410 Pebble Drive
Ft. Worth, TX 76118

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

The specific part which fails to comply or contains a defect:

- The Contactor that failed in service is a Size 4 Eaton Freedom Series with an NLI special coil for meeting specific degraded voltage conditions.
- Extent of condition:
  - Size 3, 4 and size 5 Eaton Freedom Series contactors or starters with an NLI special degraded voltage coil that have been supplied by NLI since December 2010.

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

NLI procured the commercial grade contactors and installed the special coil that was required to achieve the specific degraded voltage condition. The units were qualified, dedicated and supplied for safety related applications. The contactors were commercially procured from Eaton, the Original Equipment Manufacturer (OEM).

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

For contactors/starters utilized in continuous duty applications, the OEM shading coils, on the contactor core, shown in Figure 1 below, have the potential to become loose and fall off. If the shading coils are not in the intended location on the core, there is the potential for excessive chatter to occur on the normally open auxiliary contacts that are closed when the contactor is energized.

The safety function of the contactor is to reliably supply uninterrupted power (no contact chatter) to a load on demand. For special degraded voltage applications, the NLI supplied contactor is equipped with an NLI special coil that replaces the OEM coil.

When the contactor/starters that have the special coil installed are utilized in a continuous duty operation (continuously energized greater than 60 minutes) the special coil reaches a higher temperature than the original manufacturer's coil. The increased heat is potentially causing degradation of the acrylic resin that is utilized by the manufacturer to hold the OEM shading coils onto the OEM core. After the acrylic resin is no longer providing a secure hold on the shading coils, the shading coils can then become loose from the iron core. See the figures 1 and 3 below for identification of the shading coils.

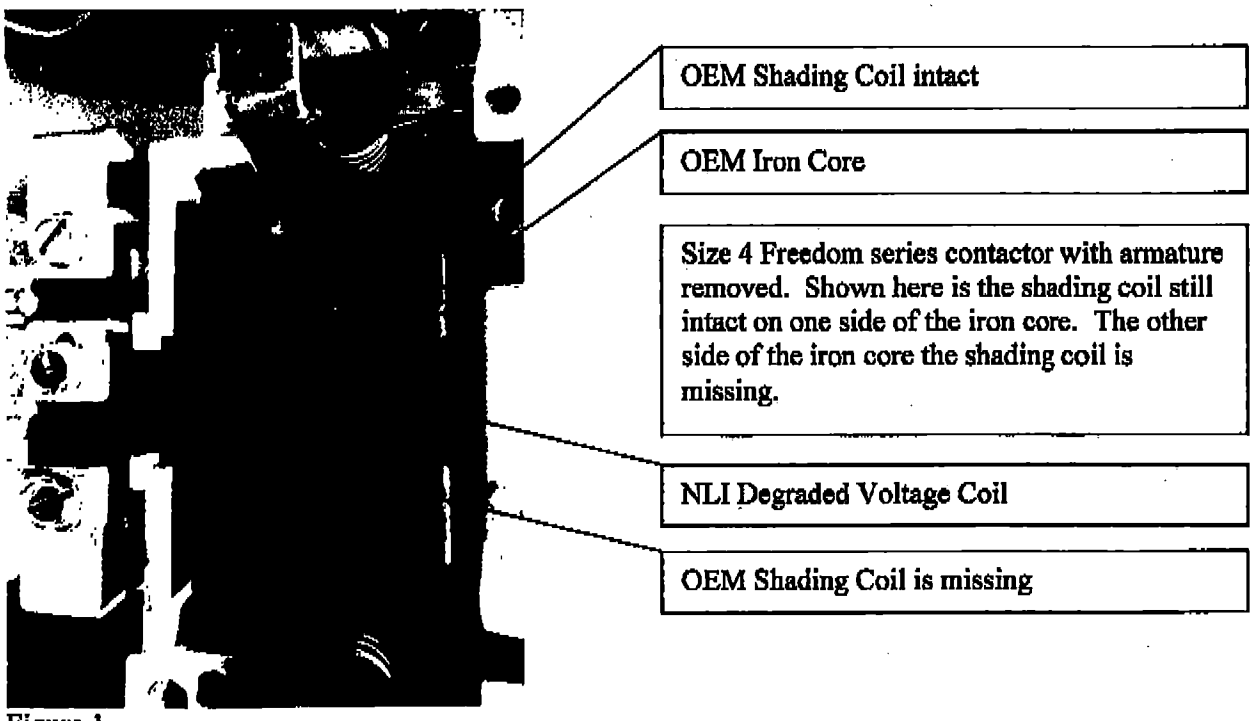
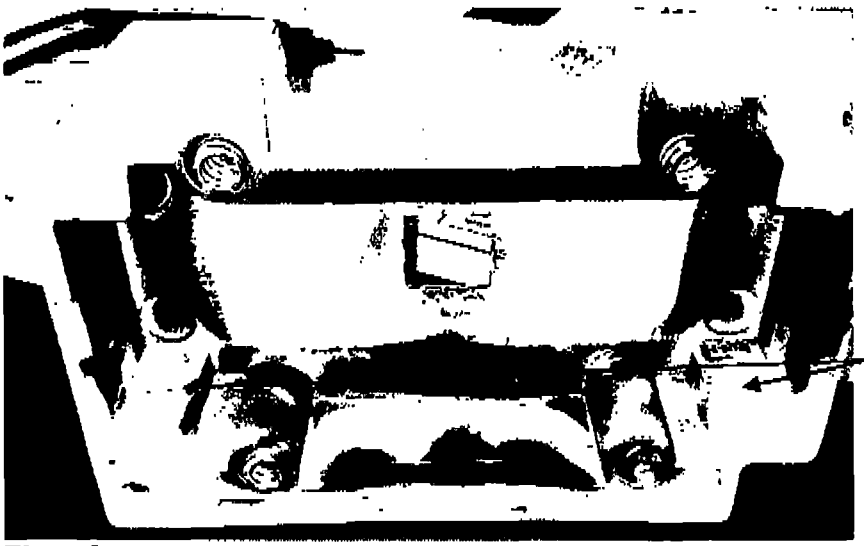


Figure 1

The NLI special degraded voltage coil is designed to generate a higher required current at the degraded voltage condition. Respectively, this higher current causes higher temperatures in the OEM core that contains the OEM shading coil.

The condition of the shading coils being loose from the core during operation causes a considerable amount of audible noise due to the armature repeatedly coming away from and then being re-magnetized to the core at 120 cycles per second. There is no evidence of any contact chatter on the main contacts. However, there has been recordable contact chatter on the normally open auxiliary contacts that are closed when the contactor is energized. On the size 4 starter, the internals showed evidence of increased wear (See Figure 2 below). If the auxiliary contacts are being used for "seal-in" for the contactor or providing power to an auxiliary relay, there is a potential for the chatter to be significant enough to drop out the contactor or cycle an auxiliary relay. This scenario would only be prevalent if the shading coils are loose from the iron core and the unit is operating without the shading coils in place.



Inside the cover of the Size 4 Freedom series contactor after operating continuously for 35 hours without the shading coils installed. The armature guides were worn and the armature created grooves in the cover.

Figure 2

The condition of the OEM shading coils becoming loose and excessive contact chatter is not considered credible failure modes for the contactors/starters that are not being utilized in continuous duty applications. In intermittent duty applications, the OEM core temperature does not increase to a level that will cause the OEM shading coils to become loose from the iron core.

Figure 3

This condition of the internal wear of the armature guides and case is not considered a credible failure mode for Size 3 contactors that have lost their shading coils, due to the armature mechanism in the Size 3 contactor is a completely different configuration.

Although the NLI degraded voltage coils have exhibited cracking in the potting material, there has been no impact in the performance of the NLI coils. There have been no failures attributed to the NLI coil performance. In all cases the NLI coil performed as originally designed. The cracks in the potting material were evaluated and tested. There was no reduction in the insulation properties of the NLI coil. The potting material is a secondary barrier and its primary purpose is to provide the configuration and shape for installation purposes.

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

On May 18, 2016, enough information was gathered from the evaluations being performed to determine the reportability of the failure to comply that is the root cause for the event.

(vi) **In the case of a basic component which contains a defect or fails to comply, the number and location of these 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 the regulations in this part.**

Client purchase orders for Size 3, 4 and Size 5 Contactors/Starters with the special coil that have been procured and dedicated are identified below.

Plant Name	Year Supplied	Project Number	Purchase order	Size 3	Size 4	Size 5
Duke Oconee	2002-2003	057-018	NE3818	X	-	-
	2003	057-025	ON53103	-	-	X
Duke Sharon Harris	2013-2015	130-17484	645690	X	X	X
	2014-2015	351022299	00732763	X	X	X
	2016	351025137	03015677	-	X	-
Energy Northwest Columbia	2013-2015	113-17684	00337098	X	-	-
FPL Turkey Point	2010-2013	037-14012	00132214	X	X	-
	2015	351022590	02328012	-	X	-
	2015	351024406	02341138	-	X	-
	2014	351021145	02324457	X	-	-
Dominion North Anna	2013-2014	075-16264	70239037	X	X	-
	2013	351020827	4500072645	X	X	-
	2015	351022537	70275270	X	X	-
	2016	351024410	4500243559	X	-	-
Entergy Waterford	2014	351020998	10388792	X	-	-

(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.**

NLI has enhanced the design of the original OEM restraint for the shading coil that can withstand the higher temperatures associated with the NLI special coil.

NLI has completed a 5 year mild environment seismic qualification for the design enhancement.

NLI is currently in the process of completing qualification for the additional qualified life per the specific utilities that the units have been supplied to since December 2010.

(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.**

The extent of condition is limited to Sizes 3, 4, and 5 due to the design placement of the OEM shading coil set in a groove on top of the OEM core solely retained by a press fit design and acrylic resin top coat.

Contributing factors for consideration:

- Contactors supplied after December 2010
- Contactors utilizing the NLI Special Degraded Voltage Coils, used in continuous operation (continuously energized contactor for > 60 minutes). The time duration of 60 minutes was derived from the required time it takes the NLI special coil to achieve the maximum temperature of the standard OEM coil.
- Components powered through the normally open auxiliary contacts that are closed when energized.
    - The specific failure identified caused the contactor to open after the shading coils had become loose from the iron core and the unit was utilizing one of the auxiliary contacts on the contactor for sealing in the coil voltage.

The applications in which the contactors are being utilized should be evaluated to determine if the NLI special coils are being used in a continuous duty application. The size 3, 4 and size 5 contactors are only susceptible to failure after the OEM shading coils become loose from the contactor. The contactors that are being utilized in the continuous duty applications should have the qualified shading coil enhancement procedure performed at the earliest convenience.

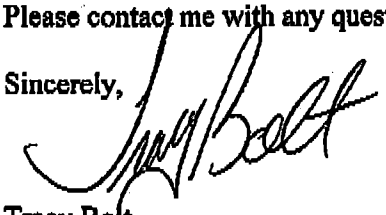
If the contactors are noticed to be creating an excessive amount of noise >85db when energized, then the unit should be monitored and evaluated to determine if the OEM shading coils have become loose from the unit. If the OEM shading coils have become loose from the iron core, NLI recommends that the qualified modification be performed. If the inside of the contactor case is severely worn, NLI recommends that the unit be replaced.

While the potting material of the NLI special coil may exhibit cracking due to temperature rise during contactor operation, no evidence has been found to suggest the coils have failed to perform their intended safety function.

The OEM shading coils associated with the size 1 and 2 cores are physically secured by the surrounding coil and contactor casing when installed. As a result, the OEM shading coils cannot fall off and are not affected or part of the extent of condition. No action is required for the size 1 or 2 contactor/starters.

Please contact me with any questions or comments.

Sincerely,



Tracy Bolt
Director of Quality Assurance