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U.S. Nuclear Regulatory Commission  
Washington, DC 20555  
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Part 21 Report No: P21-02082019IR-1, Rev. 2

Subject: Report of potential 10CFR Part 21, EATON Size 1 and 2 A200 Series Starters/Contactors

Pursuant to 10CFR 21.21 (d) (3) (ii), AZZ Nuclear is providing written notification of the identification of a deviation.

AZZ Nuclear is unable to perform the 10CFR part 21 evaluation to determine if the deviation identified could create a substantial safety hazard if left uncorrected.

PDMS material has been identified in the Eaton A200 series starters/contactors with date code T4115 (41<sup>st</sup> week of 2015) which is outside the range of May 2008 to December 2012 that were originally identified in NRC Event Number 51611 from 2015.

The deviation reported to AZZ by Susquehanna has been reviewed. The failed units were supplied to AZZ for evaluation. The evaluation has been completed to determine if there are other variables which may have contributed to the condition that was reported at the plant. The units evaluated are only the size 1 style. The size 2 units are the same basic configuration as the size 1. There have been no reported issues with size 3 and greater.

The conditions at the plant of a failure to open when de-energized could not be replicated at Nuclear Logistics with new starters. However, the failure was able to be replicated on the returned starters in which the condition was already present.

**The application in which the unit was discovered to not operate as expected:**

At Susquehanna Station, Drywell Cooling Fan application, Continuous Duty Operation, Size 1 Reversing starter installed in a 2-speed configuration utilizing an additional non-reversing starter wired in a configuration to allow for Fast Speed and Slow Speed operation. The condition was identified during a surveillance activity on the reversing starter portion of the assembly.

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Additional facilities where the A200 Series Starter/Contactors have been supplied by AZZ Nuclear / Nuclear Logistics:

BRAIDWOOD  
CALVERT CLIFFS  
GRAND GULF  
HATCH  
HB ROBINSON  
KRSKO  
LIMERICK  
PEACH BOTTOM  
PILGRIM  
PSEG  
SHEARON HARRIS  
ST. LUCIE

Results of the evaluation of the deviation are as follows:

In addition to the evaluation and testing performed by Nuclear Logistics, an inquiry was made to the manufacturer as to the phenomenon that was experienced at the Susquehanna facility. Eaton provided information that confirmed that the material that has caused the contactor to remain closed after removal of the voltage originates from the laminations of the core and armature.

The testing that has been conducted by Eaton has confirmed that in rare cases with the right conditions, the organic based non-metallic material can leach out from the core and armature and migrate to the mating surface of the core and armature. Once migration to the pole face surface occurs, the polyester content degrades due to heat, moisture, and oxygen, becoming tacky. In a small percentage of the test samples, the adhesive properties exceeded the known force of the contactor kick-out and contact springs, and the contactor failed to open.

Contributing factors for the condition to be present:

- The contactor is continuously energized without cycling for extended periods of time.
- The contactor is being energized at elevated voltages for extended periods of time.
- Excessive heat, as voltage increases the heat generated in the contactor core will also increase.

Eaton has also indicated that the units are not defective and the units are still able to be utilized.

Currently, Eaton is in the process of final testing, changing specifications, qualifying suppliers, and industrializing the change to the new material for future production. The change will take place over the next several months.

Based on the information provided by the manufacturer and the testing and inspections of the contactors at Nuclear Logistics, the most probable cause of the issues seen at the plant are due to the control voltage being at an elevated level without cycling for extended periods of time which would lead to the material in the core and armature to soften, leach out and become tacky. It has also been confirmed that once the starter/contactor has experienced the failure or delay in opening after the power is removed, the condition can be repeated at rated voltage.



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  
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Please contact me with any questions or comments.

Sincerely,

A handwritten signature in cursive script that reads "Tracy Bolt".

Tracy Bolt  
Director of Quality Assurance

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