Paragon

Date: 6/20/2025

To: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555
Fax Number (301)816-5151

10CFR Part 21 Notification: P21-03302021, Rev. 3

Subject: Failures of Size 1 and 2 Freedom Series Full Voltage Reversing Starters

Pursuant to 10CFR 21.21, Paragon Energy Solutions, LLC is providing written notification of the identification of a defect.

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

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

Richard Knott, Vice President, Quality Assurance
Paragon Energy Solutions, LLC
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.

Dominion - North Anna Station has identified instances where Size 1 and 2 starters have failed to function as expected in assemblies that were originally supplied by NLI/Paragon. The mechanical interlock exhibited binding that prevented the contactor from closing when energized.

Callaway has also reported size 1 and size 2 reversing starters that experienced binding of the mechanical interlock.

The specific part which fails to comply or contains a defect:
Eaton Starter Model AN56DN*, AN56GN*, CN55DN*, CN55GN* style Starters and Contactors.

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

Components were originally supplied by
Paragon Energy Solutions (formerly Nuclear Logistics Inc.)
7410 Pebble Drive, Fort Worth Texas 76118

(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.

Binding of the mechanical interlock preventing the contactor from closing on demand.

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

Date of Discovery: 3/29/2021 and 5/14/2025

(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.

The issue was identified on supplied starters identified below:
North Anna Station
Size 1, 73262-025-00028 (Date Code: T4515)
Size 2, 73262-028-00001 (Date Code: T4215)

T4215 = 42nd week of 2015
T4515 = 45th week of 2015

Callaway
Size 1, 92914-020-00011 (Date Code T0418) and 107465-04-00002 (Date Code: T0920)

T0418 = 4th week of 2018
T0920 = 9th week of 2020

Starters have been supplied to the identified plants below within the following date range September 2014 through March 2022. Paragon has identified the date codes of the supplied

starters and contactors to provide the specific information to the identified plants. This information has been provided directly to the specific plant.

Plant
Beaver Valley
Columbia
Ergytech/Cofrentes
Harris
NEK KRSKO
North Anna
Prairie Island
Callaway
Turkey Point
Watts Bar
Ansaldo Nucleare - KRSKO

(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.

The component design that exhibited the failure was revised by the original equipment manufacturer (EATON) in September of 2014. The failed units were from Date Codes T4215 and T4515 which are in the 42nd and 45th weeks of 2015. In September 2018 the drawing was revised again. In discussions with the OEM the revision of the drawing was due to a change in material type and was not a result of binding issues.

Samples of mechanical interlocks from within the September 2014 and September 2018 timeframe were analyzed. Dimensions were compared to the manufacturer's drawing and were found to be out of tolerance for several dimensions. It is possible that the out of tolerance dimensions contributed to the binding issue.

The manufacturer, EATON, provided the following information:
The Rev. 001 drawing was created in September 2014 due to the following reasons:

1. The original plastic raw material was discontinued by their supplier and had to be replaced.
2. Dimension 0.682±.004" was changed to 0.702" ±.004 due to a potential issue with the DC coils due to higher pull-in force, the mechanical interlock did not prevent the outside pole of the reverse contactor from closing (this issue was not present on AC coils).
3. Both of these changes were implemented in late September 2014.

Revision 2 of the interlock drawing was due to an additional material change, as a result of the new material, additional dimension tolerances were revised.

During the evaluation of the binding issue of the failed starters, it was verified that the interlock was able to be placed into a position where the starter would consistently bind. When the interlock was properly installed and placed all the way down in the slot, the starter would not bind. However, if manually pulled up in the slot, the starter was able to be bound repeatedly. The starters when originally supplied were fully tested and verified to not bind and they properly functioned at the plant when installed for greater than 50 and 100 times respectively. It is clear based on the repeated successful operation for greater than four years in service that the interlocks were properly installed when supplied. The units did not fail immediately after being installed. The only conclusion would be that the interlocks were able to slowly creep from their original installed position to a higher placement within the slot in which they were originally installed. This led to the binding of the starter when the failure occurred.

It is believed that the changes that EATON incorporated to fix the lack of interlocking ability for the DC coil application negatively impacted the starter in creating the potential for binding.

The issue is believed to be a condition caused by a tolerance stack up of the non-metallic components, whereas if the interlock dimensions are not within tolerance and there is enough play/movement in the slot area for the interlock to creep up in the slot, there is a potential for the starter to bind, preventing the starter to operate properly on demand.

Update: Revision 3 of the interlock drawing was revised on February 18, 2022 to formalize the material from RM 695-5684 RTP B-2000 to Rynite FR530 53836UJ, black. Additionally, a design manufacturing improvement was implemented in the form of tooling modifications to change the specification of the length dimension from 0.702" ±.004" to .700" +.002" / -.005". This tolerance change was implemented to avoid the binding issue.

For conservatism, Paragon is extending the upper end bounding date code to be through March 2022.

(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.

Due to the number of starters that have been installed and in service without issue, it is highly unlikely that there is a defect within all the supplied starters in the date range of September 2014 through March 2022.

Paragon recommends the following:

There are two options based on the end use application. Depending on the application, the interlock may be removed and discarded, as these starters are typically wired in a configuration that establishes an electrical interlock preventing both contactors from being energized at the same time. However, there may be some applications where the application requires the mechanical interlock to be installed. In these cases, the mechanical interlock can be replaced with a new mechanical interlock that was not manufactured within the identified date range of September 2014 through March 2022.

Please contact me with any questions or comments.

Sincerely,

Vice President Quality Assurance
Paragon Energy Solutions

Note:
Revision 1 was to correct the identified date code and to add the size of the starter and serial numbers of the units that failed.
Revision 2 for completion of the evaluation, removed Millstone from the list of affected plants.
Revision 3 is to expand date range from September 2014 through March 2022. Added additional affected plants based on the expanded date range scope of supply.