Paragon

Date: 10/27/2021

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

10CFR Part 21 Formal Notification: P21-09282021, Rev. 0

Subject: Final Notification of a Deviation with Inverter Assembly (Model NLI-072034-CSI-K-5-A)

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

On the basis of our evaluation dated 9/3/2021, it was determined that Paragon did not have sufficient information to determine if the subject condition would, or has, created a Substantial Safety Hazard or would have created a Technical Specification Safety Limit violation as it relates to the subject plant applications.
Exelon - Limerick and Peach Bottom were notified on 9/3/2021.
Duke - Brunswick was notified on 9/7/2021.

On 9/28/2021, Exelon Peach Bottom provided information indicating that the failure of the unit in service could cause a substantial safety hazard in their application.

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, Chief Nuclear Officer
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.

Inverter Assembly 1000VA
NLI P/N: NLI-072034-CSI-K-5-A
Exelon – Peach Bottom, Limerick
Duke – Brunswick

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

Components were originally supplied by
Nuclear Logistics, LLC
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.

Paragon's investigation of the failed units has concluded that Absopulse Model CSI-K-B-Q9573-1 units manufactured with transformer TR121D125/202A installed within their DC-DC converters, pose a higher risk of failing randomly during operation. These transformers were used in some of the post 2015 Absopulse inverter designs where the heat sink mounted rectifiers are being exposed to voltage levels beyond their design limits. It is our belief that prolonged operation could cause premature failure of the rectifier at indeterminate operational intervals.

The deviation relates to failure of the installed Absopulse 1000VA inverter (Model CSI-K-B-Q9573-1). The extent of condition is currently limited to Absopulse inverters manufactured or repaired in 2015 and later. As stated above, the root cause of the failure has been determined to be the transformer P/N: TR121D125/202A. It is not an issue with the transformer in general, just this specific transformer in this application. Of the post 2015 Absopulse Model CSI-K-B-Q9573-1 inverter design, the identified failures in the industry are low compared to the number of units that have been supplied. Paragon was able to run testing on an additional post 2015 unit that was on site. The additional unit did not exhibit the same high voltage spikes which were witnessed on the two failed Peach Bottom units. The reason for this is isolated to a variance in transformer model within the post 2015 converter designs.
The two failed Peach Bottom units utilized transformer model TR121D125/202A which is approximately a 4x step-up transformer, while the unit which does not exhibit high voltage spikes utilized model TR121D125/115A, which is approximately a 2.5x step-up transformer. It is Paragon's belief that post 2015 inverters, that have the TR121D125/202A (4x step-up), pose a higher risk of failing randomly during operation in this specific application.

The safety function of the DC/DC converter output rectifier is to provide the appropriate voltage output to downstream loads.

Although the failed component is the DC-DC converter output rectifiers (ROHM P/N: SCS210KE2) the root cause of the DC/DC converter failure is due to the 4X step-up transformer model TR121D125/202A.

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

On 9/28/2021, Exelon Peach Bottom provided information indicating that the failure of the unit in service could cause a substantial safety hazard in their application if left uncorrected.

(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 following table identifies the units that were supplied or refurbished after 2015

Plant	Client PO#	Project Number	NLI Model	Qty	Type of supply
Peach Bottom	90 065497	351021814	NLI-072034-CSI-K-5-A	4	New
Limerick	00606902	351026560	NLI-072034-CSI-K-5-A	2	New
Limerick	00663381	351027091	NLI-072034-CSI-K-5-A	2	New
Limerick	00704133	351029204	NLI-072034-CSI-K-5-A	2	New
Brunswick	03050825	351026846	NLI-072034-CSI-K-5-A	6	New
Brunswick	03052088	351026941	NLI-072034-CSI-K-5-A	1	New
Limerick	90 082966	351024754	NLI-072034-CSI-K-5-A	1	Refurbished
Limerick	90 083949	351024926	NLI-072034-CSI-K-5-A	1	Refurbished
Limerick	90 086799	351025299	NLI-072034-CSI-K-5-A	1	Refurbished
Limerick	00654374	351027748	NLI-072034-CSI-K-5-A	1	Refurbished
Limerick	00684578	351028652	NLI-072034-CSI-K-5-A	1	Refurbished
Limerick	00697845	351029024	NLI-072034-CSI-K-5-A	1	Refurbished
Peach Bottom	00694785	351028920	NLI-072034-CSI-K-5-A	1	Refurbished

(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.

This issue has been entered into the Paragon Non-Conformance and Corrective Action Program. Paragon has communicated with the commercial OEM regarding their corrective actions to prevent the recurrence of this issue in future units supplied to Paragon.

Paragon Corrective Actions:

- Paragon has created an inspection procedure for existing supplied units.
- The identified plants have been provided the inspection procedure to help identify suspect inverters that were built or refurbished after 2015 that may contain the 4x step up transformer.
- Paragon will work with the identified plants to rework the inverter assemblies that require the transformer replacement. Expected completion: at the plant's discretion
- The assembly instructions and/or Test plans will include an inspection to ensure the correct transformer is installed. Expected completion: by 11/30/2021

(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.

Paragon recommends the following:

Screen the generation of Absopulse inverter installed in your equipment through visual inspection. Paragon has written and provided Inspection Procedure IP-NLI-072034-CSI-K-5-A to aid the plants with their screening process.

If screening identifies the problematic transformer or if screening activities are not available at the plant; remove, segregate and return post 2015 supplied units.

Sincerely,

Tracy Bolt
Chief Nuclear Officer
Paragon Energy Solutions
817-284-0077
tbolt@paragones.com