

Part 21 (PAR)

Event # 52736

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County:	License #:		
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NRC Notified by: ETHAN SALSBURY		Notifications: JAMES DWYER R1DO	
HQ Ops Officer: JEFF HERRERA		ROBERT ORLIKOWSKI R3DO	
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10 CFR Section:			
21.21(a)(2) INTERIM EVAL OF DEVIATION			

PART 21 - INTERIM NOTIFICATION OF A POTENTIAL DEFECT ON A PRINTED CIRCUIT BOARD

"Ametek Solidstate Controls began a 10 CFR Part 21 evaluation after receiving notification from NextEra Energy Seabrook Station that a 7.5kVA Inverter would prematurely transfer to alternate source at 27A load during commissioning. The X202 Crest factor board (80-9213516-90) was replaced and the unit operated normally.

"Analysis of the failed X202 Crest Factor board identified an SCR on the printed circuit board was turning on prematurely and resulted in a transfer to alternate source or with the absence of the alternate source, to a dead bus. A capacitor was placed across the SCR on the X202 board to protect the SCR from dv/dt turn on. Subsequent testing determined the added capacitor corrected the anomaly.

"In addition to Seabrook, Ametek has recently experienced similar anomalies on two separate occasions. However, these occurrences were discovered during manufacturing and in-house testing phase for new product and were attributed to a SCR failure, excessive noise, and long leads.

"ACTION RECOMMENDED:

Ametek Solidstate Controls recommends installing a 0.22 microfarad capacitor p/n 80-134734-90 across X202 terminals J1-11 to J1-12. This capacitor will have no effect on EMI or seismic qualifications.

"If you wish to acquire the 80-134734-90 capacitor, Ametek Solidstate Controls will work with you to provide spare parts. Please contact Mr. Mark Shreve of our Client Services group at 1-800-222-9079 or 1-614-846-7500 ext. 6332. mark.shreve@ametek.com"

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SOLIDSTATE CONTROLS

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May 8, 2017

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

Attention: Document Control Desk
Subject: Interim Notification of Potential Defect - 10CFR Part 21

Product: Printed Circuit Board 80-9213516-90 Installed in Ametek Solidstate Controls
Equipment Manufactured Since May 2015

Ametek Solidstate Controls is submitting the following Report of a Potential Defect in accordance with the requirements of 10CFR21. This is an interim report as the evaluation of the root cause is ongoing. Upon determination of the final analysis, a follow up report will be issued.

The attached document provides details on the potential problem, cause and effect, and actions required. Please contact us at the phone number or email provided above if there are any questions.

Sincerely,

Ethan Salsbury
Quality Manager
Ametek Solidstate Controls

May 8, 2017

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**Interim Notification of Potential Defect – Printed Circuit Board 80-9213516-90****SUMMARY**

Ametek Solidstate Controls began a 10 CFR Part 21 evaluation after receiving notification from NextEra Energy Seabrook Station that a 7.5kVA Inverter would prematurely transfer to alternate source at 27A load during commissioning. The X202 Crest factor board (80-9213516-90) was replaced and the unit operated normally.

Analysis of the failed X202 Crest Factor board identified an SCR on the printed circuit board was turning on prematurely and resulted in a transfer to alternate source or with the absence of the alternate source, to a dead bus. A capacitor was placed across the SCR on the X202 board to protect the SCR from dv/dt turn on. Subsequent testing determined the added capacitor corrected the anomaly.

In addition to Seabrook, Ametek has recently experienced similar anomalies on two separate occasions. However, these occurrences were discovered during manufacturing and in-house testing phase for new product and were attributed to a SCR failure, excessive noise, and long leads.

PROBLEM YOU COULD SEE

The Inverter static switch could inadvertently transfer the load to bypass (or alternate source) with load applied.

The likelihood of failure is yet to be determined. However, based on the quantity operating in the field, it is believed that the likelihood of failure is low.

DISCUSSION

The testing of the returned X202 Crest Factor board took place in AEP Inverter serial number 23797-5, which had been returned to the factory for refurbishment and testing. This unit is very similar to the Seabrook Inverter which made it ideal for testing. The installed board from Seabrook transferred just as reported in the field. Analysis determined that the Q2 SCR was prematurely firing and causing the transfer to bypass.

It was suspected that Q2 was turning on due to dv/dt. The term dv/dt is the rate (speed) at which voltage is allowed to increase or decrease. This phenomenon, when an increase in voltage across the SCR occurs too quickly, can turn on the device even without a gate signal present. To prevent dv/dt turn on of the SCR, it is necessary to slow the rise time of voltage being imposed across the device. A capacitor was added across the Q2 SCR. The capacitor slows the rise time of the voltage. After the installation of the capacitor, the inverter can be subjected to any load from 0 to short circuit without forcing any static switch transfer.

In February of 2017 during a 7.5kVA the AEP refurbishment, the originally-replaced X202 board exhibited similar behavior and was replaced. At the time, it was attributed to a defective SCR. Subsequent examination was performed on the failed board and found that the dv/dt was the issue and a capacitor solved the problem.



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in January of 2017 during production testing of the 7.5 kVA inverters for Arizona Power of 2017, the inverters exhibited premature transfer at extreme overload. At the time it was attributed to the unique configuration of the equipment, it was concluded that noise was entering long leads. In this instance, ferrite cores were added to noise-sensitive wires.

The most likely cause for the SCRs turning on prematurely is dv/dt. We have used this SCR in this application for many years and have not experienced this type of issue. The SCR in question is a 4A, 200V SCR with Ametek Part Number 03-610001-00 and date code NJS1518. Other SCRs in this date code could exhibit similar characteristics.

The SCRs were purchased in May of 2015 and again in November of 2016, and most likely have the same date code. These SCRs could be in X202 Crest Factor board, part number 80-9213516-90, or inverters manufactured since May of 2015.

We are still investigating potential root causes for this anomaly.

If you are operating at a steady state load, the opportunity for transfer is low. A transient or significant load increase could increase the possibility.

ACTION RECOMMENDED:

Ametek Solidstate Controls recommends installing a 0.22 microfarad capacitor p/n 80-134734-90 across X202 terminals J1-11 to J1-12. This capacitor will have no effect on EMI or seismic qualifications.

If you wish to acquire the 80-134734-90 capacitor, Ametek Solidstate Controls will work with you to provide spare parts. Please contact Mr. Mark Shreve of our Client Services group at 1-800-222-9079 or 1-614-846-7500 ext. 6332. mark.shreve@ametek.com