



ENGINE SYSTEMS, INC.

175 Freight Road
Rocky Mount, NC 27804

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TELEFAX

Date: March 27, 2017
Company: NRC Operations Center
Fax Number: 301/816-5151
Verification No.: 301/816-5100
Reference: Report No. 10CFR21-0116, Rev. 0
From: Tom Horner
Page: 1 of 5

Dear Sir:

Following this cover is a copy of our report 10CFR21-0116, Rev. 0, for a 10CFR21 reportable notification on a diode surge suppressor, Allen-Bradley P/N 199-FSMZ-1.

A copy of this report will be mailed to the NRC Document Control Desk and to our affected nuclear customers.

Should you have questions, please let us know.

Sincerely,

ENGINE SYSTEMS, INC.

Tom Horner
Quality Assurance Manager

IEI9
NRR



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Report No. 10CFR21-0116

Rev. 0: 03/27/17

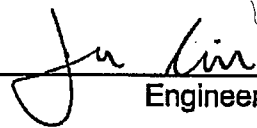
10CFR21 REPORTING OF DEFECTS AND NON-COMPLIANCE

COMPONENT: Diode Surge Suppressor
P/N: 199-FSMZ-1

SYSTEM: Emergency Diesel Generator Control System

CONCLUSION: Reportable in accordance with 10CFR21

Prepared By:



Engineering Manager

Date:

3/27/17

Reviewed By:



Quality Assurance Manager

Date:

3-27-17

REV	DATE	PAGE	DESCRIPTION
0	03/27/17		Initial issue.

COMPONENT:

Diode Surge Suppressor
Allen-Bradley P/N: 199-FSMZ-1

SUMMARY:

Engine Systems Inc. (ESI) began a 10CFR21 evaluation on February 10, 2017 after receiving notification from FirstEnergy Corp - Perry Nuclear Power Plant (PNPP) of a manufacturing defect in a diode supplied by ESI. The evaluation was concluded on March 27, 2017 and it was determined that this issue is a reportable defect as defined by 10CFR21. The manufacturing defect identified was in a diode of the same date code as two diodes that failed while installed at PNPP. The failed diodes resulted in loss of class 1E control power which could have prevented the emergency diesel generator set from performing its safety related function.

Discussion:

In January 2007, ESI supplied a governor system upgrade to PNPP. The upgrade replaced the existing Woodward EGB-35C governor/actuator, EGA control (w/ resistor box), and MOP with an EGB-35P governor/actuator, 2301A control, and DRU. The electrical components were housed in a control panel assembly. To support the slow start feature of the new system, qty 4 relays were used, each of which used a surge suppressor (flyback) diode.

PNPP experienced two failures in 2016 of the aforementioned diodes supplied by ESI. The diodes are Allen-Bradley part number 199-FSMZ-1 and they were installed across the coils of Allen-Bradley 700DC series relays. The Allen-Bradley date code stamped on the side of the diodes is BX9. The failure in both cases resulted in a short circuit condition that resulted in a loss of class 1E control power to the EDG. See below for a visual representation of a typical diode installation.

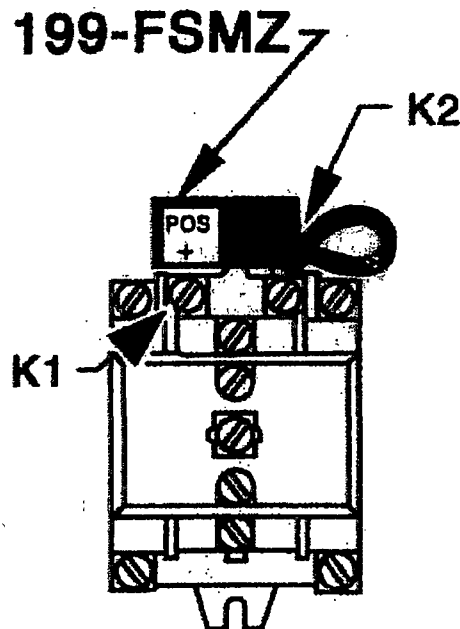


Figure 1: Typical Diode Installation

Root cause evaluation:

The root cause of the failure is determined to be a manufacturing defect internal to the diode. Though an analysis of the diodes that failed at PNPP was unable to be performed due to their condition, the analysis performed on a degraded diode of the same date code, BX9, detected an internal manufacturing defect.

Affected Users:

A listing of users with suspect diodes is provided in Table 1 below.

Customer	Customer PO#	ESI Sales Order	Qty	Date Code	C-of-C Date	Comments
FirstEnergy-Perry	45200506	8000748	8	BX9	1/04/2007	2 panels were supplied, qty. 4 diodes per panel
FirstEnergy-Perry	45200506	8000748	4	BX9	1/12/2007	Spare parts for panels
Entergy-Grand Gulf	10176857	8001068	12	ZX9	7/25/2008	2 panels were supplied, qty. 6 diodes per panel
Entergy-Grand Gulf	10188993	3004461	4	ZX9	8/19/2008	Spare parts order for panels
Progress-Shearon Harris	00579428	8001830	2	ZX9	3/14/2012	Subcomponent of relay ESI50239
Progress-Shearon Harris	00660586	3010513	2	MA9	5/21/2013	Subcomponent of relay ESI50239
Duke-Shearon Harris	03009489	3014560	2	YB9	3/30/2016	Subcomponent of relay ESI50239
TOTAL QUANTITY			34			

Table 1: Affected Users

Corrective Action:

All affected users (identified in Table 1) should perform the following:

1. Review their inventory for suspect diodes listed in Table 1. Any suspect diodes should be removed from inventory and discarded.
2. Determine if suspect diodes listed in Table 1 have been installed. Thus far, ESI has identified degraded diodes from date codes BX9 and ZX9 and it is possible that diodes from the other date codes are degraded as well. ESI has been unable to determine an expected service life. Therefore, the recommendation is to remove or replace any installed suspect diodes as soon as possible. Note that the applications for which this diode has been supplied (Enterprise engine control panels) used the same style Allen-Bradley relays as original equipment but without diode surge suppressors. It is therefore acceptable to remove the diodes and expect no change or impact to the existing equipment.

To prevent recurrence of this issue, the following has been implemented by ESI:

1. The test procedure for the diode has been enhanced to increase the test voltage and decrease the allowable leakage current. Although this was not the cause of the failure, it may have prevented identification of a degraded condition. This corrective action has already been implemented.
2. A review has been performed of other diodes supplied by ESI and at this time only this one part number is affected. A typical diode would be procured and/or sold under the diode manufacturer part number; whereas in this case it was procured from the relay manufacturer. Testing was performed using typical relay values in lieu of the diode manufacturer's acceptance criteria.

Part 21 (PAR)

Event # 52642

Rep Org: ENGINE SYSTEMS, INC.	Notification Date / Time: 03/27/2017 16:51 (EDT)
Supplier: ENGINE SYSTEMS, INC.	Event Date / Time: 03/27/2017 (EDT)
	Last Modification: 03/27/2017
Region: 1	Docket #:
City: ROCKY MOUNT	Agreement State: Yes
County:	License #:
State: NC	
NRC Notified by: TOM HORNER	Notifications: EUGENE GUTHRIE R2DO
HQ Ops Officer: BETHANY CECERE	JAMNES CAMERON R3DO
Emergency Class: NON EMERGENCY	THOMAS HIPSCHEMAN R4DO
10 CFR Section:	PART 21/50.55 REACTORS EMAIL
21.21(d)(3)(i) DEFECTS AND NONCOMPLIANCE	

PART 21 - IDENTIFICATION OF FAILED DIODE SURGE SUPPRESSOR WITH INTERNAL MANUFACTURING DEFECT

The following information is excerpted from an Engine Systems, Inc. (ESI) report received via fax:

"COMPONENT:

"Diode Surge Suppressor
"Allen-Bradley P/N: 199-FSMZ-1

"SUMMARY:

"Engine Systems Inc. (ESI) began a 10CFR21 evaluation on February 10, 2017 after receiving notification from FirstEnergy Corp - Perry Nuclear Power Plant (PNPP) of a manufacturing defect in a diode supplied by ESI. The evaluation was concluded on March 27, 2017 and it was determined that this issue is a reportable defect as defined by 10CFR21. The manufacturing defect identified was in a diode of the same date code as two diodes that failed while installed at PNPP. The failed diodes resulted in loss of class 1E control power which could have prevented the emergency diesel generator set from performing its safety related function.

"Discussion:

In January 2007, ESI supplied a governor system upgrade to PNPP. The upgrade replaced the existing Woodward EGB-35C governor/actuator, EGA control (w/ resistor box), and MOP with an EGB-35P governor/actuator, 2301A control, and DRU. The electrical components were housed in a control panel assembly. To support the slow start feature of the new system, qty 4 relays were used, each of which used a surge suppressor (flyback) diode.

"PNPP experienced two failures in 2016 of the aforementioned diodes supplied by ESI. The diodes are Allen Bradley part number 199-FSMZ-1 and they were installed across the coils of Allen-Bradley 700DC series relays. The Allen-Bradley date code stamped on the side of the diodes is BX9. The failure in both cases resulted in a short circuit condition that resulted in a loss of class 1E control power to the EDG. . .

"Root cause evaluation:

"The root cause of the failure is determined to be a manufacturing defect internal to the diode. Though an analysis of the diodes that failed at PNPP was unable to be performed due to their condition, the analysis performed on a degraded diode of the same date code, BX9, detected an internal manufacturing defect.

Affected Users:

A listing of users with suspect diodes includes FirstEnergy - Perry, Entergy - Grand Gulf, Progress - Shearon Harris, and Duke - Shearon Harris. A total quantity of 34 diodes are suspect.

"Corrective Action:

"All affected users . . . [identified above] . . . should perform the following:

"1. Review their inventory for suspect diodes listed in Table 1. Any suspect diodes should be removed from inventory and discarded.

"2. Determine if suspect diodes listed in Table 1 have been installed. Thus far, ESI has identified degraded diodes from date codes BX9 and ZX9 and it is possible that diodes from the other date codes are degraded as well. ESI has been unable to determine an expected service life. Therefore, the recommendation is to remove or replace any installed suspect diodes as soon as possible. Note that the applications for which this diode has been supplied (Enterprise engine control panels) used the same style Allen-Bradley relays as original equipment but without diode surge suppressors. It is therefore acceptable to remove the diodes and expect no change or impact to the existing equipment.

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"2. A review has been performed of other diodes supplied by ESI and at this time only this one part number is affected. A typical diode would be procured and/or sold under the diode manufacturer part number; whereas in this case it was procured from the relay manufacturer. Testing was performed using typical relay values in lieu of the diode manufacturer's acceptance criteria."

If you have any questions, you may call:

Tom Horner
Quality Assurance Manager
Tel: (252) 977-2720

ESI Report ID: 10CFR21-0116, dated 03/27/17
