

General Information or Other (PAR)

Event # 45548

Rep Org: ENGINE SYSTEMS, INC.	Notification Date / Time: 12/08/2009 11:22 (EST)
Supplier: ENGINE SYSTEMS, INC.	Event Date / Time: 12/08/2009 (EST)
	Last Modification: 12/08/2009
Region: 1	Docket #:
City: ROCKY MOUNT	Agreement State: Yes
County:	License #:
State: NC	
NRC Notified by: PAUL STEPANTSCHENK	Notifications: EUGENE GUTHRIE R2DO
HQ Ops Officer: DAN LIVERMORE	BLAIR SPITZBERG R4DO
Emergency Class: NON EMERGENCY	PART 21 COORDINATOR NRR
10 CFR Section: 21.21 UNSPECIFIED PARAGRAPH	

WOODWARD GOVERNOR SERVO FAILURE DUE TO SILVER SULFIDE CORROSION OF SURFACE MOUNT RESISTORS

"Woodward failure analysis report #85572-R001, dated 10/9/09, addressed two separate [model] PGPL remote servo failures. The failure analysis report discusses a silver sulfide corrosion issue with surface mount resistors used in the PGPL remote servo feedback transmitter circuitry. Woodward part number 9903-539 consists of a PGPL actuator and a remote servo. The PGPL actuator is mounted on the turbine's governor drive and the remote servo (Woodward part number 5296-044) is mounted at the steam valve. Hydraulic lines interconnect the PGPL to the remote servo. The PGPL actuator and remote servo was supplied by Engine Systems, Inc. (ESI) to the Callaway and Vogtle nuclear plants as part of a digital governor upgrade (Woodward 505 control) on their steam turbine generators. These are the only nuclear plants that use the P/N 9903-539 actuator remote servo assembly.

"LISTING OF WOODWARD PIN 9903-539 PGPL ACTUATORS WITH SUSPECT RESISTORS

Serial Number	Born Date	Shipped to
12369963	Nov 2000	Callaway
13305595	July 2002	Callaway
13798414	May 2004	Vogtle
13798415	May 2004	Callaway
14141720	Feb 2005	Vogtle
14409400	Sep 2005	Vogtle

"Note: Serial numbers 12369963 and 13798414 recently had the feedback board replaced during the failure analysis; these require no further corrective action."

JE19
NRR

General Information or Other (PAR)

Event # 45548



ENGINE SYSTEMS, INC.

1220 S. Washington St., Rocky Mount, NC 27801
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Telephone: 252/977-2720
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TELEFAX

Date: December 8, 2009
Company: NRC Operations Center
Fax Number: 301/816-5151
Verification No.: 301/816-5100
Reference: Report No. 10CFR21-0099, Rev. 0
From: Paul Stepantschenko
Page: 1 of 6

Dear Sir:

Following this cover is a copy of our report 10CFR21-0099, Rev.0, for a 10CFR21 reportable notification about a Woodward PGPL actuator with remote servo, P/N: 9903-539.

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.

Paul Stepantschenko
Quality Assurance Manager



ENGINE SYSTEMS, INC.

175 Freight Road, Rocky Mount, NC 27804

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Fax: 252/446-1134

Report No. 10CFR21-0099

Rev. 0: 12/07/09

10CFR21 REPORTING OF DEFECTS AND NON-COMPLIANCE

COMPONENT: Woodward PGPL actuator with remote servo P/N 5296-044
P/N: 9903-539

SYSTEM: Emergency Steam Turbine

CONCLUSION: Reportable in accordance with 10CFR21.

Prepared By: _____

[Signature]
Engineering Manager

Date: _____

12/7/09

Reviewed By: _____

[Signature]
Quality Assurance Manager

Date: _____

12/2/09

REV	DATE	PAGE	DESCRIPTION
0	12/07/09		Initial issue.

COMPONENT:

Woodward PGPL actuator with remote servo P/N 5296-044
P/N: 9903-539

SUMMARY:

Engine Systems Inc. (ESI) began a 10CFR21 evaluation on 10/9/09 to evaluate two (2) separate PGPL remote servo failures. The evaluation was concluded on 12/07/09 and was determined to be a reportable defect as defined by 10CFR21.

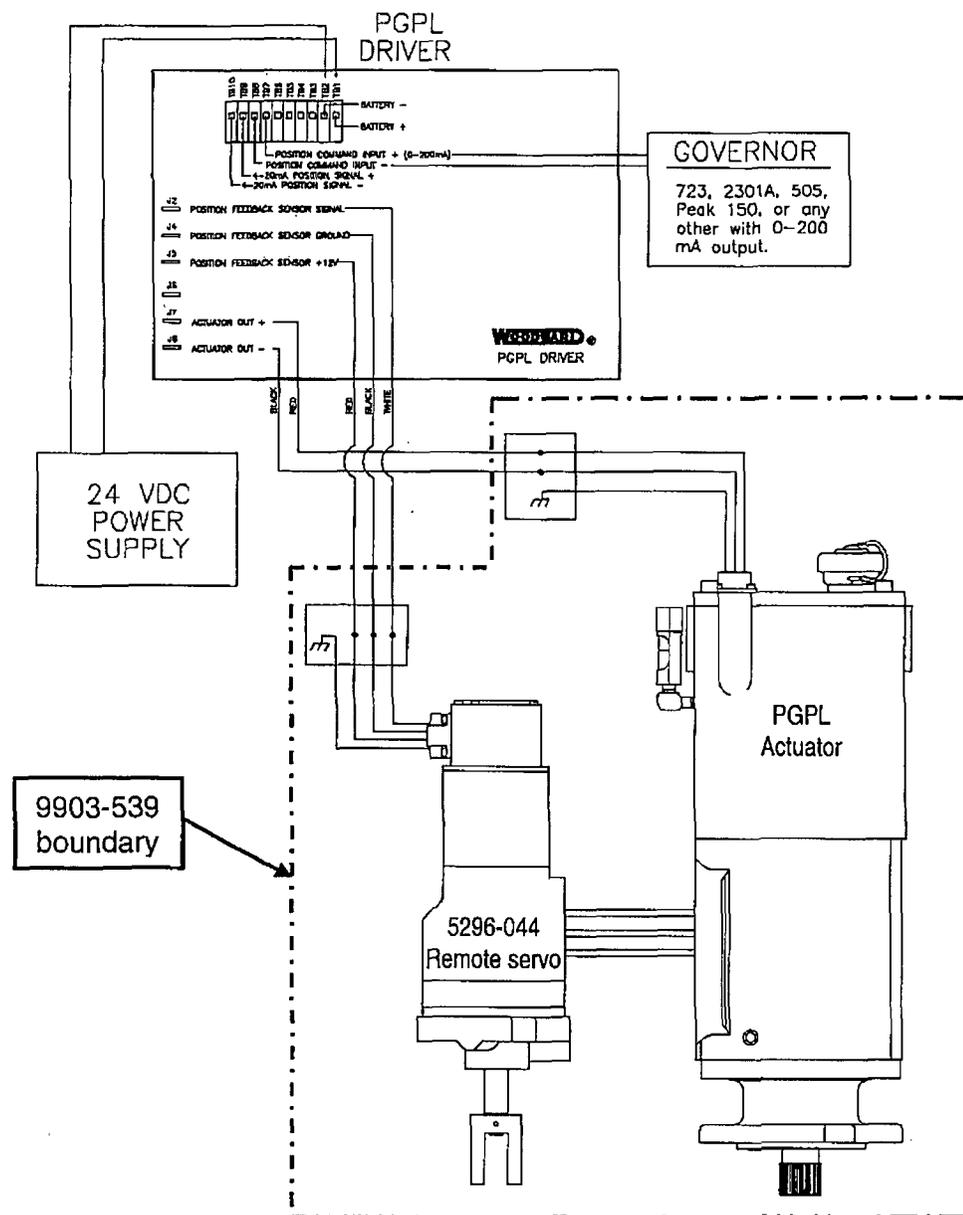
Woodward failure analysis report #85572-R001, dated 10/9/09, addressed two separate PGPL remote servo failures. The failure analysis report discusses a silver sulfide corrosion issue with surface mount resistors used in the PGPL remote servo feedback transmitter circuitry. Woodward part number 9903-539 consists of a PGPL actuator and a remote servo. The PGPL actuator is mounted on the turbine's governor drive and the remote servo (Woodward part number 5296-044) is mounted at the steam valve. Hydraulic lines interconnect the PGPL to the remote servo. The PGPL actuator and remote servo was supplied by Engine Systems, Inc. (ESI) to the Callaway and Vogtle nuclear plants as part of a digital governor upgrade (Woodward 505 control) on their steam turbine generators. These are the only nuclear plants that use the P/N 9903-539 actuator/remote servo assembly.

Two failed remote servos were sent to Woodward for root cause determination. One servo was from Callaway (S/N 12369963, original manufacture date Nov, 2000) and the other was from Vogtle (S/N 13798414, original manufacture date May, 2004). Both failures were attributed to silver sulfide corrosion (sulfuration) of surface mount resistors on the feedback board. On S/N 12369963, resistor R4 was open and on S/N 13798414, resistor R10 was open. A similar failure also occurred with resistor R11 on S/N 12369963 in 2004, at that time it was determined to be a random failure. Both feedback circuit boards contained Dale Vishay type CRCW surface mount resistors. Woodward has reported that they have only seen sulfuration on the CRCW resistors and that they began processing engineering changes in late 2005 and early 2006 to remove the Dale Vishay type CRCW resistors from their approved supplier list for this reason. The CRCW resistors were replaced with resistors manufactured by KOA Speers because sulfuration failures had not been identified with these specific resistors. Woodward has not had any sulfuration failures on the resistors currently used.

As part of this evaluation, ESI sent their test specimen PGPL remote servo to Woodward for examination. This servo was from ESI's test specimen PGPL actuator assembly, part number 9903-539, S/N 12254234 with an original manufacture date of Dec, 1999. Woodward found signs of sulfuration on two (2) of the resistors on the feedback board but no failures had occurred.

Discussion:

Part number 9903-539 consists of a PGPL actuator and a remote servo. The PGPL actuator is mounted on the turbine's governor drive and the remote servo is mounted at the steam valve. Hydraulic lines interconnect the PGPL oil supply to the remote servo. The electronic governor (a Woodard 505, in this case) senses turbine speed via a magnetic pickup input signal. The electronic governor output signal is connected to a Woodward PGPL Driver (located in the turbine control panel). The driver uses this signal, in conjunction with the remote servo position feedback signal, to send a corresponding output signal to control the PGPL actuator. Based on signal received from the driver, the PGPL actuators ports oil to the remote servo to push or pull the steam valve to achieve the desired change in turbine speed. Refer to the connection diagram below.



AFFECTED USERS:

Six (6) remote servos with suspect resistors have shipped to nuclear customers as safety related items. Failure of the suspect resistor has caused operability problems of the corresponding safety related turbine; therefore, this deviation is considered to be a defect as defined by 10CFR-part 21.

***LISTING OF WOODWARD P/N 9903-539 PGPL
ACTUATORS WITH SUSPECT RESISTORS***

Serial Number	Born Date	Shipped to
12369963	Nov 2000	Callaway
13305595	July 2002	Callaway
13798414	May 2004	Vogtle
13798415	May 2004	Callaway
14141720	Feb 2005	Vogtle
14409400	Sep 2005	Vogtle

CORRECTIVE ACTION:

The remote servos from the PGPL actuator assemblies listed in the table above should be returned to Engine Systems Inc. to have the feedback board replaced as soon as possible. Contact ESI's Customer Service department with the part number and serial number of the component(s) to be returned.

Note: Serial numbers 12369963 and 13798414 recently had the feedback board replaced during the failure analysis; these require no further corrective action.