

Part 21 (PAR)

Event # 52466

<b>Rep Org:</b> ENGINE SYSTEMS, INC	<b>Notification Date / Time:</b> 12/29/2016 16:54 (EST)
<b>Supplier:</b> ENGINE SYSTEMS, INC	<b>Event Date / Time:</b> 12/21/2016 (EST)
	<b>Last Modification:</b> 12/29/2016
<b>Region:</b> 1	<b>Docket #:</b>
<b>City:</b> ROCKY MOUNT	<b>Agreement State:</b> Yes
<b>County:</b>	<b>License #:</b>
<b>State:</b> NC	
<b>NRC Notified by:</b> TOM HORNER	<b>Notifications:</b> STEVE ROSE R2DO
<b>HQ Ops Officer:</b> JEFF HERRERA	MARK JEFFERS R3DO
<b>Emergency Class:</b> NON EMERGENCY	PART 21/50.55 REACTORS EMAIL
<b>10 CFR Section:</b> 21.21(d)(3)(i) DEFECTS AND NONCOMPLIANCE	

PART 21 - ISSUES IDENTIFIED WITH THE ENTERPRISE DIESEL ENGINE SUBCOVER

The following information is an excerpt from a facsimile report submitted:

"Engine Systems Inc. (ESI) began a 10CFR21 evaluation on November 18, 2016 upon notification of an issue with a subcover assembly at Perry Nuclear Plant. Attempts to install the subcover on their Enterprise diesel engine revealed two issues that prevented successful installation. First, one of the bolt holes was not fully machined through the entire depth of the subcover. Though the bolt could be inserted into the top of its corresponding hole, it would not pass completely through. The second issue was an interference between the rocker arm shaft and its mating pedestal. It was found that incomplete machining of the pedestal prevented the shaft from sitting flat on the pedestal.

"The evaluation was concluded on 12/21/16 and it was determined that this issue is a reportable defect as defined by 10CFR21."

The affected facilities are:

- First Energy - Perry
- Georgia Power - Vogtle

Also listed was the following affected facility:

- Korea - Yonggwang

Component: Subcover Assembly, P/N 1A-7846

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IE19  
NRR

**ENGINE SYSTEMS, INC.**175 Freight Road  
Rocky Mount, NC 27804Telephone: 252/977-2720  
Fax: 252/446-1134**TELEFAX**

**Date:** December 29, 2016  
**Company:** NRC Operations Center  
**Fax Number:** 301/816-5151  
**Verification No.:** 301/816-5100  
**Reference:** Report No. 10CFR21-0114, Rev. 0  
**From:** Tom Horner  
**Page:** 1 of 6

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Dear Sir:

Following this cover is a copy of our report 10CFR21-0114, Rev. 0, for a 10CFR21 reportable notification on a subcover assembly, P/N 1A-7846.

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.

A handwritten signature in black ink, appearing to read 'Tom Horner', is written over a horizontal line.

Tom Horner  
Quality Assurance Manager



**ENGINE SYSTEMS, INC.**

175 Freight Road, Rocky Mount, NC 27804

Telephone: 252/977-2720  
Fax: 252/446-1134

Report No. 10CFR21-0114  
Rev. 0: 12/28/16

**10CFR21 REPORTING OF DEFECTS  
AND NON-COMPLIANCE**

COMPONENT: Subcover Assembly, P/N 1A-7846

SYSTEM: Emergency Diesel Generator

CONCLUSION: Reportable in Accordance With 10CFR21

Prepared By: Jim Kim  
Engineering Manager

Date: 12/28/16

Reviewed By: Thomas W. [Signature]  
Quality Assurance Manager

Date: 12-29-16

Report No. 10CFR21-0114

Record of Revisions  
Page: 1 of 1

REV	DATE	PAGE	DESCRIPTION
0	12/28/16		Initial issue.

Report No. 10CFR21-0114  
Revision: 0  
Date: 12/28/16  
Page: 1 of 3

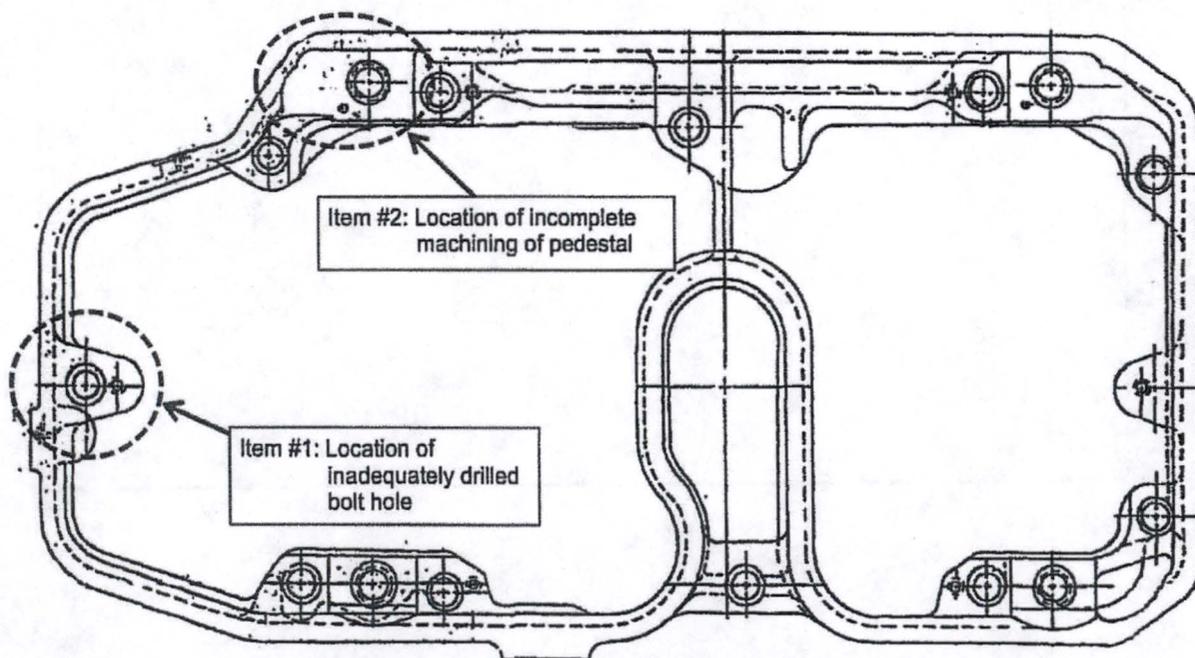
**COMPONENT:**

Subcover assembly, P/N 1A-7846.

**SUMMARY:**

Engine Systems Inc. (ESI) began a 10CFR21 evaluation on November 18, 2016 upon notification of an issue with a subcover assembly at Perry Nuclear Plant. Attempts to install the subcover on their Enterprise diesel engine revealed two issues that prevented successful installation. First, one of the bolt holes was not fully machined through the entire depth of the subcover. Though the bolt could be inserted into the top of its corresponding hole, it would not pass completely through. The second issue was an interference between the rocker arm shaft and its mating pedestal. It was found that incomplete machining of the pedestal prevented the shaft from sitting flat on the pedestal.

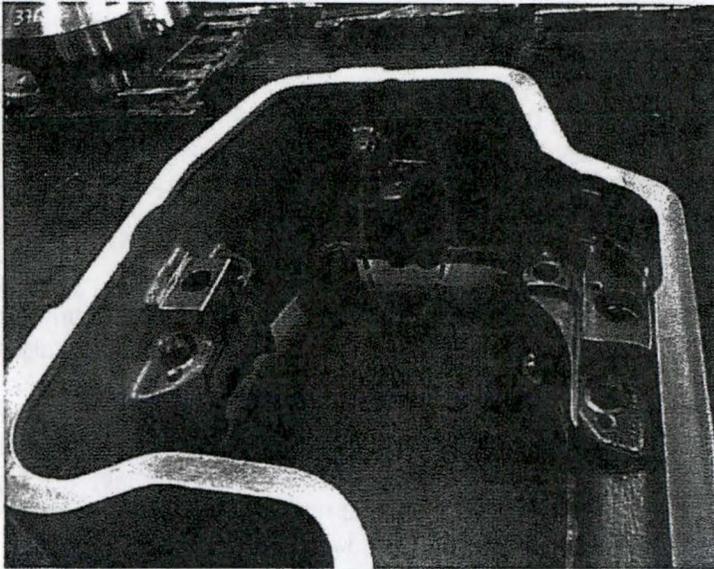
The evaluation was concluded on 12/21/16 and it was determined that this issue is a reportable defect as defined by 10CFR21. The figures and photos below and on the following page provide visual detail of the deficiencies.



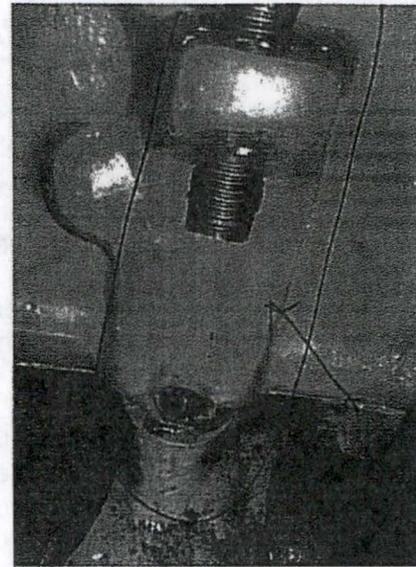
**Figure 1: Outline Drawing of Subcover**

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**Item #1:**

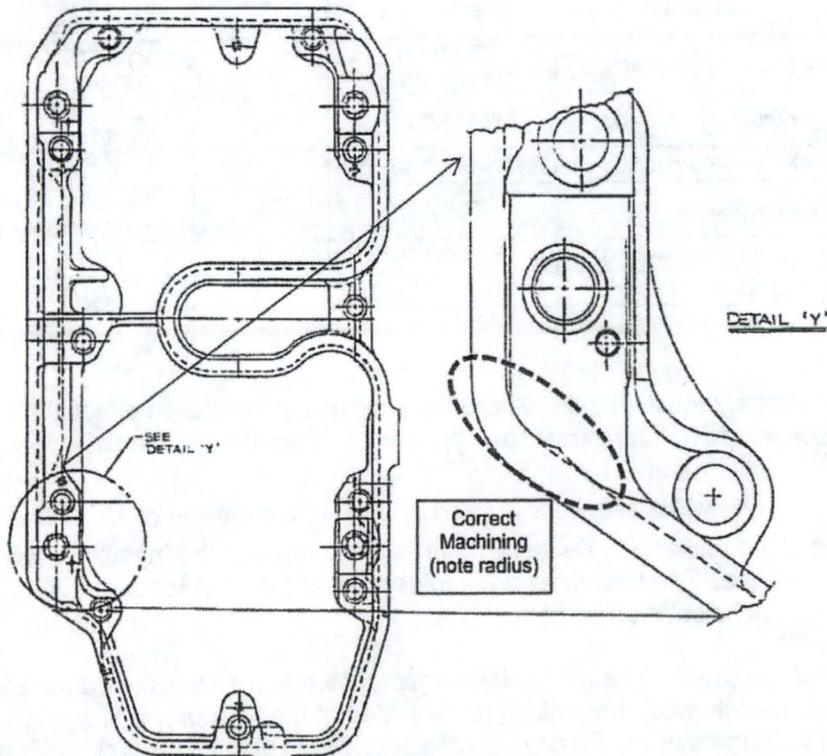


**Photo 1: Visual Depiction of Inadequately Drilled Bolt Hole**

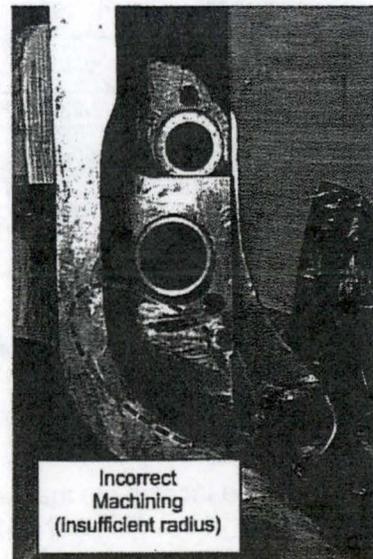


**Photo 2: Attempted Bolt Install**

**Item #2:**



**Figure 2: Ideal Pedestal Machining**



**Photo 3: Actual Machining**

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### **DISCUSSION:**

The subcover is a device that is fastened to the top of the cylinder head and provides support for the rocker arms and rocker shafts and encloses the valve stem area. There is one subcover per cylinder head and thus for a model DSRV-16-4 Enterprise engine there are 16 subcovers. Failure of a subcover would impact the ability of either of the corresponding rocker arms to provide the mechanical force to actuate the intake and exhaust valves. Without valve actuation, that particular power assembly would be unable to generate power which would reduce the output of the emergency diesel generator (EDG). Failure of the EDG to produce its nameplate rated power could prevent the safe shutdown of the nuclear power plant during an emergency situation.

The issue regarding the inadequately drilled bolt hole would be detected during installation since it would prevent the bolt from passing through the hole. Therefore, it is determined this issue would have no impact on operability since the cover could not be installed with an incompletely drilled bolt hole.

With regard to the incompletely machined pedestal, there is the potential that a customer could install the rocker arm shaft without detecting this issue. In this situation, the shaft will partially fit on the pedestal and the bolt will thread into subcover; however, the shaft will not seat fully on the pedestal. This prevents full contact with the pedestal and inhibits adequate preload throughout the bolted joint. If a customer were to install the rocker arm shaft (with mating rocker arms, pushrods, etc) onto the engine without realizing this issue, operability and durability of the engine would be compromised. This could present a substantial safety hazard.

### **AFFECTED USERS AND SHIPMENTS:**

All of the subcovers listed below are subject to the pedestal machining discrepancy and may subject to the inadequately drilled bolt hole.

ESI Sales Order	Order Date	Customer	Customer PO	Quantity Shipped	ESI Certification Date
8001930	12/19/2011	First Energy - Perry	45307431 (AFW#3168)	4	1/30/2013 (qty 1) 7/27/2013 (qty 3)
3006881 (qty 14) 8001963 (qty 1)	2/4/2010	Korea - Yonggwang	Y090528171	15	7/27/2013 (qty 14) 10/18/2013 (qty 1)
3009694	2/23/2012	Korea - Yonggwang	NYG1-02M0007-550	2	7/27/2013
3009847	4/5/2012	First Energy - Perry	45389292	8	7/27/2013 (qty 5) 9/27/2013 (qty 3)
3009695	2/23/2012	Korea - Yonggwang	Y050089101	2	10/18/2013
3015101	12/29/2015	Georgia Power - Vogtle	SNG10122963	2	4/21/2016

### **CORRECTIVE ACTIONS:**

Customers may elect to perform corrective machining to restore the subcover to its design dimensions. Otherwise, return the affected subcovers to ESI for inspection and rework. If customer rework is desired, perform the following:

- a) Inspect for the bolt hole (item #1). If rework is necessary, drill through to a diameter of 13/16".
- b) For the incomplete machining of the rocker arm pedestal (item #2), first remove the installed dowel which has 0.000" to 0.001" clearance. Then machine a 2" radius relief at the affected area. All other dimensions such as pedestal height shall remain unchanged.

The root cause analysis determined the cause to be machining errors that were not detected during ESI's dedication activities. As subcovers are returned, they will be re-machined at the vendor's facility, inspected by ESI, and returned to customers within 60 days of receipt. ESI will also incorporate revisions to the dedication report prior to the supply of any new or reworked subcovers to further clarify the inspection of these features during the dedication process, thereby preventing reoccurrence.