

**Paul A. Harden**  
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Fax: 724-643-8069May 19, 2011  
L-11-178

10 CFR 50.73

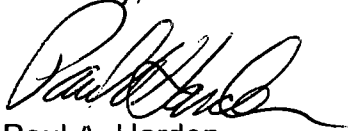
ATTN: Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001SUBJECT:  
Beaver Valley Power Station, Unit No. 2  
Docket No. 50-412, License No. NPF-73  
LER 2011-001-00

Enclosed is Licensee Event Report (LER) 2011-001-00, "Defective Fuel Injection Pump Supply Lines Provided by the Diesel Engine Manufacturer Results in an Emergency Diesel Generator Being Inoperable." This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(v)(D) and 10 CFR 21.2(c).

There are no regulatory commitments contained in this submittal. Any actions discussed in this document that represent intended or planned actions are described for the NRC's information, and are not regulatory commitments.

If there are any questions or if additional information is required, please contact Mr. Brian T. Tuite, Manager, Regulatory Compliance at 724-682-4284.

Sincerely,



Paul A. Harden

## Attachment

- c: Mr. W. M. Dean, NRC Region I Administrator  
Mr. D. L. Werkheiser, NRC Senior Resident Inspector  
Ms. N. S. Morgan, NRR Project Manager  
INPO Records Center (via electronic image)  
Mr. L. E. Ryan (BRP/DEP)

JEZZ  
NRR

# LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

Estimated burden per response to comply with this mandatory collection request: 80 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

<b>1. FACILITY NAME</b> Beaver Valley Power Station Unit Number 2	<b>2. DOCKET NUMBER</b> 05000412	<b>3. PAGE</b> 1 of 6
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**4. TITLE**  
Defective Fuel Injection Pump Supply Lines Provided by the Diesel Engine Manufacturer Results in an Emergency Diesel Generator Being Inoperable

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	25	2011	2011	- 001	- 00	05	19	2011	None	
									FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b>  6	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> (Check all that apply)									
	<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)						
<b>10. POWER LEVEL</b>  0%	<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)						
	<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)						
	<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)						
	<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)						
	<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)						
	<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)						
	<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input checked="" type="checkbox"/> OTHER (Part 21)						
	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A						

**12. LICENSEE CONTACT FOR THIS LER**

FACILITY NAME Brian T. Tuite, Manager, Regulatory Compliance	TELEPHONE NUMBER (Include Area Code) (724) 682-4284
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**13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT**

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	EK	DG	F010	Yes					

<b>14. SUPPLEMENTAL REPORT EXPECTED</b>				<b>15. EXPECTED SUBMISSION DATE</b>		
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE). <input checked="" type="checkbox"/> NO				MONTH	DAY	YEAR

**ABSTRACT** (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

At the time of discovery on March 25, 2011, during the Beaver Valley Power Station Unit Number 2 (BVPS-2) fifteenth Refueling Outage, BVPS-2 was in Mode 6 with all fuel loaded in the reactor vessel, the upper internals installed and approximately 23 feet of water in the reactor cavity. Both trains of the Residual Heat Removal (RHR) System were operable and one RHR train was in operation. At 0305 hours, the BVPS-2 Train A Emergency Diesel Generator (EDG) (2EGS-EG2-1) was returned to operable status following scheduled maintenance activities which included replacing the fuel injection pump supply lines to the fuel injectors. Within the following hour, the Train B EDG (2EGS-EG2-2) was placed on clearance for scheduled maintenance. At 1400 hours on March 25, 2011, the Train A EDG was declared inoperable, based on information from the manufacturer concerning the adequacy of the assembly method for the replacement fuel injector supply line compression fittings. Considering risk insights, site management determined that one EDG would be maintained available at all times during the restoration activities to restore a required EDG to operable status. Following successful surveillance testing, the BVPS-2 Train A EDG was declared operable at 0058 hours on March 27, 2011. With both EDGs inoperable, this event is reportable pursuant to 10 CFR 50.73(a)(2)(v)(D) as a loss of safety function for systems needed for accident mitigation. The event is also reportable pursuant to 10 CFR 50.73(a)(2)(i)(B) as an inadvertent operation/condition prohibited by the plant's Technical Specifications. Pursuant to 10 CFR 21.2(c), this report also satisfies the reporting requirements of 10 CFR Part 21.

The direct cause is the ferrules were incorrectly swaged onto fuel injection pump supply lines as supplied by the vendor (Fairbanks Morse Engine). The root cause is the vendor (Fairbanks Morse Engine) design change control process was inadequate in that the design change made to the fuel injection pump supply lines incorporated the use of an unsuitable ferrule. Corrective actions included removal of the replacement fuel injection pump supply lines and reinstalling the previously removed fuel injection pump supply lines. The safety significance associated with the inadequate engagement of the EDG fuel injection pump supply lines compression fittings is considered very low.

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**NARRATIVE**

Energy Industry Identification System (EIS) codes are identified in the text using the format [XX].

**DESCRIPTION OF EVENT**

At the time of discovery on March 25, 2011, during the Beaver Valley Power Station Unit Number 2 (BVPS-2) fifteenth Refueling Outage (2R15), BVPS-2 was in Mode 6 with all fuel loaded in the reactor vessel and the upper reactor vessel internals installed. The reactor vessel head was not installed and the reactor cavity contained the normal amount of water (approximately 23 feet above the reactor vessel flange) for performing refueling activities. Both trains of the Residual Heat Removal System [BP] were operable and one of these two operable trains was in operation. In Mode 6, one Emergency Diesel Generator (EDG) [EK] is required to be operable by BVPS-2 Technical Specification 3.8.2 "AC Sources – Shutdown."

During the 2R15 outage, maintenance was planned for both EDGs with the BVPS-2 Train A EDG (2EGS-EG2-1) to be worked first, tested and returned to operable status followed by the Train B EDG (2EGS-EG2-2). Scheduled maintenance activities for the Train A EDG included replacing the twelve fuel injection pump supply lines to the fuel injectors with new fuel injection pump supply lines procured from the EDG manufacturer, Fairbanks Morse Engine. During a maintenance run of the Train A EDG on March 22, 2011 following the replacement of the twelve fuel injection pump supply lines, the supply line to the number four injector fitting had a leak of approximately six drops per second that could not be stopped. This line was removed and the ferrule at the leaking connection was found to be cocked and displaced from its designed installation position. Based on the recommendation from the manufacturer's service representative, the previously installed line to the number four injector was reinstalled. Another maintenance run of the Train A EDG was performed which included tightening of several fuel supply line fittings to eliminate indications of minor leakage. Then, an eight hour post maintenance test and endurance run of the EDG was completed satisfactorily and the Train A EDG was declared operable at 0305 hours on March 25, 2011. Following the planned 2R15 refueling outage schedule, the Train B EDG was then placed on clearance and disassembly was started for the planned maintenance.

Later in the morning of March 25, 2011, Fairbanks Morse Engine informed its service representative (who was onsite) that Fairbanks Morse recommended the removal of all of the new fuel injection pump supply lines previously installed (during 2R15), and returning them to the factory for repair. This information was promptly provided to outage management personnel for evaluation. Visual inspections of the suspect connections were performed by a technician and indications of movement on some of the fuel injection pump supply lines were observed. At 1400 hours on March 25, 2011, the Train A EDG was declared inoperable, due to concerns about the adequacy of the vendor's assembly method

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for the fuel line compression fittings. The Train A EDG was considered available to function if needed.

Required Action "B" of BVPS-2 Technical Specification 3.8.2 was applied due to not having at least one EDG operable. The required actions included immediately initiating actions to restore one EDG to operable status, suspending all core alterations, and suspending positive reactivity additions. Considering risk insights, site management determined that one EDG would be maintained available at all times during the restoration activities to restore a required EDG to operable status. Maintenance activities that were in progress on the Train B EDG were stopped. The Train B EDG was then returned to available status prior to placing the Train A EDG on clearance to reinstall the fuel injection pump supply lines removed during 2R15. No unnecessary work that could challenge shutdown safety was permitted and the Technical Specification 3.8.2 required offsite circuit remained operable to supply required electrical loads during the period of time that both EDGs were inoperable. Following restoration and successful surveillance and post maintenance testing, the BVPS-2 Train A EDG was declared operable at 0058 hours on March 27, 2011.

**CAUSE OF EVENT**

The direct cause is the ferrules were incorrectly swaged onto the fuel injection pump supply lines as supplied by the vendor, Fairbanks Morse Engine. Fairbanks Morse documentation indicates that the Parker Hannifin CPI ferrule that was installed was not suitable for use on the 0.75 inch x 0.120 inch wall tubing of which the fuel injection pump supply lines were manufactured.

The root cause is the vendor (Fairbanks Morse Engine) design change control process was inadequate in that the design change made to the fuel injection pump supply lines incorporated use of an unsuitable ferrule. In addition, this error was not detected by the vendor. Parker Hannifin catalog information (4230/4233) does not endorse the use of its CPI ferrule with 0.75 inch x 0.120 inch wall thickness tubing. Interviews indicated that even though the wall thickness of the fuel injection pump supply lines was increased (0.095 inches to 0.120 inches), the vendor did not identify this modification to the fuel injection pump supply lines to BVPS-2 as required by the purchase order. The vendor also did not identify this modification by changing the part number of these components.

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**ANALYSIS OF EVENT**

From approximately 0305 hours on March 25, 2011, until 0058 hours on March 27, 2011, both of the BVPS-2 EDGs were inoperable, although one EDG was available to function if needed during this period. In Mode 6, a minimum of one EDG is required to be operable per Technical Specification 3.8.2. Therefore, BVPS-2 operated in a plant Mode that requires a minimum of one EDG to be operable per the plant's Technical Specifications with both EDGs inoperable. This event represents two 10 CFR Part 50.73 reportable conditions. The first reportable event is an inadvertent operation/condition prohibited by the plant's Technical Specifications which is reportable per 10 CFR 50.73(a)(2)(i)(B) and occurred when the Train A EDG was declared operable on March 25, 2011 at 0305 hours when this EDG was actually inoperable due to the inadequately swaged fuel injection pump supply lines procured from the EDG engine manufacturer. This condition was unknown until later in the day on March 25, 2011 when BVPS-2 was informed of the manufacturer's recommendation to remove the affected lines. Following discovery, the Technical Specification 3.8.2 Condition B actions were initiated promptly and one EDG was maintained available at all times during the restoration activities to restore a required EDG to operable status.

This event is also reportable pursuant to 10 CFR 50.72(b)(3)(v)(D) and 10 CFR 50.73(a)(2)(v)(D) as a loss of safety function for systems needed for accident mitigation. With no EDGs operable in Mode 6 from approximately 0305 hours on March 25, 2011, until 0058 hours on March 27, 2011, this condition could have prevented the fulfillment of a safety function for systems needed to mitigate the consequences of an accident as the safety functions needed for accident mitigation could have been impaired in the event of a loss of off-site power. This event was previously reported pursuant to 10 CFR 50.72(b)(3)(v)(D) at 2135 hours on March 25, 2011 (Event Notification No. 46700).

Pursuant to 10 CFR 21.2(c), this report satisfies the reporting requirements of 10 CFR 21. See the additional information section, below, for information regarding the manufacturer, part number, nature of defect and potential safety hazard.

The safety significance associated with this event is considered to be very low. An Engineering evaluation concluded that there was reasonable assurance that Train A EDG would be available to perform its safety function for a 24-hour period, following any plant transient or non-seismic external event. A risk assessment was performed assuming a postulated seismic event during the time that the EDG was degraded, which resulted in a very low Incremental Core Damage Probability (ICDP). One EDG was maintained available at all times to function, if needed, during the restoration activities and the required offsite circuit remained operable to supply required electrical loads during the period of time that both EDGs were inoperable.

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**CORRECTIVE ACTIONS**

1. All of the defective replacement fuel injection pump supply lines were removed from the Train A EDG and the fuel injection pump supply lines previously removed during 2R15 were reinstalled. Following successful surveillance and post maintenance testing, the Train A EDG was declared operable at 0058 hours on March 27, 2011.
2. FirstEnergy Nuclear Operating Company (FENOC) has inactivated the stock codes for the defective replacement fuel injector pump supply lines to prevent future procurement activities.
3. A plant operating experience report has been issued on this event (OE 33402).
4. FENOC will update the Nuclear Procurement Issues Committee (NUPIC) Industry Issues database, to ensure that the nuclear industry is informed of the issues regarding the Fairbanks Morse Engine design change process.

Completion of the above and other corrective actions are being tracked through the BVPS corrective action program.

**PREVIOUS SIMILAR EVENTS**

There were no prior Licensee Event Reports at BVPS Unit 1 and BVPS Unit 2 for the past five years related to a BVPS EDG being declared inoperable.

**ADDITIONAL INFORMATION**

Basic component supplier:

Fairbanks Morse Engine  
701 White Ave.  
Beloit, WI 53511  
(608) 364-8494

Basic component which contains a defect:

Replacement fuel injection pump supply lines (Fairbanks Morse Part Numbers P12611001 and P12611002) on the 12 cylinder model PC2.2 and model PC2.3 Fairbanks Morse Engines.

Nature of the defect:

Improperly seated ferrules on the replacement fuel injection pump supply lines.

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Safety hazard which could be created by such a defect:

In the event that a tube was to back out of the fitting entirely, a substantial amount of fuel would be flowing out of the header onto the engine and around the engine room. If the tube was to back out of the fitting, fuel would no longer be supplied to that cylinder and the total EDG power output would be reduced. This type of failure could have an adverse effect on the EDG's ability to start within the required timeframe and accept the required load assumed in plant's safety analysis for a design basis accident.

Information on extent of condition:

Fairbanks Morse Engine has provided information to BVPS that indicates affected replacement fuel injection pump supply lines (Part numbers P12611001 and P12611002) were only supplied to BVPS since the CPI ferrule was first implemented in 2004. BVPS-1 does not utilize Fairbanks Morse Engines on either of the two EDGs and therefore was not affected.

CR 11-91738