energy harbor

Beaver Valley Power Station
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September 8, 2023
L-23-197

10 CFR 50.73

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

SUBJECT:
Beaver Valley Power Station, Unit No. 2
Docket No. 50-412, License No. NPF-73
LER 2023-004-00

Enclosed is Licensee Event Report (LER) 2023-004-00, "Condition Prohibited by Technical Specifications and Loss of Safety Function due to Emergency Diesel Generator Lube Oil Contamination by Fuel Oil." This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B), 10 CFR 50.73(a)(2)(v)(A) and 10 CFR 50.73(a)(2)(v)(D).

There are no regulatory commitments contained in this submittal. If there are any questions or if additional information is required, please contact Ms. Julie Hartig, Manager (Acting), Regulatory Compliance and Emergency Response, at 724-682-4224.

Sincerely,

William C Cothen
For Barry Blair

Barry N. Blair

Enclosure: Beaver Valley Power Station, Unit No. 2 LER 2023-004-00

cc: NRC Region I Administrator
NRC Senior Resident Inspector
NRC Project Manager
INPO Records Center (via INPO Industry Reporting and Information System)
BRP/DEP

Enclosure
L-23-197

Beaver Valley Power Station, Unit No. 2 LER 2023-004-00

NRC FORM 366 (03-14-2023) | U.S. NUCLEAR REGULATORY COMMISSION | APPROVED BY OMB: NO. 3150-0104 | EXPIRES: 08/31/2023

LICENSEE EVENT REPORT (LER)

(See Page 2 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

1. Facility Name		2. Docket Number	3. Page
Beaver Valley Power Station, Unit No. 2	■ 050 ☐ 052	00412	1 OF 4

4. Title

Condition Prohibited by Technical Specification and Loss of Safety Function due to Emergency Diesel Generator Lube Oil Contamination by Fuel Oil

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved		
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	☐ 050	Docket Number
07	12	2023	2023	- 004 -	00	09	08	2023	Facility Name	☐ 052	Docket Number

9. Operating Mode	10. Power Level
1	100

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*

10 CFR Part 20	☐ 20.2203(a)(2)(vi)	**10 CFR Part 50**	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)	☐ 73.1200(a)
☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)	☐ 73.1200(b)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)	☐ 73.1200(c)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)	☐ 73.1200(d)
☐ 20.2203(a)(2)(i)	**10 CFR Part 21**	☐ 50.46(a)(3)(ii)	☑ 50.73(a)(2)(v)(A)	**10 CFR Part 73**	☐ 73.1200(e)
☐ 20.2203(a)(2)(ii)	☐ 21.2(c)	☐ 50.69(g)	☐ 50.73(a)(2)(v)(B)	☐ 73.77(a)(1)	☐ 73.1200(f)
☐ 20.2203(a)(2)(iii)		☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ 73.77(a)(2)(i)	☐ 73.1200(g)
☐ 20.2203(a)(2)(iv)		☑ 50.73(a)(2)(i)(B)	☑ 50.73(a)(2)(v)(D)	☐ 73.77(a)(2)(ii)	☐ 73.1200(h)
☐ 20.2203(a)(2)(v)		☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)		

☐ **OTHER** (Specify here, in abstract, or NRC 366A).

12. Licensee Contact for this LER

Licensee Contact	Phone Number (Include area code)
Julie Hartig, Manager (Acting), Regulatory Compliance and Emergency Response	724-682-4224

13. Complete One Line for each Component Failure Described in this Report

Cause	System	Component	Manufacturer	Reportable to IRIS		Cause	System	Component	Manufacturer	Reportable to IRIS

14. Supplemental Report Expected		15. Expected Submission Date	Month	Day	Year
☑ No	☐ Yes (If yes, complete 15. Expected Submission Date)				

16. Abstract (Limit to 1326 spaces, i.e., approximately 13 single-spaced typewritten lines)

At 1617 on July 12, 2023, with Beaver Valley Power Station, Unit No. 2 (BVPS-2) at 100 percent power in Mode 1, the 2-2 Emergency Diesel Generator (EDG) was declared Inoperable due to its Rocker Arm Lube Oil (LO) System viscosity degrading such that the required 30-day mission time would not be met. This was likely due to Fuel Oil System leakage into the Rocker Arm LO System from a loose fuel oil injection line packing nut. The effectiveness of torquing the packing nut was indeterminate during subsequent LO test results. Compensatory measures were implemented to monitor and maintain the LO viscosity within the required limit by a proceduralized drain and fill process that will be executed based on LO sample results and EDG run time. The 2-2 EDG was declared Operable at 0615 on July 15, 2023.

This event is reportable as a Condition Prohibited by Technical Specifications per 10 CFR 50.73(a)(2)(i)(B) and as a Loss of Safety Function per 10 CFR 50.73(a)(2)(v)(A) and (D). The additional planned corrective action is to implement a permanent repair if fuel oil leakage increases during continued monitoring. Enhancements include revising the maintenance procedures to check the tightness of fuel oil packing nuts and to replace the high-pressure fuel oil line O-rings and packing on both EDGs.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(See NUREG-1022, R.3 for instruction and guidance for completing this form http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/)

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2023

1. FACILITY NAME		2. DOCKET NUMBER	3. LER NUMBER		
			YEAR	SEQUENTIAL NUMBER	REV NO.
Beaver Valley Power Station, Unit No. 2	■ 050 ☐ 052	00412	2023	- 004	- 00

NARRATIVE

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

BACKGROUND

Beaver Valley Power Station, Unit No. 2 (BVPS-2) has a Train 'A' and a Train 'B' Emergency Diesel Generator (EDG) [EK] to power their respective emergency buses and associated Engineered Safety Feature (ESF) Systems. The redundant trains ensure the minimum safety functions will be performed with either EDG Operable.

The EDG Lube Oil (LO) System [LA] provides lubrication to the main bearings, crank pins, camshaft bearing, and other oil-lubricated wearing parts within the EDG. The EDG LO System also includes a Rocker Arm LO System that provides lubrication for the rocker arms and valve gear while the EDG is operating. The Rocker Arm LO reservoir level is maintained by the EDG LO System through a level control valve.

Leakage from the Fuel Oil System [DC] injectors or fuel oil line connections may cause fuel oil to contaminate the Rocker Arm LO System. Fuel oil contamination above 6.17 percent into the Rocker Arm LO System degrades the required viscosity for the LO to perform its function.

Technical Specification LCO 3.8.1, "AC Sources – Operating", requires two EDGs in Modes 1-4. If one required EDG is Inoperable, the required action per the Technical Specification Bases is to restore the EDG within 72 hours or shutdown the unit to Mode 3 within 6 hours and Mode 5 within 36 hours.

Technical Specification LCO 3.8.2, "AC Sources – Shutdown", requires one EDG in Modes 5 and 6. If the required EDG is Inoperable, the required action is to suspend core alterations and positive reactivity additions, and to restore the EDG immediately.

DESCRIPTION OF EVENT

On July 12, 2023, with BVPS-2 at 100 percent power in Mode 1, an increased amount of fuel oil at a concentration of 3.7 percent was discovered during lube oil analysis of the 2-2 EDG Rocker Arm LO reservoir. This LO sample had been obtained on June 28, 2023, and was a step change from the 1.9 percent concentration identified in a previous sample obtained on April 19, 2023. With a calculated leak rate of 0.082 percent / hour, the 2-2 EDG would have been capable of operating for approximately 3.13 days until the maximum calculated dilution of 6.17 percent was met. The 2-2 EDG would not have been able to meet its mission time of 30 days; therefore, the 2-2 EDG was declared Inoperable at 1617 on July 12, 2023.

No observable leakage was found during troubleshooting to identify the source of leakage. However, the fuel injection line packing nut on cylinder No. 11 was found loose and tightened two revolutions.

LO samples were taken during the subsequent nine-hour 2-2 EDG maintenance run completed on July 14, 2023. Based on the LO sample test results, it is indeterminate if the leak had been repaired or if residual fuel oil remained present in the LO system during the EDG run.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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Beaver Valley Power Station, Unit No. 2	☐ 052	00412	2023	- 004	- 00

NARRATIVE

DESCRIPTION OF EVENT (Continued)

Compensatory measures were established to restore and maintain Operability of the Rocker Arm LO System, and the 2-2 EDG was declared Operable at 0615 on July 15, 2023. The fuel oil concentration in the LO system will be monitored and the viscosity will be maintained within the required limits by using a proceduralized drain and fill process as directed by sample results and EDG run time.

It is believed that the fuel oil leakage into the Rocker Arm LO System was the result of fuel oil injector maintenance that occurred during the BVPS-2 23rd refueling outage (2R23) in which the EDG maintenance window began on April 10, 2023; therefore, the 2-2 EDG was Inoperable from that time until compensatory measures were established on July 15, 2023.

The Past Operability Review identifies that during Mode 6, when at least one EDG is required to be Operable per LCO 3.8.2, the 2-1 EDG was simultaneously Inoperable from April 24, 2023 to May 4, 2023.

Additionally, the 2-1 EDG was Inoperable other times to support minor maintenance and testing following 2R23 while BVPS-2 was in Mode 1. However, the Inoperable time in each case was less than the 3.13 days that the 2-2 EDG was capable of performing its safety function.

CAUSE OF EVENT

The most likely direct cause of the event is the loose packing nut on the fuel injection line to the No. 11 cylinder. The contributing cause is there are no preventative maintenance instructions for the injector high pressure fuel oil lines that would identify an unrecognized loose packing nut.

ANALYSIS OF EVENT

This event is reportable as a Condition Prohibited by Technical Specifications per 10 CFR 50.73(a)(2)(i)(B) as the 2-2 EDG was Inoperable for approximately three months. This is also reportable as a Condition that Could Have Prevented Fulfillment of a Safety Function per 10 CFR 50.73(a)(2)(v)(A) and (D) for the period of Inoperability in Mode 6 during 2R23 in which the 2-1 EDG was also Inoperable.

The plant risk associated with the 2-2 EDG fuel oil dilution of the Rocker Arm LO event is considered to be very low safety significance. This is based on the fact that the EDG was determined to have remained capable of satisfying its PRA mission time of 24 hours over the entire period in which the identified condition existed.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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Beaver Valley Power Station, Unit No. 2	■ 050 ☐ 052	00412	2023	- 004	- 00

NARRATIVE

CORRECTIVE ACTIONS

Completed Corrective Actions:

1) The packing nut associated with the fuel injection line to the No. 11 cylinder has been tightened.

2) Compensatory measures have been implemented to ensure the Rocker Arm LO System required viscosity is maintained.

Planned Corrective Actions:

1) Perform a permanent repair if there is evidence of increased leakage that dilutes the LO greater than 0.11 percent/hour.

Planned Enhancements:

1) Revise maintenance procedures to check the tightness of the fuel oil packing nuts.

2) As these are likely original equipment, replace the high-pressure fuel oil line O-rings and packing on the 2-1 and 2-2 EDGs.

PREVIOUS SIMILAR EVENTS

A review for similar events was performed. The 2-2 EDG LO had degraded viscosity due to fuel oil intrusion because of an air bound gravity drain line from the fuel oil injection pumps to the underground storage tank. This prevented excess fuel oil from the fuel oil injection pumps from draining and allowed intrusion into the LO. The 2-2 EDG was declared Inoperable, and a Condition Prohibited by Technical Specifications and a Loss of Safety Function was reported in LER 2022-001-00 on September 8, 2022. Although the events were similar in nature, the cause was unrelated to this issue.