

**Eric A. Larson**  
Site Vice President724-682-5234  
Fax: 724-643-8069March 7, 2014  
L-14-109

10 CFR 50.73

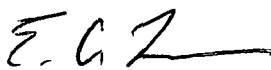
ATTN: Document Control Desk  
U. S. Nuclear Regulatory Commission  
Washington, DC 20555-0001SUBJECT:  
Beaver Valley Power Station, Unit No. 1  
Docket No. 50-334, License No. DPR-66  
LER 2014-002-00

Enclosed is Licensee Event Report (LER) 2014-002-00, "Beaver Valley Unit 1 Turbine Driven Auxiliary Feedwater Pump Governor Oscillations Result in Pump Trip." This event is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B) and 10 CFR 50.73(a)(2)(v)(B).

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 F. Sepelak, Supervisor, Regulatory Compliance at 724-682-4282.

Sincerely,



Eric A. Larson

Enclosure – LER 2014-002-00

cc: Mr. W. M. Dean, NRC Region I Administrator  
Mr. J. H. Nadel, NRC Acting Resident Inspector  
Mr. J. A. Whited, NRR Project Manager  
INPO Records Center (via INPO Consolidated Event System)  
Mr. L. E. Ryan (BRP/DEP)

**LICENSEE EVENT REPORT (LER)**

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

Estimated burden per response to comply with this mandatory information collection request: 80 hours. 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](mailto: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 1	<b>2. DOCKET NUMBER</b> 05000334	<b>3. PAGE</b> 1 OF 4
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**4. TITLE**  
Beaver Valley Unit 1 Turbine Driven Auxiliary Feedwater Pump Governor Oscillations Result in Pump Trip

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
01	06	2014	2014	002	00	03	07	2014	None	
									FACILITY NAME	DOCKET NUMBER
									None	

<b>9. OPERATING MODE</b>  Mode 3	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §:</b> (Check all that apply) <table style="width:100%; border:none;"> <tr> <td><input type="checkbox"/> 20.2201(b)</td> <td><input type="checkbox"/> 20.2203(a)(3)(i)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(C)</td> <td><input type="checkbox"/> 50.73(a)(2)(vii)</td> </tr> <tr> <td><input type="checkbox"/> 20.2201(d)</td> <td><input type="checkbox"/> 20.2203(a)(3)(ii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(1)</td> <td><input type="checkbox"/> 20.2203(a)(4)</td> <td><input type="checkbox"/> 50.73(a)(2)(ii)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(viii)(B)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(i)</td> <td><input type="checkbox"/> 50.36(c)(1)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iii)</td> <td><input type="checkbox"/> 50.73(a)(2)(ix)(A)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(ii)</td> <td><input type="checkbox"/> 50.36(c)(1)(ii)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(iv)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(x)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iii)</td> <td><input type="checkbox"/> 50.36(c)(2)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(A)</td> <td><input type="checkbox"/> 73.71(a)(4)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(iv)</td> <td><input type="checkbox"/> 50.46(a)(3)(ii)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(v)(B)</td> <td><input type="checkbox"/> 73.71(a)(5)</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(v)</td> <td><input type="checkbox"/> 50.73(a)(2)(i)(A)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(C)</td> <td><input type="checkbox"/> OTHER</td> </tr> <tr> <td><input type="checkbox"/> 20.2203(a)(2)(vi)</td> <td><input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)</td> <td><input type="checkbox"/> 50.73(a)(2)(v)(D)</td> <td><small>Specify in Abstract below or in NRC Form 366A</small></td> </tr> </table>	<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)	<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 checked="" 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 type="checkbox"/> OTHER	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input checked="" type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<small>Specify in Abstract below or in NRC Form 366A</small>
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<b>10. POWER LEVEL</b>  000																																					

**12. LICENSEE CONTACT FOR THIS LER**

FACILITY NAME Brian Sepelak, Supervisor, Regulatory Compliance	TELEPHONE NUMBER (Include Area Code) 724-682-4282
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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
D	BA	65	W290	Y					

**14. SUPPLEMENTAL REPORT EXPECTED**  YES (If yes, complete 15. EXPECTED SUBMISSION DATE)  NO

15. EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR

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

On January 6, 2014, the Beaver Valley Power Station (BVPS) Unit 1 tripped from full power due to a main transformer differential protection main unit generator trip as a result of a main unit transformer failure. All three Auxiliary Feedwater (AFW) pumps automatically started, as expected, due to lowering steam generator levels. The Turbine Driven Auxiliary Feedwater (TDAFW) pump ran for 1 hour and 49 minutes at which time the pump tripped due to governor oscillations. The TDAFW pump was declared inoperable. Subsequent investigation determined that the governor oscillations were due to a misadjusted governor needle valve that was last set during refueling outage 1R22 in October, 2013. Therefore the pump was inoperable from the time Mode 3 was entered on November 1, 2013 at 1006 hours. Technical Specifications (TS) require three trains of AFW to be operable in Modes 1 through 3. Entry into Mode 3 and operation with an inoperable pump, for longer than permitted by the TS, constitute conditions prohibited by TS. During this time each of the Motor Driven AFW pumps were rendered inoperable, separately, for maintenance and/or testing. This constitutes a condition that could have prevented the fulfillment of a Safety Function. The governor has been properly adjusted and the appropriate procedures will be revised.

This event is being reported under 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by Technical Specifications and under 10 CFR 50.73(a)(2)(v)(B) as a condition that could have prevented the fulfillment of a Safety Function – Remove Residual Heat.

NRC FORM 366A (01-2014)		<b>LICENSEE EVENT REPORT (LER) CONTINUATION SHEET</b>			U.S. NUCLEAR REGULATORY COMMISSION	
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<b>NARRATIVE</b>						
<p>Energy Industry Identification System (EIS) codes are identified in the text as [XX].</p> <p><b>CONDITIONS PRIOR TO OCCURRENCE</b></p> <p>Unit 1: Mode 3, 553 degrees F, 2239 psig</p> <p>There were no systems, structures, or components (SSCs) that were inoperable at the start of the event that contributed to the event.</p> <p><b>DESCRIPTION OF EVENT</b></p> <p>On January 6, 2014, at 1659 hours the Beaver Valley Power Station (BVPS) Unit 1 tripped from full power due to a main transformer [XMFR] differential protection [87] main unit generator [GEN] trip as a result of a main unit transformer failure (Reference BVPS Unit 1 LER 2014-001-00 Automatic Reactor Trip due to Main Unit Transformer Failure). All three Auxiliary Feedwater [BA] (AFW) pumps [P] automatically started, as expected, due to lowering steam generator [SG] levels. The reactor trip response was as expected with no complications. At 1757 hours the plant was stabilized in Mode 3.</p> <p>At 1848 hours the Control Room received an alarm indicating that the Turbine Driven AFW (TDAFW) pump had stopped. The responding operator reported that the TDAFW pump had tripped and the two Motor Driven (MDAFW) pumps were operating properly. At 1902 hours the MDAFW pumps were secured. The TDAFW pump ran for 1 hour and 49 minutes at which time the pump tripped due to governor oscillations. The TDAFW pump was declared inoperable. On January 7, 2014, the TDAFW pump was run to determine the cause of the pump trip. The pump ran for 1 hour and 21 minutes then tripped due to governor oscillations. Subsequent investigation determined that the governor oscillations were due to a misadjusted governor [65] needle valve [FCV] that was last adjusted during refueling outage 1R22 in October 2013.</p> <p><b>Background</b></p> <p>During 1R22, maintenance was performed on the turbine governor for the TDAFW pump. On November 1, 2013, at 1006 hours Unit 1 entered Mode 3. At 2320 hours the TDAFW pump was started for surveillance testing. After two minutes of run time, the pump was secured from the Control Room due to the turbine emitting steam and water from the drains more than the local operator thought was normal. The pump casing drains were opened and water was drained from the pump. Based on initial TDAFW pump operation in Mode 3 and the amount of water observed draining out of the turbine, there was not reasonable assurance that the TDAFW pump was operable upon entry into Mode 3.</p> <p>On November 2, 2013, at 0011 hours, the TDAFW pump was again started for surveillance and post maintenance testing. After 1 hour and 22 minutes the pump was secured from the Control Room due to governor oscillations and declared inoperable. It was thought that the oscillations were caused by water that had accumulated in the steam lines during their heat up process. The main steam lines were drained and the TDAFW pump was run successfully for 18 minutes during a post maintenance test. The TDAFW pump was declared operable at 1323 hours.</p> <p>On November 4, 2013, at 1127 hours, the "A" train MDAFW pump was declared inoperable due to the discovery of water in its lubricating oil. The "A" train MDAFW pump was repaired, tested then declared operable on November 6, 2013, at 1253 hours.</p>						

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<b>NARRATIVE</b>						
<p>On November 5, 2013 Unit 1 tripped from 47 percent power due to a faulted 4KV cable [CBL5] (Reference BVPS Unit 1 LER 2013-003-00, Beaver Valley Unit 1 Turbine Trip and Subsequent Reactor Trip due to 4KV Cable Fault). During the trip the TDAFW pump automatically started, as expected. The TDAFW pump ran for 33 minutes and was secured from the Control Room when the plant was stable in Mode 3. There were no problems noted with the pump operation during the thirty three minute run.</p> <p>On November 26, 2013, the "B" train MDAFW pump was rendered inoperable from 0858 hours until 0933 hours for the performance of a planned quarterly surveillance test.</p> <p>On December 9, 2013, the "A" train MDAFW pump was rendered inoperable from 0933 hours until 1236 hours for the performance of a planned quarterly surveillance test.</p> <p>On December 18, 2013, the "B" train MDAFW pump was rendered inoperable from 0934 hours until 0949 hours for the performance of planned relay surveillance testing.</p> <p>As noted above, on January 6, 2014, at 1659 hours, Unit 1 tripped from full power due to a main transformer differential protection main unit generator trip. The TDAFW pump ran for 1 hour and 49 minutes at which time the pump tripped due to governor oscillations. The TDAFW pump was declared inoperable.</p> <p>On January 7, 2014, the TDAFW pump was run to determine the cause of the pump trip. The pump ran for 1 hour and 21 minutes then tripped due to governor oscillations. After further investigation and discussion with the pump vendor, it was determined that the governor oscillations were due to a misadjusted governor compensating needle valve. The governor adjustment was made during the refueling outage when the turbine was run using pressurized air and not steam as the motive force. This resulted in the turbine governor oil running at a lower than normal operating temperature. When the pump was run with steam as the motive force, the oil in the governor control heated up and the flow through the needle valve changed enough to cause the governor control to oscillate. This resulted in divergent governor oscillations that eventually caused the pump to trip on over-speed.</p> <p>On January 8, 2014, the TDAFW pump was run, with steam as the motive force, and the governor needle valve was properly adjusted. The TDAFW pump surveillance test was then run for 1 hour and 41 minutes without incident. At 1609 hours the pump was declared operable. It has been determined that the TDAFW pump was inoperable due to the misadjusted governor control from the time Mode 3 was entered following the 1R22 refueling outage until the issue was corrected on January 8, 2014.</p> <p><b>CAUSE OF EVENT</b></p> <p>The TDAFW Pump governor was not adjusted with the governor at stable governor oil operating temperature following maintenance activities during 1R22. This action in conjunction with not re-insulating the turbine trip and throttle valve during 1R22 ultimately resulted in excessive governor oscillations due to oil viscosity changes from heating of the governor oil from near ambient room temperature to near stable governor operating oil temperature. Due to excessive governor oscillations, the turbine trip and throttle valve automatically tripped closed to prevent potential damage to the TDAFW pump.</p> <p>The significance of temperature change on turbine governor oil viscosity and resulting governor performance was not recognized nor addressed in site procedures and in the TDAFW Pump operability decision making process.</p>						

**LICENSEE EVENT REPORT (LER)  
CONTINUATION SHEET**

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**NARRATIVE**

**ANALYSIS OF EVENT**

BVPS Unit 1 tripped from full power due to a main transformer differential protection main unit generator trip. All three AFW pumps automatically started, as expected, due to lowering steam generator levels. The TDAFW pump ran for 1 hour and 49 minutes at which time the pump tripped due to governor oscillations. The TDAFW pump was declared inoperable. Subsequent investigation determined that the governor oscillations were due to a misadjusted governor needle valve that was last set during 1R22 in October, 2013. Therefore the pump was unavailable from the time Mode 3 was entered on November 1, 2013. A degraded condition exposure time of 1635.4 hours, while the TDAFW pump was unavailable due to the governor needle valve being out of adjustment, was assumed in this analysis.

The plant risk associated with the BVPS Unit 1 TDAFW pump oscillating governor event is considered to be very low. This is based on the delta core damage frequency and delta large early release frequency for the event during the 1635.4 hour period that the degraded condition existed.

This event is being reported under 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by Technical Specifications and under 10 CFR 50.73(a)(2)(v)(B) as a condition that could have prevented the fulfillment of a Safety Function – Remove Residual Heat. Although this event is being reported under 10 CFR 50.73(a)(2)(v)(B) it will not be counted as a Safety System Functional Failure for the performance indicator based on an engineering analysis showing that there was no loss of ability to fulfill the safety function as the pump mission time requirement for the limiting Design Basis Accident was satisfied.

**CORRECTIVE ACTIONS**

- 1.) Performed a proper adjustment of the governor control needle valve while at a stable governor operating oil temperature. (Complete)
- 2.) Revise the appropriate surveillance procedures to ensure a stable governor operating oil temperature is achieved in order to adequately assess governor performance.
- 3.) Revise the appropriate maintenance procedures to ensure a stable governor operating oil temperature is achieved prior to making final needle valve adjustments.

Completion of the above and other corrective actions is being tracked through the BVPS Corrective Action Program.

**PREVIOUS SIMILAR EVENTS**

A review of BVPS LERs from the previous three years identified the following BVPS Unit 1 LERs involving Auxiliary Feedwater System.

- BVPS LER 2013-001-00 Manual Start of a Motor Driven Auxiliary Feedwater Pump
- BVPS LER 2011-002-01 Failure to Comply With Technical Specification 3.7.5 due to the Inoperability of Two or More Trains of the Auxiliary Feedwater

CR 2014-00177, 2014-00244, 2014-02358