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L-11-247

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 2011-003-00

Enclosed is Licensee Event Report (LER) 2011-003-00, "Automatic Actuation of Standby Service Water Pumps Following Unexpected Service Water Pump Trip." This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A).

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

Enclosure – BVPS Unit 2 LER 2011-003-00

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

JE22
NRR

NRC FORM 366 U.S. NUCLEAR REGULATORY COMMISSION (10-2010)				APPROVED BY OMB NO. 3150-0104 EXPIRES 10/31/2013											
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, 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.							
1. FACILITY NAME						2. DOCKET NUMBER				3. PAGE					
Beaver Valley Power Station Unit Number 2						05000412				1 OF 5					
4. TITLE															
Automatic Actuation of Standby Service Water Pumps Following Unexpected Service Water 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			
06	10	2011	2011	- 003	- 00	08	08	2011	None						
									FACILITY NAME			DOCKET NUMBER			
9. OPERATING MODE			11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)												
1			<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 checked="" 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 type="checkbox"/> OTHER			
<input type="checkbox"/> 20.2203(a)(2)(vi)			<input type="checkbox"/> 50.73(a)(2)(i)(B)			<input type="checkbox"/> 50.73(a)(2)(v)(D)			Specify in Abstract below or in NRC Form 366A						
10. POWER LEVEL															
100															
12. LICENSEE CONTACT FOR THIS LER															
FACILITY NAME								TELEPHONE NUMBER (Include Area Code)							
Brian T. Tuite, Manager, Regulatory Compliance								(724) 682-4284							
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	BI	MO	S188	Y											
14. SUPPLEMENTAL REPORT EXPECTED								15. EXPECTED SUBMISSION DATE		MONTH	DAY	YEAR			
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO															
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)															
<p>On June 10, 2011 at 1457 hours, Beaver Valley Power Station (BVPS) Unit No. 2 unexpectedly experienced a trip of the "A" Service Water Pump (2SWS-P21A) which was operating on the "A" Service Water System (SWS) pipe header. The pump tripped on motor over current. The "A" and "B" Standby Service Water System pumps (2SWE-P21A and 2SWE-P21B) automatically started on low Service Water header pressure on the "A" and "B" piping train headers and recovered pressure in both the "A" and "B" SWS headers. The downstream side of each SWS header is connected to each other via non-safety related cooling loads. The non-safety related loads are isolated on a containment isolation signal phase "A" or if a low pressure condition exists on the SWS header(s) for greater than 45 seconds. The "B" Service Water Pump (2SWS-P21B) continued to operate normally during this event supplying "B" SWS header.</p> <p>This event is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A) as a condition that resulted in an unplanned valid actuation of an emergency service water system per 10 CFR 50.73(a)(2)(iv)(B)(9) that does not normally run and that serves as ultimate heat sink. The unexpected trip of the BVPS Unit 2 Service Water Pump 21A was the direct cause for the automatic actuation of the BVPS Unit 2 Standby Service Water Pumps 21A and 21B. The reason for the unexpected trip of 2SWS-P21A was due to an over current condition in the motor which led to a motor trip. The safety significance associated with the over current trip of the running service water pump 2SWS-P21A that occurred at BVPS Unit 2 on June 10, 2011 is considered to be very low.</p>															

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NARRATIVE					
<p>Energy industry identification system (EIS) codes are identified in the text using the format [XX].</p> <p>CONDITIONS PRIOR TO OCCURRENCE</p> <p>Unit 2: Mode 1 at 100 percent power</p> <p>There were no systems, structures, or components that were inoperable at the start of the event that contributed to the event other than as described below.</p> <p>DESCRIPTION OF EVENT</p> <p>On June 10, 2011 at 1457 hours, Beaver Valley Power Station (BVPS) Unit No. 2 unexpectedly experienced a trip of the "A" Service Water Pump (2SWS-P21A) [BI-P] which was operating on the "A" Service Water System (SWS) pipe header. The pump motor [MO] tripped on ground over current. The "A" and "B" Standby Service Water (SWE) System [KG] pumps (2SWE-P21A and 2SWE-P21B) automatically started on low Service Water header pressure on the "A" and "B" piping train header and recovered pressure in both the "A" and "B" SWS headers. The downstream side of each SWS header is connected to each other via non-safety related cooling loads. The non-safety related loads are isolated on a containment isolation signal phase "A" [JM] or if a low pressure condition exists on the SWS header(s) for greater than 45 seconds. The "B" Service Water Pump (2SWS-P21B) continued to operate normally during this event supplying the "B" SWS header. BVPS Unit No. 2 entered Technical Specification 3.7.8 "Service Water System" Condition "A" and other applicable Technical Specification Conditions for supported plant equipment at 1457 hours due to the "A" Service Water System subsystem being declared inoperable.</p> <p>The "B" SWE pump 2SWE-P21B was shut down per plant operating procedures at approximately 1625 hours. Prior to securing the "A" SWE pump 2SWE-P21A, at approximately 1817 hours, the SWS pump 2SWS-P21C was aligned to the "A" SWS header and placed in service. The "A" SWE pump 2SWE-P21A was then shut down per plant operating procedures at 1824 hours. BVPS Unit No. 2 then exited the Technical Specification 3.7.8 Condition "A" and other applicable Technical Specification Conditions for supported equipment due to the "A" Service Water System subsystem being declared operable at 1843 hours.</p> <p>On June 14, 2011 bent indicator needles on the local pressure gauges (2SWS-PI122A) [PI] and (2SWS-PI122B) [PI] for the SWS pump seal water supply strainers, were documented in the Corrective Action Program. The bent needles were attributed to a pressure transient that resulted from the 2SWS-P21A pump motor tripping. Walk down of the piping and other components in the vicinity of the damaged indicators, found no other damage. The damaged gauges were replaced.</p> <p>CAUSE OF EVENT</p> <p>The unexpected trip of the BVPS Unit 2 Service Water Pump 21A was the direct cause for the</p>					

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<p>automatic actuation of the BVPS Unit 2 Standby Service Water Pumps 21A and 21B. The unexpected trip of the BVPS Unit 2 Service Water Pump 21A was due to a motor stator insulation breakdown that resulted in a turn-to-turn short circuit. The most probable direct cause of the motor stator insulation breakdown was excessive voids and de-lamination in the motor winding insulation after being rewound at the vendor facility in 2005. The source of the excessive voids was due to inadequate impregnation of the resin during the Vacuum Pressure Impregnation (VPI) process. With poor resin penetration, vibration from normal motor operation plus the movement of the end turns, particularly during starting, led to a premature failure of the pump motor. The lack of adequate consolidation caused the coil turns to be loose with respect to each other. The lack of resin penetration further allowed the turns to move with respect to each other. The turn-to-turn insulation broke down from vibration and movement causing a turn-to-turn short that rapidly caused the coil to fail.</p> <p>This motor was previously repaired in 2005 by rewinding following a similar failure (Reference: BVPS Unit 2 LER 2005-002-00). Two sample coils were included in the repair, one being evaluated by the vendor performing the repair and one being evaluated by BETA Laboratory. The sample coil evaluated by the vendor was determined to be acceptable prior to the installation of the rewound motor. The repaired motor was reinstalled and passed its acceptance testing.</p> <p>The root cause of the SWS pump motor failure is that the vendor supplied a defective rewound motor to BVPS and it was not returned for rewind following identification of voids on the sample coil by BETA Laboratory. This testing by BETA Laboratory was completed after installation and initial acceptance of the rewound pump motor. One of the two sample coils obtained during the motor rewind indicated significant voids, de-lamination of the insulation layers and lacked compactness of the windings. The BETA Laboratory testing results were dispositioned by FirstEnergy Nuclear Operating Company (FENOC) and the rewound pump motor remained in service based on the results of a subsequent Partial Discharge test (IRIS test) of the pump motor.</p>						
ANALYSIS OF EVENT						
<p>The SWS, which draws water from the ultimate heat sink (Ohio River), provides normal plant cooling for safety related and non-safety related equipment during both plant operation and shutdown conditions. The SWE system is designed to provide a heat sink if the Main Intake Structure [MK] (which contains the SWS pumps) becomes disabled by the postulated beyond-design-basis event of a river barge impact explosion. The SWE pumps are located within the Alternate Intake Structure, upstream of the Main Intake Structure on the Ohio River. The SWE is designed to accommodate unit shutdown from 100 percent reactor power and subsequent cooldown of the Reactor Coolant System [AB] to less than 200 degrees Fahrenheit. The SWE pumps are provided with an automatic start feature such that each SWE pump will automatically start and align to its associated SWS piping train header when a low pressure is sensed in its associated SWS header. This automatic start feature is not required to meet the postulated beyond-design-basis loss of the Main Intake Structure event, but is provided to prevent inadvertent plant trip on loss of a running SWS pump since normal power operation cannot</p>						

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<p>NARRATIVE</p> <p>continue without adequate SWS flow. The automatic initiation of the SWE improves the reliability of the unit's heat sink capability. The downstream side of each SWS header is connected to each other via non-safety related cooling loads.</p> <p>During the unexpected loss of the running "A" SWS header pump, a low pressure was ultimately experienced in the "A" and "B" SWS headers, causing the "A" and "B" SWE header pumps to start. When the pressure in the "A" and "B" SWS headers reached the low-pressure set points, the "A" and "B" SWE pump automatically started as designed. The SWS and SWE systems performed as designed for a single SWS pump trip and as described in the Updated Final Safety Analysis Report (UFSAR). Safety related components and systems were not adversely affected by this event, as there was no notable interruption of service water cooling. All risk significant SSCs functioned as designed in response to the trip of the normally running Service Water pump 2SWS-P21A. This unplanned demand event did not result in a reactor trip, and the SWS headers remained available throughout the exposure time.</p> <p>The safety significance associated with the pump motor over current trip of the running Service Water pump 2SWS-P21A, and unplanned automatic actuation of the Standby Service Water pumps 2SWE-P21A and 2SWE-P21B that occurred at BVPS Unit 2 on June 10, 2011 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 limited period that the degraded condition existed.</p> <p>This event is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A) as a condition that resulted in an unplanned valid actuation of an emergency service water (SWE) system per 10 CFR 50.73(a)(2)(iv)(B)(9) that does not normally run and that serves as ultimate heat sink.</p> <p>CORRECTIVE ACTIONS</p> <ol style="list-style-type: none"> 1. The 2SWS-P21A motor was repaired by rewinding. 2. The Purchase Order specific to the 2SWS-P21A motor rewind included three winding samples to be taken, two during the VPI process. 3. Engineering will review the motor data from the vendor rewind for possible discrepancies that would lead to shortened motor life. 4. A plant operating experience report has been issued on this event (OE33945). 5. Fleet Engineering to review the Fleet Motor Specification and revise as appropriate based on lessons learned from the root cause. The revision is to include, but not limited to verification of coil consolidation prior to insertion in the motor core and the addition of a requirement to inspect sample coils prior to the motor being returned to service as appropriate. <p>Completion of the above and other corrective actions are being tracked through the BVPS corrective action program.</p>					

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NARRATIVE <div style="margin-top: 20px;"> PREVIOUS SIMILAR EVENTS <p>A review found no prior BVPS Unit 1 and two prior BVPS Unit 2 Licensee Event Reports within the previous ten years involving a valid automatic actuation of an Auxiliary River Water System pump (BVPS Unit 1) or a Standby Service Water System pump (BVPS Unit 2).</p> <p>BVPS Unit 2 LER 2005-002-00, "Automatic Actuation of Standby Service Water Pump Following Unexpected Service Water Pump Trip."</p> <p>BVPS Unit 2 LER 2001-002-00, "Trip of One Service Water Pump Caused Automatic Actuation of Emergency Service Water System."</p> <p>Note: BVPS Unit 2 LER 2001-002-00 is similar to this LER but involved a trip of the 2SWS-P21C motor.</p> </div>					

CR 11-96293