

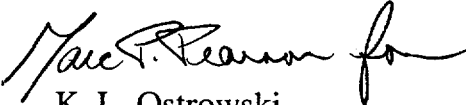
December 21, 1999
L-99-188

Beaver Valley Power Station, Unit No. 2
Docket No. 50-412 License No. NPF-73
LER 99-011-00

United States Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

In accordance with Appendix A, Beaver Valley Technical Specifications, the following Licensee Event Report is submitted:

LER 99-011-00, 10 CFR 50.73(a)(2)(i), "Inoperability of Service Water System Train B Due to Deformed Discharge Expansion Joint on In-Service Pump 2SWS*P21C."


K. L. Ostrowski
Plant General Manager

Attachment

IE22

PAZ ADOCU 05000412

LER 99-011-00

L-99-188

Page 2

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FACILITY NAME (1)
Beaver Valley Power Station Unit 2

DOCKET NUMBER (2)
05000412

PAGE (3)
1 OF 8

TITLE (4)
Inoperability of Service Water System Train B Due to Deformed Discharge Expansion Joint on In-Service Pump 2SWS*P21C

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
11	09	99	99	011	00	12	21	99	N/A	
									FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	POWER LEVEL (10)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
		20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)
1	100	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	BI	EXJ	F155	Y	X	BI	CKV	W030	Y
X	BI	PI	D243	Y	X	BI	ISV	W030	Y

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	NO						
	X						

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)(16)

Service Water System (SWS) "swing" pump 2SWS*P21C was supplying the SWS B Train, since approximately 0425 hours on 11/15/99, while the train normal supply pump 2SWS*P21B was out of service for planned replacement of the pump vacuum break check valve 2SWS-487. At approximately 0056 hours on 11/21/99, it was discovered that the 2SWS*P21C discharge expansion joint 2SWS-EJM222C was deformed outward. Due to the unknown condition of 2SWS-EJM222C, 2SWS*P21C was declared inoperable and required action of Technical Specification (TS) 3.7.4.1 was entered. At approximately 0154 hours on 11/21/99, Standby Service Water Pump 2SWE-P21B was placed into service to supply B SWS Train and 2SWS*P21C was removed from service. The subject work on 2SWS*P21B was completed and the pump was placed into service to supply B SWS Train and the TS required action was exited, at approximately 0035 hours on 11/22/99.

Investigation determined 2SWS-EJM222C most likely deformed, at approximately 1149 hours on 11/9/99, due to water hammer of the 2SWS*P21C discharge piping during pump startup for quarterly safeguards protection system slave relay testing. The water hammer resulted from a stuck closed pump discharge vacuum break check valve, 2SWS-488. 2SWS-EJM222C and 2SWS-488 have been replaced. A formal root cause evaluation of the deformed expansion joint will be performed by 1/31/2000. NRC notification per 10 CFR 50.72(b)(1)(ii)(B) was made, at approximately 1430 hours on 12/16/99, following engineering assessment that concluded the ability of 2SWS-EJM222C to withstand a design transient and maintain SWS pressure boundary integrity is indeterminate and therefore the capability of the SWS to perform its intended function under all design events was potentially adversely affected.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Beaver Valley Power Station Unit 2	05000412	99	011	00	2 OF 8

TEXT (If more space is required, use additional copies of NRC Form 366A)(17)

PLANT AND SYSTEM IDENTIFICATION

Westinghouse Pressurized Water Reactor (PWR)

Service Water System (SWS) {BI}*

SWS Pump 2SWS*P21C {BI/P}

SWS Pump 2SWS*P21C Discharge Expansion Joint 2SWS-EJM222C {BI/EXJ}*

* Energy Industry Identification System (EIIS) system and component function identifier codes appear in the text as {XX/XX}.

EVENT DESCRIPTION

Service Water System (SWS) "swing" pump 2SWS*P21C was in-service, since approximately 0425 hours on November 15, 1999, supplying the B SWS Train (subsystem), while the train normal supply pump 2SWS*P21B {BI/P} was out of service to replace the pump vacuum break check valve 2SWS-487 {BI/VACB}. 2SWS*P21C is capable of being aligned to supply either SWS Train (A or B). At approximately 0056 hours on November 21, 1999, it was discovered that the 2SWS*P21C pump discharge metal expansion joint 2SWS-EJM222C was deformed outward due to an apparent pressure excursion. Based on the as-found condition of the expansion joint, 2SWS*P21C was declared inoperable, effective at time of discovery and required action of Technical Specifications (TS) was entered. Required ACTION of TS 3.7.4.1 specifies that with less than two SWS subsystems OPERABLE, to restore at least two subsystems to OPERABLE within 72 hours or be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. At approximately 0154 hours on November 21, 1999, Standby Service Water Pump 2SWE-P21B {KG/P} was placed into service to supply B SWS Train and 2SWS*P21C was removed from service. The work on 2SWS*P21B was completed and the pump was placed into service to supply B SWS Train and the required action of TS 3.7.4.1 was subsequently exited at approximately 0035 hours on November 22, 1999.

2SWS-EJM222C (Senior Flexonics, Incorporated Drawing Number D-54909) most likely deformed on November 9, 1999, at approximately 1149 hours. This determination was based upon: review of surveillance test procedures, computer logs, Operating Shift Logs for the pump run documentation prior to November 15, 1999, and discovery on November 11, 1999 that the pump local pressure indicator 2SWS-PI101C {BI/PI} had been over-ranged, as evidenced by a bent indicator pointer. (Issues associated with the station response to the discovery

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Beaver Valley Power Station Unit 2	05000412	99	011	00	3 OF 8

TEXT (If more space is required, use additional copies of NRC Form 366A)(17)

EVENT DESCRIPTION (continued)

of the over-ranged instrument will be handled through the Corrective Action Program.)

An in-kind replacement indicator had been installed in place of failed indicator 2SWS-PI101C, Dresser Industries Valve & Instrument Division / Ashcroft Trade Mark, Model No. 45-1279SS-04L-XSG6N, prior to discovery of the deformed expansion joint on November 21, 1999.

Event discovery was made during routine rounds of the Intake Structure and is credited to attention to detail by the outside duty Operator (non-licensed, utility). This event was not readily self-revealing as the expansion joint is partially obscured from visual observation by a hazard shield and the expansion joint was holding normal SWS pressure.

REPORTABILITY

TS 3.7.4.1 requires at least two service water subsystems (trains) be OPERABLE to supply safety related equipment. Required ACTION of TS 3.7.4.1 specifies that with less than two SWS subsystems OPERABLE, to restore at least two subsystems to OPERABLE within 72 hours or be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Therefore, operation with 2SWS*P21C supplying the B SWS Train from November 15, 1999 until November 21, 1999 exceeded the TS required action time frame. As such, this event constitutes an operation or condition prohibited by TS, which is applicable to the non-emergency event 30-day LER reporting criteria of 10 CFR 50.73(a)(2)(i)(B).

Engineering assessment, initiated following event discovery concluded at approximately 1345 hours on December 16, 1999, that the ability of 2SWS-EJM222C to withstand a design transient and maintain SWS pressure boundary integrity is indeterminate. Consequently, the capability of the SWS system to perform its intended function under all design basis events was potentially adversely affected due to the as-found condition of the expansion joint. Based on this conclusion, it cannot be assured that the Unit remained within its plant design basis during the time frame that 2SWS*P21C was relied upon to maintain operability of SWS Train B, from November 15, 1999 until 2SWS*P21B was placed into service to supply the train on November 22, 1999. Therefore, at approximately 1430 hours on December 16, 1999, NRC 1-hour non-emergency event notification was made per the reporting criteria of 10 CFR 50.72(b)(ii)(B), for the Unit having been "In a condition that is outside the design basis of the plant." In addition, the NRC

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Beaver Valley Power Station Unit 2	05000412	99	011	0	4 OF 8

TEXT (If more space is required, use additional copies of NRC Form 366A)(17)

REPORTABILITY (continued)

Resident Inspector was advised of this notification. This event is therefore also applicable to the non-emergency event 30-day LER reporting criteria of 10 CFR 50.53(a)(2)(ii)(B), for the plant being "In a condition that was outside the design basis of the plant."

CAUSE OF THE EVENT

The apparent cause of deformed expansion joint 2SWS-EJM222C is attributed to water hammer of the B SWS Train piping on November 9, 1999. This occurred at approximately 1149 hours when the pump was auto-started for Operations Surveillance Test 2(OST)-1.12B, "Safeguards Protection System Train B Safety Injection System Go Test." Prior to this test, the pump had been shutdown at approximately 1051 hours, on November 9, 1999 to prepare for the test. During the pump shutdown, the water column in the pump suction separated, causing a vacuum condition in the pump discharge piping upstream of the pump discharge check valve 2SWS-59. This vacuum condition resulted from obstruction of the pump vacuum break path due to a stuck closed vacuum break check valve 2SWS-488 {BI/VACB}. Consequently, the water hammer then occurred upon startup of the pump for the test.

Disassembly / inspection of the vacuum break path components revealed the following:

The disc of the vacuum break path check valve, 2SWS-488 manufactured by Walworth Co. Model 5341WE, was stuck closed due to mechanical binding/sticking from corrosion buildup of the valve disc swing arm to hinge pin. The gate of the flowpath manual isolation valve 2SWS-483, Walworth Co. Model 5202WE {BI/ISV} was separated from the valve stem and lodged in the vacuum break flowpath piping. The 2SWS-483 valve gate separation is attributed to corrosion of the valve carbon steel gate and valve stem combined with the hydrodynamic mechanical effects of the event.

Operability of the Unit SWS pumps vacuum break check valves is verified on a quarterly basis during performance of each SWS pump's respective Operating Surveillance Test (OST) 2OST-30.2 (pump 21A), -30.3 (pump 21B), and -30.6 (pump 21C). Prior to the event, operability of 2SWS-488 had last been satisfactorily verified during performance of the OST on September 18, 1999. The preventive maintenance (PM) activity for the annual inspection and cleaning of 2SWS-488 was last performed on June 26, 1998. On August 20, 1999, the

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Beaver Valley Power Station Unit 2	05000412	99	011	00	5 OF 8

TEXT (If more space is required, use additional copies of NRC Form 366A)(17)

CAUSE OF THE EVENT (continued)

associated work orders for the next completion of the PM had been closed based upon the pending implementation of Technical Evaluation Report 10884 for replacement of the vacuum break check valves on the Unit's SWS pumps. At the time of the event, the PM was therefore beyond its site administrative limit (September 19, 1999). The effect of deferring the PM performance on the operability of vacuum break check valve 2SWS-488 is pending completion of a formal root cause analysis.

SAFETY IMPLICATIONS

The event was isolated to deformation of 2SWS-EJM222C, with no indication of existing or potential piping failures noted beyond the 2SWS*P21C discharge isolation valves 2SWS-MOV102C1 and 2SWS-MOV102C2 (BI/ISV). During the time period 2SWS*P21C was supplying the SWS B Train with the deformed expansion joint 2SWS-EJM222C, the pump would have been able to successfully mitigate the design basis accident. However, this would not have applied if an additional challenge to the expansion joint would have occurred due to a pump re-start, either through Emergency Diesel Generator automatic start sequencing or manual starting of the pump. With a postulated failure of the expansion joint SWS pressure boundary, it is expected that the Operator would have promptly shutdown 2SWS*P21C, which would have then isolated 2SWS Trains A and B from the pump due to automatic closure of the pump motor-operated discharge valves 2SWS-MOV102C1 and 2SWS-MOV102C2.

In addition it is expected that the opposite SWS Train A would have functioned to mitigate the accident. If an assumed single failure of SWS Train A prevented the train from completing successful mitigation of a design basis accident, SWS Train B could have provided required cooling flow through the use of Standby Service Water Pump 2SWE*P21B. SWE pumps are adequately sized to provide enough flow for all Engineered Safety Feature loads supplied by the SWS. 2SWE*P21B would have automatically started on low Train header pressure unless a loss of offsite occurred, in which case appropriate action could have been taken to manually start the pump. In addition, discharge pressure from the running 2SWE*P21B would have closed the 2SWS Train B discharge header check valve 2SWS-107. This would have further isolated 2SWS Train B from a failure of expansion joint 2SWS-EJM222C.

Assumed SWS leakage from a pressure boundary failure of 2SWS-EJM222C may have adversely affected operation of Unit 1 RWS Pump 1WR-P-1B,

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Beaver Valley Power Station Unit 2	05000412	99	011	00	6 OF 8

TEXT (If more space is required, use additional copies of NRC Form 366A)(17)

SAFETY IMPLICATIONS (continued)

which is located in the same pump cubicle. In response to the resulting SWS low header pressure, it is anticipated the Operator would have expeditiously shutdown 2SWS*P21C to limit the consequences and severity of the occurrence.

Based on the above discussion, it is expected that the failure of expansion joint 2SWS-EJM222C, would not have prevented the fulfillment of the design function of the SWS to supply all ESF loads. As such, the deformation of expansion joint 2SWS-EJM222C had minimal effect on the health and safety of the public.

The change in core damage probability (CDP) associated with the deformed Unit 2 SWS expansion joint 2SWS-EJM222C is approximately 1.02E-06 at Unit 2 and 1.20E-08 at Unit 1. The Unit 2 value is based on the assumption that pump 2SWS*P21B was out-of-service and pump 2SWS*P21C was operating in its place from approximately 0425 hours on November 15, 1999 until 0056 hours on November 21, 1999. This CDP determination assumes that during the 140.5-hour time period the expansion joint was unknowingly deformed, the expansion joint would have failed upon a given seismic event or pump restart due to the loss of offsite power. The Unit 1 CDP value is based on the increased frequency (2.711E-02 events per year) of a flood occurring in the "B" intake structure cubicle due to the failure of the Unit 2 expansion joint during this time frame.

Risk associated with this condition at Unit 1 is low and would be considered non-risk significant per the EPRI PSA Applications Guide screening criteria for temporary changes. Risk associated with this condition at Unit 2 is also low, but it is slightly above the non-risk significant threshold value of 1.0E-06 per the EPRI PSA Applications Guide. However, if non-quantifiable factors are applied the condition could be considered to be non-risk significant. To support this, the Unit 2 CDP analysis conservatively assumed that the expansion joint would fail 100% of the time for any seismic event or pump restart. Assuming that the expansion joint had a slight probability of remaining intact during these transients, the resultant CDP value would be less than the 1.0E-06 threshold value. Therefore, the event could then be considered to be non-risk significant.

CORRECTIVE ACTION

1. On November 21, 1999, inspection of the remaining metal expansion joints in both Unit 2 SWS trains was conducted and the joints were found to be in good condition, with no apparent signs of distress.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Beaver Valley Power Station Unit 2	05000412	99	011	00	7 OF 8

TEXT (If more space is required, use additional copies of NRC Form 366A)(17)

CORRECTIVE ACTION (continued)

2. On November 24, 1999, structural engineering personnel performed walkdowns of the SWS piping in the pump cubicles of the Unit 2 SWS pumps and determined there were no indications in the cubicles that the piping or adjacent structures experienced significant displacements.
3. An inspection of pipe supports downstream of 2SWS*P21C and 2SWS-EJM222C was performed, which found no apparent damage.
4. Deformed expansion joint 2SWS-EJM222C of SWS pump 2SWS*P21C has been removed and a replacement expansion joint has been installed.
5. 2SWS*P21C vacuum break check valve 2SWS-488 has been replaced with a new style nozzle check valve, Enertech Model DRVZ.
6. The piping downstream of 2SWS*P21C has been evaluated for potential over-stress conditions due to the hydraulic transient, resulting from this event and determined to be acceptable.
7. Prior to returning 2SWS*P21C to service, possible effects from potential over-stress conditions upon the pump and its discharge isolation valves, 2SWS-MOV102C1 and 2SWS-MOV102C2, due to this event, will be evaluated.
8. Manual isolation valve 2SWS-483 has been repaired.
9. The 2SWS*P21C discharge check valve, 2SWS-59 was inspected for signs of distress due to the hydraulic transient that deformed the pump discharge expansion joint 2SWS-EJM222C and on December 19, 1999 was determined to be acceptable.
10. By January 31, 2000, a formal root cause evaluation for deformed expansion joint 2SWS-EJM222C and vacuum break check valve 2SWS-488 of SWS pump 2SWS*P21C will be performed. As part of this, the time period from September 19, 1999 until November 9, 1999, will be evaluated regarding operability of 2SWS*P21C. This LER will be updated, as required, based on the results of the above described formal root cause evaluation.
11. The failure mechanism associated with the valve gate of 2SWS-483 is being evaluated under a separate Condition Report.
12. Following return of 2SWS*P21C to service, an inspection of the manual isolation valves of the corresponding vacuum break check

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET (2) NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Beaver Valley Power Station Unit 2	05000412	99	011	00	8 OF 8

TEXT (If more space is required, use additional copies of NRC Form 366A)(17)

CORRECTIVE ACTION (continued)

valves of the other SWS pumps on Unit 2 and Unit 1 RWS pumps will be conducted. This will be completed by May 31, 2000.

13. The vacuum break check valves currently employed on the intake pumps of the Unit 2 SWS and corresponding Unit 1 River Water System (RWS) will be replaced with nozzle style check valves, Enertech Model DRVZ. This action is complete for Unit 2 pumps 2SWS*P21B and 2SWS*P21C. This action will be completed on the remaining Unit 2 pump (2SWS*P21A) by January 31, 2000. In addition this action will be completed by May 31, 2000 on Unit 1, which will replace currently used plug style check valves.
14. Issues associated with the station response to the discovery of the over-ranged discharge pressure local indicator of 2SWS*P21C will be handled through the Corrective Action Program.
15. Issues associated with the deferral of the PM performance for the vacuum break check valves will be handled through the Corrective Action Program.

SIMILAR EVENTS

Review of BVPS documentation for both Units for the past two years did not reveal a prior similar occurrence.