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February 10, 1997  
NPD2VPO:0606

*Beaver Valley Power Station, Unit No. 2*  
*Docket No. 50-412 License No. NPF-73*  
*LER 96-010-00*

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 96-010-00, 10 CFR 50.73(a)(2)(i), "Migration of Leak Sealant Material into the Reactor Head Vent System."

R. L. LeGrand  
Division Vice President  
Nuclear Operations

LE/ds

Attachment

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**LICENSEE EVENT REPORT (LER)**

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

FACILITY NAME (1) Beaver Valley Power Station Unit 2						DOCKET NUMBER (2) 05000412			PAGE (3) 1 OF 5		
TITLE Migration of Leak Sealant Material into the Reactor Head Vent System											
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	
12	02	96	96	010	00	02	10	97	Beaver Valley Power Station Unit 1	05000334	
OPERATING MODE (9)			20.402(b)			20.405(c)			50.73(a)(2)(iv)		
POWER LEVEL (10)			20.405(a)(1)(i)			50.36(c)(1)			50.73(a)(2)(v)		
0%			20.405(a)(1)(ii)			50.36(c)(2)			50.73(a)(2)(vii)		
			20.405(a)(1)(iii)			X 50.73(a)(2)(i)			50.73(a)(2)(viii)(A)		
			20.405(a)(1)(iv)			50.73(a)(2)(ii)			50.73(a)(2)(viii)(B)		
			20.405(a)(1)(v)			50.73(a)(2)(iii)			50.73(a)(2)(x)		
(Specify in abstract below and in Text NRC Form 366A)											
LICENSEE CONTACT FOR THIS LER (12)											
NAME R. L. LeGrand, Vice President Nuclear Operations and Plant Manager						TELEPHONE NUMBER (include Area Code) (412) 393-7622					
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)											
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDs		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDs	
E	BA	HCV	T020	Y							
X	BA	ISV	K085	Y							
SUPPLEMENTAL REPORT EXPECTED (14)									EXPECTED SUBMISSION DATE (15)		
YES (if yes, complete EXPECTED SUBMISSION DATE)					X NO						
ABSTRACT (Limited to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)											
<p>On December 2, 1996, at approximately 1500 hours, while in Mode 3, a maintenance repair crew at Beaver Valley Power Station (BVPS) Unit 2 completed the leak repair of a Reactor Head Vent System (RHVS) one inch isolation valve, 2RCS-624, by the injection of a leak sealant material into the valve body cavity. During subsequent engineering investigation and management evaluation of this repair, finalized on January 12, 1997, it was determined that leak sealant material, which had migrated from the site of the repair and fouled valves and piping, would have prevented the RHVS from accomplishing its design functions of venting the reactor head or providing an alternate letdown path. Therefore, the RHVS was inoperable, while in Modes 1 through 4, contrary to the requirements of Technical Specification (TS) Limiting Condition (LCO) 3.4.12. Also, contrary to the requirements of TS LCO 3.0.4, a mode change from Mode 3 to Mode 2 was made without meeting the conditions for TS LCO 3.4.12. This is a condition prohibited by Technical Specifications and is reportable pursuant to the requirements of 10CFR50.73(a)(2)(i).</p> <p>On December 3, 1996, while in Mode 2, station management directed the reactor to be shutdown to perform additional RHVS leak testing. During leak testing of the RHVS on December 4-5, 1996, it was identified that Train A modulating valve 2RCS-HCV-250A failed to indicate fully closed. On December 6, 1996, station management directed that the plant be cooled down to Mode 5 to disassemble and evaluate 2RCS-HCV-250A. Problems were then identified with the stroking of Train B modulating valve 2RCS-HCV-250B. On December 7-8, 1996, maintenance personnel found leak sealant material in 2RCS-HCV-250A, 2RCS-HCV-250B and in piping downstream of 2RCS-624. Engineering investigations determined that leak sealant had migrated from the site of the repair, because the incorrect compound had been used and an excessive amount of material had been injected. The overall root cause of the event was determined to be insufficient management controls of the leak repair process.</p> <p>Valve 2RCS-624 was permanently removed. A section of the RHVS piping and valves 2RCS-HCV-250A and 2RCS-HCV-250B were replaced. The repaired system was tested satisfactorily and the RHVS was declared operable on December 14, 1996.</p> <p>Testing demonstrated that the Reactor Coolant System integrity was maintained by the normal plant pressure boundaries throughout the event. The plant was not operated beyond the startup mode (Mode 2) during the course of the event. The plant was promptly placed in a safe, shutdown condition and the RHVS operability fully restored prior to power operation. There were no safety implications to the health and safety of the public as a result of this event.</p>											

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

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Beaver Valley Power Station Unit 2	05000412	96	010	00	2 OF 5

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

**PLANT AND SYSTEM IDENTIFICATION**

Westinghouse Pressurized Reactor (PWR)

Reactor Vessel Head Vent System (RHVS) {AB}\*

RHVS Isolation Valve ( for 2RCS-FG200) 2RCS-624 {AB/ISV/K085}\*

RHVS Hand Control Valve (modulating valve) 2RCS-HCV-250A Train A {AB/HCV/T020}\*

RHVS Hand Control Valve (modulating valve) 2RCS-HCV-250B Train B {AB/HCV/T020}\*

RHVS Upstream Isolation Valve Train A 2RCS-SOV-200A {AB/ISV/T020}\*

RHVS Upstream Isolation Valve Train B 2RCS-SOV-200B {AB/ISV/T020}\*

RHVS Downstream Isolation Valve Train A 2RCS-SOV-201A {AB/ISV/T020}\*

RHVS Downstream Isolation Valve Train B 2RCS-SOV-201B {AB/ISV/T020}\*

\* Energy Industry Identification System (EIIIS) System, Component, and Manufacturer Codes are identified in the text as {EIIIS.SS/CCC/MMMM}.

**CONDITIONS PRIOR TO OCCURRENCE**

Unit 1: Mode 1, 100% Reactor Power

Unit 2: Mode 3, 0% Reactor Power

**DESCRIPTION OF EVENT**

On November 29, 1996, at Beaver Valley Power Station (BVPS) Unit 2, operators identified a small leak from the Reactor Head Vent System (RHVS) {EIIIS:AB}, during a Mode 3 containment walkdown in preparation for a reactor startup. The leak was approximately 15 drops per minute (dpm) from a blind flange downstream of normally shut one inch isolation valve, 2RCS-624 {EIIIS:AB/ISV/K085}, in a dead-leg portion of the RHVS. Valve 2RCS-624 is not required to be repositioned for RHVS operation. After consultation with the valve vendor, the closure torque on 2RCS-624 was increased from 55 foot-pounds to 65 foot-pounds. Leakage at the downstream flange decreased to 6 dpm, which was less than the Technical Specification (TS) permitted value for the identified Reactor Coolant System (RCS) leakage. However, the continued leakage indicated that leakage existed past three normally shut RHVS valves in series, 2RCS-SOV-200A(B), 2RCS-SOV-201A(B) {EIIIS: AB/ISV/T020} and 2RCS-624. A Technical Evaluation Report (TER) and 10CFR50.59 safety analysis were prepared to implement leak repairs.

On December 2, 1996, at approximately 1500 hours, while in Mode 3, a maintenance repair crew completed the leak repair of valve 2RCS-624, by the injection of a leak sealant material into the valve body cavity. During subsequent engineering investigation and management evaluation of this repair, finalized on January 12, 1997, it was determined that leak sealant material, which had migrated from the site of the repair and fouled valves and piping, would have prevented the RHVS from accomplishing its design functions of venting the reactor head or providing an alternate letdown path. Therefore, the RHVS was inoperable, while in applicable Modes 1 through 4, contrary to the requirements of Technical Specification Limiting Condition for Operation (LCO) 3.4.12. Also, contrary to the requirements of TS LCO 3.0.4, a mode change from Mode 3 to Mode 2 was made without meeting the conditions for TS LCO 3.4.12. This is a condition prohibited by Technical Specifications and is reportable pursuant to the requirements of 10CFR50.73(a)(2)(i).

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On December 3, 1996, while in Mode 2, station management directed the reactor to be shutdown to perform additional RHVS leak testing. During leak testing of the RHVS on December 4-5, 1996, it was identified that modulating valve 2RCS-HCV-250A {EHS:AB/HCV/T020} failed to indicate fully closed. On December 6, station management directed that the plant be cooled down to Mode 5 to disassemble and evaluate 2RCS-HCV-250A. Problems were then identified with the stroking of Train B modulating valve 2RCS-HCV-250B {EHS:AB/HCV/T020}. On December 7-8, 1996 maintenance personnel found leak sealant material in 2RCS-HCV-250A, 2RCS-HCV-250B and in piping downstream of 2RCS-624. Engineering investigations determined that the leak sealant had migrated from the site of the repair, because the incorrect compound had been used and an excessive amount of material had been injected.

**CAUSE OF EVENT**

The overall root cause of the event was determined to be insufficient management controls of the leak repair process. The cause of the migration of the leak sealant compound and resultant performance degradation of the head vent modulating valves was the incorrect specification by Duquesne Light Company (DLC) engineers of the expected piping conditions that would exist during the sealant injection, and the over-injection of the leak sealant compound.

**ANALYSIS OF EVENT**

During the week of December 9, 1996, an Event Response Team (ERT) was assembled to collectively review RHVS event. The following information is from the ERT Report.

The incorrect specification of piping conditions by DLC resulted in the vendor prescribing a compound that failed to harden (cure), and migrated by gravity to the "tee" which connected the injected piping to the main head vent system flow path. Subsequent testing of the modulating valves resulted in a small amount of the compound being swept downstream to the modulating valve inlets. The piping conditions provided to the vendor were selected based upon the maximum system operating temperature. Since the RHVS line was leaking, and "steam" was initially reported when 2RCS-624 was operated, DLC engineers believed that the line was hot and failed to critically question the compound selection.

Subsequent interviews with individuals that initially reported the "steam," determined that they had touched the line, that it was not hot, and the "steam" was most likely atomized water spraying from the leak. Control Room indication of <100°F line temperature also confirmed that the line was not hot while the leak existed.

In addition to using the incorrect sealant compound, a greater quantity of leak sealant was injected than was intended and specified in the work document. An estimated 11 cubic inches of compound was injected, while only 6 cubic inches was authorized. This occurred because vendor technicians did not clearly communicate to each other the amount of compound that had been loaded into the leak seal injection gun, and the individuals performing the injection believed only the correct amount authorized ( 6 cubic inches) plus allowance for gun components (2 cubic inches) had been loaded into the gun. In reality, the gun had been loaded with an estimated 16 cubic inches prior to the injection.

The cause for the over-injection was inadequate vendor implementation of process specifications, weak vendor oversight by DLC line supervision, and weak Quality Control of the evolution. DLC personnel failed to critically question the vendor technicians regarding compound volume control methods, and the Quality Control Department elected not to establish hold points for volume verification.



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**CORRECTIVE ACTIONS**

Immediate corrective actions were as follows:

1. The Plant Manager issued a Stop Work Order December 9, 1996, prohibiting the use of leak repair methods until the leak repair program was assessed and appropriate improvements implemented.
2. The leak repaired area, including the 2RCS-624 valve and its piping were permanently removed from the RHVS. The affected piping and modulating valves 2RCS-HCV-250A and 2RCS-HCV-250B were replaced. The new piping configuration was properly stress analyzed before installation. These actions were completed by December 12, 1996.
3. During piping removal for replacement on December 9, 1996, the piping was inspected including upstream of the "tee" and downstream of the modulating valves. Only a slight stain was observed just upstream of the "tee" and no indication of leak sealant compound was found downstream of the modulating valves. An estimated teaspoonful of compound was found in one of the modulating valves (2RCS-HCV-250A) and only a slight trace of compound was noted in the other modulating valve (2RCS-HCV-250B).
4. The RHVS was tested following component replacement on December 13, 1996, and determined to be fully operable.
5. The compound and piping removed from the RHVS was evaluated to determine the amount of compound recovered from the system. The amount recovered was estimated to equal the 11 cubic inches of compound that was injected.

Follow-Up Corrective Actions:

1. Existing leak repairs (currently installed) at both Units were evaluated by December 12, 1996, to determine if similar operational concerns existed. Based upon information available, disposition of these determined that there were no safety-significant anomalies. Temporary modification packages will be "backfit" for these existing leak repairs by February 28, 1997.
2. An engineering evaluation of the leak repair program was completed on December 16, 1996.
3. Procedure 1/2CMP-75-Leak Repair-1M, "General Leak Repair Procedure" was extensively revised into an integrated maintenance and engineering document addressing leak repairs on January 30, 1997.
4. Procedure 1/2CMP-75-Leak Repair-1M, "General Leak Repair Procedure," was also revised to include the requirement for work control procedures to be used in the field on January 30, 1997.
5. A new Engineering Standard, ES-G-021, "On-Line Leak Repair," was issued February 1, 1997, which establishes the methods necessary to perform an engineering review of a proposed on-line leak repair.
6. Documented DLC approval of vendor-supplied information will be required. This was addressed by 1/2CMP-75-Leak Repair-1M on January 30, 1997 and by ES-G-021 on February 1, 1997.
7. Ownership of the leak repair process has been assigned to Nuclear Engineering Department (NED). Maintenance will retain the implementation role. This ownership clarification was incorporated into 1/2CMP-75-Leak Repair-1M on January 30, 1997.
8. NED engineers responsible for evaluating leak repairs will be required to have read the pertinent industry and BVPS documents as a part of their qualification to perform this activity. This requirement will be formalized in NED procedures by February 28, 1997.

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9. A technical training module for selected NED, Quality Services and Maintenance personnel will be established in cooperation with the Training Department. The module will be presented by April 30, 1997.
10. No injections shall be performed injecting directly into the process side of a system. This was incorporated into 1/2CMP-75-Leak Repair-1M on January 30, 1997.
11. During work package preparation for leak sealing, Engineering and Maintenance will establish hold points for parameters that are critical to the specific type of repair. DLC maintenance supervision will be required to observe the entire process and perform verification by the hold point, prior to allowing the work to proceed. The designated DLC maintenance supervisor will be accountable for leak repair vendor performance during the specific task in progress and will be required to conduct mandatory, detailed pre-job briefings. In addition, Quality Control will be required to observe and separately verify the established hold points. These items were incorporated into 1/2CMP-75-Leak Repair-1M on January 30, 1997.
12. The Quality Services Manager reviewed this event with select Quality Services personnel by January 31, 1997. A training module on this event and generic leak repair issues was presented to select Quality Control (QC) personnel by QC supervision by January 31, 1997.

**REPORTABILITY**

Based upon DLC management discussions on January 12, 1997, it was determined that, due to the injection of the leak sealant material into valve 2RCS-624 on December 2, 1996 the RHVS would not have been able to perform its design functions. This was based upon the fact that Engineering could not conclusively determine whether the system could have accomplished those functions with the sealant material in the modulating valves and associated piping. The implication is that the plant was subsequently operated in a Mode (required by TS in Modes 1-4) where the RHVS was required to be operable pursuant to TS LCO 3.4.12, without entering the appropriate TS action statement and meeting the requirements of that action statement. Also, contrary to the requirements of TS LCO 3.0.4, a mode change from Mode 3 to Mode 2 was made without meeting the conditions for TS LCO 3.4.12. This is an event or condition prohibited by Technical Specifications and is reportable pursuant to the requirements of 10CFR50.73(a)(2)(i).

**SAFETY IMPLICATIONS**

Testing demonstrated that the Reactor Coolant System integrity was maintained by the normal plant pressure boundaries throughout the event. The plant was not operated beyond the startup mode (Mode 2) during the course of the event. The plant was promptly placed in a safe, shutdown condition and the RHVS operability fully restored prior to power operation. There were no safety implications to the health and safety of the public as a result of this event.

**SIMILAR EVENTS**

A review of Beaver Valley Power Station Licensee Event Reports for the past two years did not identify any similar events.