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L-09-231

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 2009-001-00

Attached is Licensee Event Report (LER) 2009-001-00, "Equipment Operability for Steam Generator Tube Rupture Safety Analysis Not Met." This event is being reported in accordance with 10 CFR 50.73(a)(2)(v)(C) and 50.73(a)(2)(v)(D).

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. Colin P. Keller, Manager, Regulatory Compliance at 724-682-4284.

Sincerely,

Paul A. Harden

Attachment

cc: Mr. S. J. Collins, NRC Region I Administrator
Mr. D. L. Werkheiser, NRC Senior Resident Inspector
Ms. N. S. Morgan, NRR Project Manager
INPO Records Center (via electronic image)
Mr. L. E. Ryan (BRP/DEP)

IE22
NRR

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

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4. TITLE
Equipment Operability for Steam Generator Tube Rupture Safety Analysis Not Met

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
									None	
08	19	2009	2009 -	001 -	00	10	15	2009	FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE: 1

10. POWER LEVEL: 100 %

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(a)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☒ 50.73(a)(2)(v)(C)	☐ OTHER Specify in Abstract below or in NRC Form 366A
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☒ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Colin P. Keller, 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

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete 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 August 19, 2009, Beaver Valley Power Station (BVPS) Unit 2 discovered that a combination of two inoperable same-train components could invalidate the design basis accident safety analysis, even though applicable Technical Specification Required Actions are being met. Specifically, if one Emergency Diesel Generator and one of the four Atmospheric Steam Dump Valves are not available with no other postulated single failures, Engineering has determined that the time frame for Reactor Coolant System depressurization would be extended during a postulated Steam Generator Tube Rupture design basis accident. As a result, the ruptured steam generator could overfill. Maintaining a steam bubble in the secondary side of a ruptured steam generator ensures that a large portion of any radioactive iodine will be partitioned (i.e., contained) within the secondary water and not released to the environment when secondary steam is released. This partitioning is a safety function credited in the licensing basis safety analysis. This specific plant configuration occurred within the last 3 years, which could have prevented the fulfillment of the safety function of a structure or system that is needed to control the release of radioactive material; or mitigate the consequences of an accident. This is reportable per 10 CFR 50.73(a)(2)(v)(C) and 10 CFR 50.73(a)(2)(v)(D).

The root cause of this event was an inadequate design basis review during original plant design (legacy item) which resulted in minimal design capacity with respect to Steam Generator Tube Rupture overfill. Subsequently identified issues made it necessary to rely on cross-train components to meet safety analyses assumptions. The safety significance of these plant configurations is very low.

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

DESCRIPTION OF EVENT

On August 19, 2009, while operating at 100 percent power, Beaver Valley Power Station (BVPS) Unit 2 discovered that a combination of two inoperable same-train components could invalidate the design basis accident safety analysis, even though applicable Technical Specification Required Actions were being met. This adverse configuration was discovered while reviewing a proposed procedure change. Specifically, this involves a BVPS Unit 2 Emergency Diesel Generator (EDG) [EK] and an Atmospheric Steam Dump Valve (ADV) [SB] in the design basis accident analysis for Steam Generator Tube Rupture (SGTR).

Each of the three BVPS steam generators has one individual ADV (Train A powered). There is also one common ADV (Train B powered) which draws steam from a steam line connected to each of the three steam generators, which can be manually isolated from any steam generator. In order to meet current SGTR overfill safety analysis, three of the four ADVs need to be available post-accident for manual operation, or two ADVs available post-accident for remote operation.

During a SGTR, a plant operator is required by procedure to perform several actions to mitigate the event. These include isolating auxiliary feedwater flow [EA] to the ruptured steam generator and using the ADVs to rapidly cool down the Reactor Coolant System (RCS) [AB] prior to depressurization. These steps must be completed in a timely manner to preclude overfilling of the secondary side of the ruptured steam generator which could lead to a release of primary and secondary water through the main steam safety valves. This type of release is not bounded by the current design basis dose consequence analyses. Design basis SGTR analysis does consider various postulated single failures of available components, which include ADVs and power sources for these valves.

However, if the Train "A" EDG is not available (Required Action for Technical Specification 3.8.1, AC Power Sources – Operating, entered and met) and one of the four ADVs is not available (Required Action for Technical Specification 3.7.4, Atmospheric Dump Valves, entered and met), and assuming no other postulated single failures, Engineering has determined that the time frame for RCS depressurization would be extended during a SGTR. Coupled with the other consequences of the de-energized emergency bus from the consequential Loss of Offsite Power, the ruptured steam generator could overfill. Maintaining a steam bubble in the secondary side of a ruptured steam generator ensures that a large portion of any radioactive iodine will be partitioned (i.e., contained) within the secondary water and not released to the environment when secondary steam is released through the ADVs.

The steam/water interface in a ruptured steam generator (i.e., steam generator iodine

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partitioning) is a safety function credited in the licensing basis safety analysis. In addition to meeting specified accident dose limits, a steam generator overfill condition was explicitly prohibited in the Nuclear Regulatory Commission's review of the current BVPS Unit 2 SGTR safety analysis (presumably since the aggregate consequences of steam generator overfill were not specifically assessed).

A review of BVPS Unit 2 equipment alignments over the last three years concluded that there was one prior occurrence when both the Train "A" EDG and one ADV were simultaneously not operable and unable to perform design functions for approximately ten hours on February 12, 2008. This condition violated the assumptions of the BVPS Unit 2 SGTR analysis of record. In this condition, BVPS Unit 2 was susceptible to a steam generator overfill which could not be mitigated in a timely fashion using safety related equipment, thus violating a BVPS Unit 2 licensing basis. The steam partitioning safety function could have not been assured if a design basis SGTR event occurred with these two simultaneous out of service conditions. Thus, this was a condition that could have prevented the fulfillment of the safety function of a structure or system (without postulating any single failure) that are needed to: (C) Control the release of radioactive material; or (D) Mitigate the consequences of an accident. Therefore, this is reportable pursuant to 10 CFR 50.73(a)(2)(v)(C) and 10 CFR 50.73(a)(2)(v)(D), consistent with 10 CFR 50.73(a)(2)(vi) which includes discovery of design/analysis inadequacies.

CAUSE OF EVENT

The root cause of this event was an inadequate design basis review during original plant design (legacy item) which resulted in minimal design capacity with respect to Steam Generator Tube Rupture overfill. Due to subsequently identified issues with this Steam Generator Tube Rupture overfill analysis, it was realized that it was necessary to rely on cross-train components to meet safety analyses assumptions.

Contributing Causes were: 1) previous engineering review processes did not contain sufficient rigor to identify this loss of a safety function; 2) procedures for on-line risk assessment and management (1/2-ADM-0804) and Technical Specification compliance (1/2OM-48.1.I) did not include the prohibition for concurrent removal of this equipment, and 3) personnel developing and reviewing engineering documents focused on the standard engineering parameter of a single failure being mitigated by a complete available train of equipment instead of relying on cross train components to satisfy safety function.

ANALYSIS OF EVENT

The plant risk associated with the BVPS Unit 2 unanalyzed potential steam generator overfill conditions resulting from a Steam Generator Tube Rupture concurrent with a Loss of Offsite Power during the last three year period time frame when both an "A" Train EDG

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and an ADV were inoperable, is considered to be very low. The plant configurations that resulted in these potential steam generator overfill conditions were assessed using the BVPS Configuration Risk Management Program. The safety significance of these plant configurations is very low based on the relatively short durations and analyzed Incremental Core Damage Probability (ICDP) and Incremental Large Early Release Probability (ILERP). Furthermore, there was a low probability of having a steam generator overfill event during the periods while in these configurations.

CORRECTIVE ACTIONS

1. A standing Operations order was promptly issued to prohibit voluntarily removing one EDG and one ADV from service concurrently.

2. The affected site procedures have been revised to alert Work Planning and Operations / Control Room personnel that the “A” Train Emergency Diesel Generator and any Atmospheric Steam Dump Valve at Unit 2 cannot be removed from service concurrently.

3. The engineering interface process will be strengthened by clarifying the specific requirements involving explicit use of cross-train components. This will minimize the potential for rule or knowledge based errors.

4. An extent of condition review determined that a similar condition also applies to BVPS Unit 1. [Note: the specific adverse configuration was not entered at BVPS Unit 1 within the last three years and is not reportable.] The same limitations on not taking one Train “A” EDG out of service coincident with one ADV at BVPS Unit 2 will also be applied to BVPS Unit 1.

5. An additional extent of cause will be performed for safety analyses which may require components of opposite trains to satisfy a safety function.

6. An Operating Experience report (No. 29759) has been issued on this issue.

Completion of the above and other corrective actions are being tracked through the BVPS corrective action program.

PREVIOUS SIMILAR EVENTS

A review found no prior BVPS Unit No. 1 or prior BVPS Unit No. 2 Licensee Event Reports within the last three years for an event involving a design basis safety analysis deficiency.

CR 09-63451