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Beaver Valley Power Station, Unit No. 2
Docket No. 50-412 License No. NPF-73
LER 2002-003-00

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 2002-003-00, 10 CFR 50.73(a)(2)(i)(B), "Calibration Discrepancies in Delta Temperature Tau Time Constant Values Used in the Reactor Protection System."



Lew W. Myers

Attachment

- c: Mr. D. S. Collins, Project Manager
Mr. D. M. Kern, Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator
INPO Records Center (via electronic image)
Mr. L. E. Ryan (BRP/DEP)

NRC FORM 366 (7-2001)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB NO. 3150-0104	EXPIRES 7-31-2004
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: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@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 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.	

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4. TITLE
Calibration Discrepancies in Delta Temperature Tau Time Constant Values Used In The Reactor Protection System

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
2	22	2002	2002	003	00	04	22	2002	Beaver Valley Unit 1	05000334
									FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE	5	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)							
		20.2201(b)		20.2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)	
10. POWER LEVEL	0	20.2201(d)		20.2203(a)(4)		50.73(a)(2)(iii)		50.73(a)(2)(x)	
		20.2203(a)(1)		50.36(c)(1)(i)(A)		50.73(a)(2)(iv)(A)		73.71(a)(4)	
		20.2203(a)(2)(i)		50.36(c)(1)(ii)(A)		50.73(a)(2)(v)(A)		73.71(a)(5)	
		20.2203(a)(2)(ii)		50.36(c)(2)		50.73(a)(2)(v)(B)		OTHER Specify in Abstract below or in NRC Form 366A	
		20.2203(a)(2)(iii)		50.46(a)(3)(ii)		50.73(a)(2)(v)(C)			
		20.2203(a)(2)(iv)		50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)			
		20.2203(a)(2)(v)	X	50.73(a)(2)(i)(B)		50.73(a)(2)(vii)			
		20.2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)			
20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)					

12. LICENSEE CONTACT FOR THIS LER

NAME L. R. Freeland, Manager Regulatory Affairs/Corrective Action	TELEPHONE NUMBER (Include Area Code) (724) 682-5284
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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

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

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

During a review of historical data for Overtemperature Delta Temperature (OTDT) reactor trip function used in the Reactor Protection System (RPS) at Beaver Valley Power Station (BVPS) Unit No. 2, it was identified that the procedure methodology for lead/lag testing did not provide correct data for time constant measurements. The incorrect OTDT lead and lag times caused the OTDT time constant Tau 4 (lead time) for all three Reactor Coolant System loops to not comply with the BVPS Unit 2 Technical Specification 3.3.1.1 Reactor Trip System Instrumentation setpoints, which requires a Tau 4 value of greater than or equal to 30 seconds. Therefore, the previously implemented Tau 4 time constant was not in compliance with BVPS Unit 2 Technical Specification requirements.

During an extent of condition review, it was identified that surveillance calibration procedures utilized to calibrate the Overpower Delta Temperature (OPDT) rate/lag modules at BVPS Unit No. 1 contained incorrect scaling values and calibration instructions. This caused the OPDT time constant Tau 3 (lead time) for all three Reactor Coolant System loops to not comply with the BVPS Unit 1 Technical Specification 3.3.1.1 Reactor Trip System Instrumentation setpoints, which requires a Tau 3 value of greater than or equal to 10 seconds. Therefore, the previously implemented Tau 3 time constant was not in compliance with BVPS Unit 1 Technical Specification requirements. Both BVPS Unit 1 and Unit 2 discrepancies are reportable pursuant to 10 CFR 50.73(a)(2)(i)(B). These events were combined due to being identified via the same review activity.

The cause for the Tau 4 discrepancy at BVPS Unit 2 was determined to be less than adequate method of presentation of written communication in 2001. The cause for the Tau 3 discrepancy at BVPS Unit 1 occurred due to non-existent/inadequate process to translate, verify and review that design requirements are correctly implemented in calibration procedures. The safety significance of these conditions was low.

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PLANT AND SYSTEM IDENTIFICATION

Westinghouse-Pressurized Water Reactor (PWR)
Reactor Trip System Instrumentation (JC)

CONDITIONS PRIOR TO OCCURRENCE

Unit 2: Mode 5 at 0 % power
Unit 1: Mode 1 at 100 % power

There were no systems, structures, or components that were inoperable at the start of the event that contributed to the event.

DESCRIPTION OF EVENT

Design Engineering was conducting a review of historical performance data for Overtemperature Delta Temperature (OTDT) reactor trip function used in the Reactor Protection System (RPS) at Beaver Valley Power Station (BVPS) Unit No. 2. On February 22, 2002, while the unit was shutdown for a refueling outage, the review revealed that the procedure methodology for lead/lag testing did not provide correct data for time constant measurements. The procedures that calibrate the OTDT Temperature (T)-Average lead/lag cards contained an incorrect test setup caused by a calculation error. These errors caused incorrect OTDT T-Average dynamic compensation in all three OTDT protection channels.

The incorrect OTDT T-Average lead and lag times caused the OTDT time constant Tau 4 (lead time) for all three Reactor Coolant System loops to not comply with the BVPS Unit 2 Technical Specification 3.3.1.1 Reactor Trip System Instrumentation setpoints. BVPS Unit 2 Technical Specification Table 3.3-1 requires a Tau 4 value of greater than or equal to 30 seconds as stated in the Unit 2 Licensing Requirements Manual Section 4.1, Core Operating Limits Report (COLR). Therefore, the previously implemented Tau 4 time constant was not in compliance with BVPS Unit 2 Technical Specification requirements. This discrepancy did not apply to BVPS Unit 1.

As a result of the above finding, an extent of condition review was initiated at BVPS Units 1 and 2 involving RPS dynamic time response testing. During this extent of condition review, an inconsistency was noted between the approved scaling methodology and the test methodology utilized in the maintenance surveillance procedure for the Overpower Delta Temperature (OPDT) channel for BVPS Unit No. 1. Subsequent review by Engineering on March 7, 2002, confirmed that the procedures utilized to calibrate the OPDT T-Average rate/lag modules at BVPS Unit No. 1 contain incorrect test methods and scaling values. This error renders the OPDT T-Average dynamic compensation non-functional for lower T-Average rates of changes (less than approximately 2.5F per second). The BVPS Unit No. 1 Technical Specifications require that the OPDT channel be

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operated with values as shown in the BVPS Unit 1 COLR. The COLR specified that the Tau 3 time constant used in the OPDT T-Average rate/lag compensator be greater than or equal to 10 seconds. The incorrect scaling values caused the Tau 3 to not meet the COLR criterion. Therefore, the previously implemented Tau 3 time constant did not comply with BVPS Unit 1 Technical Specification requirements.

The calibration and test during initial plant startup in 1975 of the lead/lag modules in the three OPDT channels at BVPS Unit No. 1 specified a module Bias value of 0.00 VDC. This Bias value was still being utilized in current surveillance procedures when this extent of condition evaluation determined that the Bias value should have been set at 1.111 VDC. This discrepancy did not apply to BVPS Unit 2.

REPORTABILITY

BVPS Unit 2 Technical Specification 3.3.1.1 states that the reactor trip system instrumentation channels must be operable as shown in Table 3.3-1. The allowable value for OTDT in Table 3.3-1 is provided in Item 7 and listed in Notation A. Notation A states that Tau 4 is a time constant utilized in the lead-lag compensator for the T-Average circuit and shall be as specified in the COLR. The COLR in the Licensing Requirements Manual (LRM) lists Tau 4 as greater than or equal to 30 seconds. The Tau 4 (lead) time constant that was previously implemented is inconsistent with Technical Specification requirements (in a non-conservative direction). This condition has existed since this value was implemented in August 2001. Because the implemented value of Tau 4 does not meet Technical Specifications requirements, this is a condition prohibited by plant Tech Specs and is reportable pursuant to 10 CFR 50.73 (a)(2)(i)(B).

BVPS Unit 1 Technical Specification 3.3.1.1 states that the reactor trip system instrumentation channels shall be operable as shown in Table 3.3-1. The allowable value for OPDT in Table 3.3-1 is provided in Item 8 and listed in Notation B. Notation B states that Tau 3 is the time constant utilized in the rate lag compensator for T-Average and shall be as specified in the COLR. The COLR in the LRM listed Tau 3 as greater than or equal to 10 seconds. The Tau 3 time constant that was previously implemented was not in compliance with Technical Specification requirements (in a non-conservative direction). This condition existed since initial plant startup in 1975. Because the implemented value of Tau 3 did not meet Technical Specifications requirements, this was a condition prohibited by plant Tech Specs and is reportable pursuant to 10 CFR 50.73 (a)(2)(i)(B).

CAUSE OF EVENT

In June 2001, due to pending changes in BVPS Unit 2 technical specifications, a procedure engineer drafted a revision to the maintenance surveillance procedures (MSP) involving Reactor Coolant Temperature Loop Delta-T T-Average protection calibrations at BVPS Unit 2. Engineering organizations reviewed these MSPs. Comments were provided and discussed with the originators,

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which included changes to the OTDT lead/lag test setup. A calculation was developed by the procedure engineer documenting the scaling and number changes to procedure data sheets in accordance with previously discussed comments. In August 2001, during the implementation of the technical specification amendment, Maintenance Engineering performed a final review and approval of the procedures and the Instrumentation and Control personnel performed these procedures. During the performance of these MSPs, incorrect Tau 4 time constants were installed in all three OTDT loops at BVPS Unit 2 due to an incorrect test setup.

The cause for the Tau 4 discrepancy at BVPS Unit 2 was determined to be a less than adequate method of presentation of written communication. It was determined that the existing program, which controls and documents procedure scaling, is inadequate in that it does not include a basis for every procedure value. The fact that the test setup in obtaining the lag time is not included in a documented procedure basis resulted in a wrong assumed value being used in the procedure time constant evaluation. A contributing cause was less than adequate content of written communications. This was due to the failure of maintenance surveillance procedures to contain the proper value on curves resulting in a wrong assumed value being used in the procedure time constant evaluation.

The cause for the Tau 3 discrepancy at BVPS Unit 1 was determined to be non-existent/inadequate process to translate, verify and review that design requirements are correctly implemented in calibration procedures. The BVPS Unit 1 scaling manual, as issued in 1979, contained the required Bias value for the OPDT dynamic compensation module. However, the scaling manual was considered a scaling guidance document and not a design document. Prior to 1999, no process existed to translate design requirements into procedure scaling values; thereby no process existed to ensure design requirements were installed in the plant. Although a process is in place today, it is inadequate. The present program consists of documents that translate design requirements into procedure values only for design requirement changes that have occurred since the process began in 1999. These documents do not provide a basis or check for every value used in the procedure and did not exist at all prior to 1999. Therefore, no process exists to check that all values in the procedure properly reflect required design values. The non-existent/inadequate process resulted in an incorrect module setting going undetected for many years.

SAFETY IMPLICATIONS

An evaluation was performed on the incorrectly set lead/lag time constants at BVPS Unit 2. The areas that were considered relative to this evaluation are as follows: (1) Non-Loss of Coolant Accident (LOCA) events, (2) Control Systems, (3) LOCA and LOCA-related events, (4) Containment analyses, and (5) Steam Generator Tube Rupture (SGTR) events.

As a result of this review, the only impacted areas of concern relative to the incorrect settings of the lead/lag function were those non-LOCA events that rely on OTDT for protection. Of the current licensing basis analyses for Beaver Valley Unit 2, only the Rod Withdrawal at Power and Loss of

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Load events credit OTDT for protection. The other remaining non-LOCA events are not impacted by the incorrectly set OTDT Lead/Lag time constants because OTDT is not credited in these analyses. The Rod Withdrawal at Power and Loss of Load cases are the only events that credit OTDT for protection and were analyzed. The results of the analyses showed that the conclusions in the Unit 2 Updated Final Safety Analysis Report (UFSAR) remain valid. The erroneous Lead/Lag time constants cause a slightly later reactor trip; but in all cases, the applicable acceptance criteria continue to be met.

Other events such as LOCA, and containment analysis are not impacted, since they do not model the Overtemperature Delta T reactor trip function. The SGTR event models Overtemperature Delta T function, but does not take credit for Reactor Protection System operation. Therefore, there is no impact.

Based on the information discussed above, it can be concluded that at no time was Beaver Valley Unit 2 operating in an unsafe condition. Therefore, the conclusions presented in the Beaver Valley Unit 2 UFSAR remained valid.

The incorrect settings from the OTDT trip setpoints would not render the OTDT trip function unavailable and had no effect on Probabilistic Risk Analysis (PRA) analyzed core damage frequency for BVPS Unit 2.

An evaluation determined that the BVPS Unit No. 1 safety analysis results as described in the current BVPS Unit No. 1 UFSAR would remain valid for a Tau 3 rate/lag value of greater than or equal to zero seconds at least back through 1998. The review evaluated all design basis events including LOCA and non-LOCA design basis events; though the effect on Tau 3 is primarily a concern for the non-LOCA events. Thus, although the maintenance surveillance procedures did not comply with the BVPS Unit 1 Technical Specifications requirements for Tau 3, the plant conditions would have provided equivalent or conservative operation as compared to a Tau 3 setting of zero seconds. Therefore, the BVPS Unit 1 OPDT function would have operated conservatively with respect to current plant safety analyses.

A non-conservative value of Tau 3 for BVPS Unit 1 relative to its Technical Specifications would not render the OPDT trip functionally unavailable and had no effect on PRA analyzed core damage frequency for BVPS Unit 1.

Based on the above, the safety significance of this condition was low.

CORRECTIVE ACTIONS

1. The affected BVPS Unit 2 OTDT maintenance surveillance procedures were revised and the instrument channels were re-calibrated using the correct time constant values prior to returning to Mode 2 from the Unit 2 refueling outage.

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2. The Tau 3 time constant used in the BVPS Unit 1 OPDT T-Average rate/lag compensator was revised to a value greater than or equal to 0 seconds in the COLR. An evaluation performed pursuant to 10 CFR 50.59 determined that reducing the Tau 3 required rate/lag value from 10 seconds to greater than or equal to zero seconds would still produce acceptable BVPS Unit No. 1 safety analysis results as described in the BVPS Unit No. 1 Updated Final Safety Analysis Report (UFSAR).
3. A review will be performed of the scaling manual of both Units to ensure that they reflect current design requirements and on the maintenance procedure review process to ensure that the values used in the calibration procedures are correct with respect to required design values.
4. An independent team will be assembled to review the BVPS OTDT and OPDT calculation/review process.
5. A training needs analysis will be performed on process scaling training involving the OTDT and OPDT RPS trip functions for designated engineers, technicians, supervisors and procedure developers to determine if additional training is warranted.
6. Additional actions are being evaluated which would enhance the RPS surveillance testing program. This includes evaluating for potential standardized test methods and to develop a background bases document for RPS OTDT and OPDT values used in maintenance surveillance procedures.
7. The extent of condition review on these issues is continuing.

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

PREVIOUS SIMILAR EVENTS

A review of past Beaver Valley Power Station Licensee Event Reports for the last five years found one event involving the Delta-Temperature Reactor Protection System function at BVPS Unit 1 or Unit 2.

LER 1-99-012, "Inoperability of Loop 1 Over Temperature Delta Temperature Function and Resulting Noncompliance with Tech Spec 3.3.1.1, Table 3.3-1, Action 7, Item a."