



FirstEnergy Nuclear Operating Company

**James H. Lash**  
Site Vice President

724-682-5234  
Fax: 724-643-8069

November 6, 2006  
L-06-158

***Beaver Valley Power Station, Unit No. 1***  
***Docket No. 50-334 License No. DPR-66***  
***LER 2006-004-00***

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

The following Licensee Event Report is submitted:

LER 2006-004-00, 10 CFR 50.73(a)(2)(iv)(A), "Reactor Trip Due to a Failed Universal Logic Board in the Solid State Protection System"



James H. Lash

Attachment

c: Mr. T. G. Colburn, NRR Senior Project Manager  
Mr. P. C. Cataldo, NRC Senior Resident Inspector  
Mr. S. J. Collins, NRC Region I Administrator  
INPO Records Center (via electronic image)  
Mr. L. E. Ryan (BRP/DEP)

IE22

NRC FORM 366 (6-2004)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104		EXPIRES 6/30/2007				
<b>LICENSEE EVENT REPORT (LER)</b>  (See reverse for required number of digits/characters for each block)										
1. FACILITY NAME Beaver Valley Power Station Unit Number 1				2. DOCKET NUMBER 05000334		3. PAGE 1 of 4				
4. TITLE Reactor Trip Due to a Failed Universal Logic Board in the Solid State Protection System										
5. EVENT DATE			6. LER NUMBER			7. REPORT DATE				
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR		
09	07	2006	2006	- 004	- 00	11	06	2006		
8. OTHER FACILITIES INVOLVED										
FACILITY NAME				DOCKET NUMBER						
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"/> 20.2201(d)		<input type="checkbox"/> 20.2203(a)(3)(ii)		<input type="checkbox"/> 50.73(a)(2)(ii)(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"/> 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"/> 20.2203(a)(2)(ii)		<input type="checkbox"/> 50.36(c)(1)(ii)(A)		<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)				
10. POWER LEVEL		<input type="checkbox"/> 20.2203(a)(2)(iii)		<input type="checkbox"/> 50.36(c)(2)		<input type="checkbox"/> 50.73(a)(2)(v)(A)				
100		<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"/> 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"/> 20.2203(a)(2)(vi)		<input type="checkbox"/> 50.73(a)(2)(i)(B)		<input type="checkbox"/> 50.73(a)(2)(v)(D)				
						<input type="checkbox"/> 50.73(a)(2)(vii)				
						<input type="checkbox"/> 50.73(a)(2)(viii)(A)				
						<input type="checkbox"/> 50.73(a)(2)(viii)(B)				
						<input type="checkbox"/> 50.73(a)(2)(ix)(A)				
						<input type="checkbox"/> 50.73(a)(2)(x)				
						<input type="checkbox"/> 73.71(a)(4)				
						<input type="checkbox"/> 73.71(a)(5)				
						<input type="checkbox"/> OTHER				
						Specify in Abstract below or in NRC Form 366A				
12. LICENSEE CONTACT FOR THIS LER										
FACILITY NAME L. R. Freeland, Director Performance Improvement						TELEPHONE NUMBER (Include Area Code) (724) 682-5206				
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	JG	SSPS Card	W120	Yes						
14. SUPPLEMENTAL REPORT EXPECTED					15. EXPECTED SUBMISSION DATE			MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE). <input checked="" type="checkbox"/> NO										
16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)										
<p>On September 7, 2006, Beaver Valley Power Station (BVPS) Unit No. 1 experienced an unexpected reactor trip at 2157 due to an opening of the "B" Reactor Trip Breaker. All safety systems functioned as designed. All three Auxiliary Feedwater System pumps started as expected on low steam generator levels. The plant was stabilized in Mode 3 with primary and secondary parameters returned to normal hot standby values. This event is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A) as an event that resulted in automatic actuation of the Reactor Protection System and the Auxiliary Feedwater System.</p> <p>The cause of the reactor trip was due to the unexpected opening of the "B" Reactor Trip Breaker caused by a failure of universal logic card A312B output gate in the Solid State Protection System (SSPS) that produced an invalid SSPS signal to the trip breaker. The root cause was a manufacturing defect on the integrated circuit Z9 that was not identified by pre and post manufacturing testing. The plant risk associated with the BVPS Unit 1 reactor trip that occurred on September 7, 2006, is considered to be very low.</p>										

## LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Beaver Valley Power Station Unit Number 1	05000334	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 of 4
		2006	-- 004	-- 00	

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

## PLANT AND SYSTEM IDENTIFICATION

Westinghouse-Pressurized Water Reactor {PWR}  
Solid State Protection System {JG}

## CONDITIONS PRIOR TO OCCURRENCE

Unit 1: Mode 1 at 100 percent power. 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.

## DESCRIPTION OF EVENT

On September 7, 2006, the Beaver Valley Power Station (BVPS) Unit No. 1 experienced an unexpected reactor trip at 21:57 while operating at full power. The reactor trip then caused a Main Turbine trip. The first out computer point for the reactor trip was Turbine Trip due to Reactor Trip. The operating crew entered Emergency procedure E-0 (Reactor Trip or Safety Injection), and transitioned to ES-0.1 (Reactor Trip Response) in response to the trip. Following the reactor trip, safety systems functioned as designed. The safety related 4160v emergency busses correctly switched automatically to their respective offsite power feed when the Main Generator tripped after the reactor trip. All three Auxiliary Feedwater System pumps started as expected on low steam generator levels. The plant was stabilized in Mode 3 with primary and secondary parameters returned to normal hot standby values. N-36 intermediate range power instrument failed off scale low following the reactor trip, but was unrelated to the cause of the reactor trip.

## CAUSE OF EVENT

The cause of the reactor trip was the unexpected opening of the "B" Reactor Trip Breaker caused by a random failure of universal logic card A312B output gate in the Solid State Protection System (SSPS) that produced an invalid SSPS signal to the trip breaker. The cause of the Universal Logic Board (ULB) failure was a manufacturing defect (corrosion) on the integrated circuit Z9 that was not identified by pre and post manufacturing testing. An assessment of ULB failures demonstrates that the failures occur in a random, unpredictable manner.

## LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Beaver Valley Power Station Unit Number 1	05000334	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 of 4
		2006	-- 004	-- 00	

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

## REPORTABILITY

On September 7, 2006, BVPS Unit 1 experienced a reactor trip at 21:57. This was reportable pursuant to 10 CFR 50.72(b)(2)(iv)(B) as an actuation of the Reactor Protection System when the reactor is critical and pursuant to 10 CFR 50.72(b)(3)(iv)(A) as an event that resulted in the valid automatic actuation of the Auxiliary Feedwater System. BVPS notified the Nuclear Regulatory Commission per 10 CFR 50.72 via EN No. 42834 at 23:23 EDT on September 7, 2006.

This reactor trip is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A) as an event that was not part of a pre-planned sequence which resulted in the automatic actuation of: the Reactor Protection System per 10 CFR 50.73(a)(2)(iv)(B)(1) and of the Auxiliary Feedwater System per 10 CFR 50.73(a)(2)(iv)(B)(6).

## SAFETY IMPLICATIONS

At the time of the BVPS Unit 1 reactor trip due to the unexpected opening of the "B" Reactor Trip Breaker on September 7, 2006, there were no other PRA modeled components that were unavailable. Plant safety systems functioned as designed following the reactor trip. This event is bounded by the Design Basis "Loss of External Electrical Load and/or Turbine Trip" described in Section 14.1.7 of the BVPS Unit 1 Updated Final Safety Analysis Report (UFSAR).

The cause of the reactor trip was due to the unexpected opening of the "B" Reactor Trip Breaker caused by a defective logic card that produced an invalid SSPS signal to the trip breaker. Therefore, a spurious reactor trip initiating event was used to analyze the risk associated with this event.

The plant risk associated with the BVPS Unit 1 reactor trip that occurred on September 7, 2006, due to the unexpected opening of the "B" Reactor Trip Breaker is considered to be very low. This is based on the conditional core damage probability for the event when considering the actual component unavailability that was present at the time of the reactor trip.

## CORRECTIVE ACTIONS

1. The failed SSPS Universal Logic Board (ULB) card was replaced.

## LICENSEE EVENT REPORT (LER)

1. FACILITY NAME	2. DOCKET	6. LER NUMBER			3. PAGE
Beaver Valley Power Station Unit Number 1	05000334	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 of 4
		2006	-- 004	-- 00	

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

## CORRECTIVE ACTIONS (Continued)

- Initial laboratory analysis confirmed that the failure was in the Integrated Circuit portion of the logic card. The failed SSPS logic card received additional Westinghouse destructive failure analysis.
- FirstEnergy Nuclear Operating Corp. (FENOC) is participating with Westinghouse on performing additional generic investigations on ULB cards. This will include evaluating methods to ensure more reliable ceramic MHTL (Motorola High Threshold Logic) devices are used when manufacturing SSPS boards and will include evaluating SSPS board replacement strategy considerations.

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

## PREVIOUS SIMILAR EVENTS

A review found two prior BVPS Unit 1 and one prior BVPS Unit 2 Licensee Event Reports (LERs) within the last five years involving the a Solid State Protection System issue:

- LER 1-2006-002 LER 1-06-002, "Unit Shutdown Completed as Required by Plant Technical Specification for Failed Solid State Protection System Memory Card." This event involved a failed SSPS testing circuit (bent card pin).
- LER 1-2003-007, "Inadvertent Reactor Trip During Solid State Protection System Testing." This event did not involve a failed SSPS component.
- LER 2-2001-003, "Condition Inadvertently Exceeds Technical Specification Allowed Outage Time." This involved a human performance event associated with a failed SSPS component.

Though not LERs, there have been other SSPS ULB failures and non-ULB failures noted within the last two years at BVPS. Although no specific common mode failures have been identified, FENOC continues to work with Westinghouse on addressing SSPS related failures.

## COMMITMENTS

There are no new commitments made by FENOC for BVPS Unit No. 1 in this document.