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L-03-094

***Beaver Valley Power Station, Unit No. 1***  
***Docket No. 50-334 License No. DPR-66***  
***LER 2003-002-01***

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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 supplement is submitted:

LER 2003-002-01, 10 CFR 50.73(a)(2)(ii)(B), "Potential Overpressurization of Unit 1 Cable Vaults if a CO2 Discharge Were to Occur, Results in an Unanalyzed Condition."

  
L. William Pearce

Attachment

- c: Mr. T. G. Colburn, NRR Senior 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)

IE22

<b>1. FACILITY NAME</b> Beaver Valley Power Station Unit No. 1	<b>2. DOCKET NUMBER</b> 05000334	<b>3. PAGE</b> 1 OF 5
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**4. TITLE**  
Potential Overpressurization of Unit 1 Cable Vaults if a CO2 Discharge Were to Occur Results in Unanalyzed Condition

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
02	05	2003	2003 - 002 - 01			05	30	2003	None	
									FACILITY NAME	DOCKET NUMBER

<b>9. OPERATING MODE</b>	1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)</b>					
		20.2201(b)	20.2203(a)(3)(ii)	X	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)	
<b>10. POWER LEVEL</b>	100	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)	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)(iii)(A)		50.73(a)(2)(viii)(B)				

**12. LICENSEE CONTACT FOR THIS LER**

<b>NAME</b> L. R. Freeland, Manager Regulatory Affairs/Performance Improvement	<b>TELEPHONE NUMBER (Include Area Code)</b> (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

<b>14. SUPPLEMENTAL REPORT EXPECTED</b>				<b>15. EXPECTED SUBMISSION DATE</b>		
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)

On February 5, 2003, during an extent of condition review of the potential to over-pressurize a fire area if the Carbon Dioxide (CO2) fire protection system discharges, it was discovered that the East and West Cable Vaults fire areas at Beaver Valley Unit 1 (BV-1) were susceptible to this concern. If the total flooding CO2 fire suppression systems in the East and West Cable Vaults were discharged, the resultant pressure transient could cause the fire barriers within the subject areas to be structurally challenged, causing the fire barriers to be breached. Losing the fire barrier integrity could result in a decrease in CO2 concentration in the area, which would reduce the effectiveness of the CO2 system to extinguish the fire. If the fire were not extinguished it could result in the potential for a postulated fire in one fire area to spread to an adjacent fire area. This would invalidate the assumptions made in the BV-1 10 CFR 50 Appendix R fire protection safe shutdown analysis and thus represents an unanalyzed condition. As a compensatory measure, the automatic CO2 suppression systems in the East and West Cable Vaults were disabled on February 5, 2003 at 2150 hours in response to the initial identified issue and a fire watch was established in the affected areas. The fire protection system alarm function remained enabled in order to provide notification in the Control Room if a fire would occur. These measures eliminated the potential for a CO2 overpressure transient condition to occur in the affected areas.

The root cause of this event was determined to be insufficient design and system interface applicable to engineering work practices with a secondary cause of inadequate or incomplete design aspects. These were chosen because the impact to the CO2 protected areas, due to the more tightly sealed areas resulting in a higher pressure peak, was never recognized by the fire barrier program owner when the new seals were installed.

This condition is reportable pursuant to 10 CFR 50.72(b)(3)(ii)(B) (EN# 39573) and 10CFR 50.73 (a)(2)(ii)(B) as an unanalyzed condition that significantly degrades plant safety.

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## PLANT AND SYSTEM IDENTIFICATION

Westinghouse-Pressurized Water Reactor (PWR)  
Fire Protection System (KQ)

## CONDITIONS PRIOR TO OCCURRENCE

Unit 1: Mode 1 at 100 % power

There were no systems, structures, or components that were inoperable that contributed to the event other than as described below.

## DESCRIPTION OF EVENT

On February 5, 2003, during an extent of condition review of the potential to over-pressurize a fire area if the Carbon Dioxide (CO<sub>2</sub>) fire protection system discharges, it was discovered that the East and West Cable Vault fire areas at Beaver Valley Unit 1 (BV-1) were susceptible to this concern. If the total flooding CO<sub>2</sub> fire suppression systems in the East and West Cable Vaults were discharged, the resultant pressure transient could cause the fire barriers within the subject areas to be structurally challenged, causing the fire barriers to be breached. Losing the fire barrier integrity could result in a decrease in CO<sub>2</sub> concentration in the area, which would reduce the effectiveness of the CO<sub>2</sub> system to extinguish the fire. If the fire were not extinguished it could result in the potential for a postulated fire in one fire area to spread to an adjacent fire area. This would invalidate the assumptions made in the BV-1 10 CFR 50 Appendix R fire protection safe shutdown analysis and thus represents an unanalyzed condition.

As a compensatory measure, the automatic CO<sub>2</sub> suppression systems in the East and West Cable Vaults were disabled on February 5, 2003 at 2150 hours in response to the initial identified issue and a fire watch was established in the affected areas. The fire protection system alarm function remained enabled in order to provide notification in the Control Room if a fire would occur. These measures eliminated the potential for a CO<sub>2</sub> overpressure transient condition to occur in the affected areas.

## BACKGROUND INFORMATION

Prior to 1976 while BV-1 was under construction, the CO<sub>2</sub> system was designed, installed and tested. The initial test results showed excessive leakage from CO<sub>2</sub> protected areas which adversely impacted CO<sub>2</sub> concentrations. The leakage sources were identified and were initially sealed to meet the standards that were in effect at the time. Following the issuance of NUREG-0050 "Recommendations Related to the Browns Ferry Fire" in 1976, the requirements for fire area separation and seals were strengthened. In a continuing effort to ensure sufficient fire area separation, potential leakage paths between fire areas were identified and sealed with improved seals in various fire areas including areas protected by CO<sub>2</sub> fire suppression systems. It was not

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recognized at the time that sealing the leakage paths would have an adverse impact on the room pressure and hence the fire barrier integrity after a CO2 discharge.

In January of 2001, room enclosure leakage testing was performed in the Unit 1 Cable Tray Mezzanine and East and West Cable Vaults to support a CO2 concentration calculation for the Cable Tray Mezzanine. The test data was used in a calculation to determine room parameters after a CO2 discharge. The resultant peak pressure in the Cable Tray Mezzanine was noted as abnormally high and that room's structural integrity was questioned. As an extent of condition from the Cable Tray Mezzanine pressure findings, the East and West Cable Vaults were chosen for evaluation. By comparing the room volumes, effective leakage area, and CO2 amounts injected during a discharge, the resultant peak pressures were estimated as being equivalent to or higher than the pressure in the Cable Tray Mezzanine, and this led to the identification the condition described in this report.

**REPORTABILITY**

This condition was evaluated as an unanalyzed condition that significantly degrades plant safety since a potential discharge of the CO2 fire suppression system in response to a postulated fire could have invalidated the assumptions made in the BV-1 fire protection safe shutdown analysis performed per 10 CFR 50 Appendix R. Therefore, this condition is reportable pursuant to 10 CFR 50.72(b)(3)(ii)(B) (EN# 39573) and 10CFR 50.73 (a)(2)(ii)(B) as an unanalyzed condition that significantly degrades plant safety.

**CAUSE OF EVENT**

The root cause of this event was determined to be insufficient design and system interface applicable to engineering work practices with a secondary cause of inadequate or incomplete design aspects. These were chosen because the impact to the CO2 protected areas, due to the more tightly sealed areas resulting in a higher pressure peak, was never recognized by the fire barrier program owner when the new seals were installed.

**SAFETY IMPLICATIONS**

An evaluation was performed on the analysis of safe shutdown circuits in the affected areas as documented in the BVPS-1 Fire Protection Appendix R Report Rev. 22, Table 5.1-1 and 5.1-2 and concluded the following:

**Fire originating in the West Cable Vault**

Damage from a fire originating in the West Cable Vault fire area would likely be confined to the fire area, and would not impact post-fire safe shutdown capability. The combined volume of CO2 from the cable vault and cable mezzanine suppression systems, along with the fact that the cable mezzanine is at a lower elevation than the cable vault except for the interconnecting tunnel, would

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probably have allowed adequate CO2 concentration to extinguish the fire in the cable mezzanine. Thus, automatic and manual suppression capability would likely prevent the spread of fire to adjacent areas. In a less likely scenario where the fire would spread, the fire could impact safe shutdown by spreading to the Cable Mezzanine, thus hindering access to the East Cable Vault where the Backup Indicating Panel is located, and the West Cable Vault where isolation switches for the Power Operator Relief Valves (PORVs) are located.

Fire originating in the East Cable Vault

A fire originating in the East Cable Vault would most likely not result in any equipment damage outside of the original fire area and probably not impact post-fire safe shutdown capability. Automatic and manual suppression capability would probably prevent the spread of fire to adjacent areas. In the less likely, worst case scenario where the fire would spread, post-fire safe shutdown could be affected by fire spreading to the Cable Mezzanine. This scenario could prevent access to the Backup Indicating Panel thus effecting alternate safe shutdown actions. Post-fire safe shutdown could be affected by a fire in the East Cable Vault and breach of the barrier between the East Cable Vault and Pipe Tunnel, hindering required operator actions to safely shutdown the plant due to smoke and CO2 on the lower elevation of the pipe tunnel.

A detailed delta core damage frequency evaluation using the current BVPS-1 PRA model and the fire sequences for the Unit 1 Cable Vaults and Cable Mezzanine areas was performed. The evaluation assumed that if the fire originated in the West Cable Vault, the fire door barrier leading to the Cable Mezzanine would be guaranteed to fail, since the door is oriented to open into the Cable Mezzanine area and would only be held closed by the door latch. If the fire originated in the East Cable Vault, it is assumed that the double fire door leading to the ventilation equipment room fails first based on the pressure force from the area of the double doors acting upon the single latch. The failure of the double door would relieve the pressure in the area and thus the fire door between the East Cable Vault and Cable Mezzanine would remain intact and functional given a fire in the East Cable Vault with a CO2 discharge. For this case, the fire in the East Cable Vault does not spread to the Cable Mezzanine. The evaluation also assumed that the automatic CO2 suppression system was ineffective in extinguishing the fire in either of the Cable Vaults. However, once the fire reached the Cable Mezzanine, credit was given for both manual suppression and the Cable Mezzanine automatic CO2 suppression system to control the fire before any damage could occur within that area. The evaluation also credits the additional time that it would take for a fire to propagate from its ignition source in the West Cable Vault until it could potentially damage equipment located within the Cable Mezzanine, given the covered cable trays and IEEE-383 type cable characteristics. Based on these assumptions, the evaluation determined that the condition described in this report would be of very low safety significance.

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**CORRECTIVE ACTIONS**

1. Following the identification of condition, the automatic CO2 Suppression system was disabled while maintaining fire detection and alarm capabilities. A fire watch was established in the East and West Cable Vaults as an interim compensatory measure.
2. A permanent solution to mitigate the CO2 generated over-pressure potential in the East and West Cable Vaults will be developed and implemented.
3. An evaluation of the penetration control program and fire protection program procedures (1/2-ADM-2021 and 1/2-ADM-1900) will be performed to ensure adequate communication and inter-disciplinary reviews exist for seal installation.
4. As part of the continuing extent of condition review, an evaluation of the Unit 1 emergency diesel generator rooms will be performed to ensure that the installed CO2 pressure relief capabilities are sufficient. These rooms are the only areas with total flooding fire suppression systems that have not yet been analyzed at Unit 1.
5. An evaluation of the Unit 2 CO2 protected areas will be performed to ensure sufficient pressure relief capabilities exist.

Corrective action completion is being tracked through the Corrective Action Program.

**PREVIOUS SIMILAR EVENTS**

A review of past Beaver Valley Power Station Licensee Event Reports for the last three years found no similar events involving fire protection or Appendix R violations at BVPS Unit 1 or Unit 2.

## ATTACHMENT

### Beaver Valley Power Station, Unit No. 1 License Event Report 2003-002-01

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#### Commitment List

The following list identifies those actions committed to by FirstEnergy Nuclear Operating Company (FENOC) for Beaver Valley Power Station (BVPS) Unit Nos. 1 and 2 in this document. Any other actions discussed in the submittal represent intended or planned actions by Beaver Valley. These other actions are described only as information and are not regulatory commitments. Please notify Mr. Larry R. Freeland, Manager, Regulatory Affairs/Performance Improvement, at Beaver Valley on (724) 682-5284 of any questions regarding this document or associated regulatory commitments.

<b>Commitment</b>	<b>Due Date</b>
A permanent solution to mitigate the CO2 generated over-pressure potential in the East and West Cable Vaults will be developed and implemented.	As tracked through the Corrective Action Program.
An evaluation of the penetration control program and fire protection program procedures (1/2-ADM-2021 and 1/2-ADM-1900) will be performed to ensure adequate communication and inter-disciplinary reviews exist for seal installation.	As tracked through the Corrective Action Program.
An evaluation of the Unit 1 emergency diesel generator rooms will be performed to ensure that the installed CO2 pressure relief capabilities are sufficient.	As tracked through the Corrective Action Program.
An evaluation of the Unit 2 CO2 protected areas will be performed to ensure sufficient pressure relief capabilities exist.	As tracked through the Corrective Action Program.