

# Duquesne Light Company

Beaver Valley Power Station  
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December 23, 1992

JOHN D. SIEBER  
Vice President - Nuclear Group

U. S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555

Subject: Beaver Valley Power Station, Unit No. 2  
Docket No. 50-412, License No. NPF-73  
Auxiliary Feedwater System Waterhammer

By letter dated November 5, 1992, the NRC forwarded Inspection Report Nos. 50-334/92-20 and 50-412/92-20 and requested a review of "waterhammer" events occurring on the Beaver Valley Unit 2 (BV-2) Auxiliary Feedwater System (FWE) and our plans to resolve this issue. We have reviewed past "waterhammer" events on the FWE system and have determined that the root cause of these events can be attributed to back leakage and bonnet leakage on the FWE check valves, which will be addressed through valve upgrade.

Leakage on the FWE check valves has resulted in the following three conditions occurring in the FWE system:

1. Main feedwater flow recirculation into the FWE system (Intra System Recirculation).
2. Steam pocket formation in FWE piping with subsequent steam pocket collapse (slugging noise).
3. Steam pocket formation in FWE piping with a FWE pump start and unthrottled auxiliary feedwater flow resulting in a steam pocket collapse waterhammer.

The auxiliary feedwater piping system has been evaluated for the effects of the postulated waterhammer events. The evaluation includes operating conditions for deadload, pressure, thermal and waterhammer transient loading. In cases where the pipe stress levels under the postulated water hammer transients exceed normal and upset values, an assessment of system operability was made to faulted code allowables. In all cases system operability was demonstrated.

In addition, actions have been taken to detect and mitigate intra system recirculation and steam pocket formation in the FWE system in order to reduce the probability of a waterhammer event from occurring. Our short and long term corrective actions to resolve this issue are provided in Attachment 1.

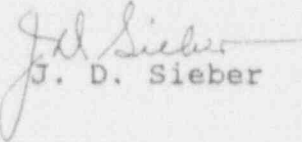
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If there are any questions concerning this matter, please contact  
Mr. Nelson Tonet at (412) 393-5210.

Sincerely,

  
J. D. Sieber

Attachment

cc: Mr. L. W. Rossbach, Sr. Resident Inspector  
Mr. T. T. Martin, NRC Region I Administrator  
Mr. A. W. De Agazio, Project Manager  
Mr. M. L. Bowling (VEPCO)

## ATTACHMENT 1

### Short and Long Term Corrective Actions

The following actions have been taken to detect and mitigate intra system recirculation and steam pocket formation in the FWE system.

- The operator checks the FWE system pipe temperatures once per shift to detect the onset of intra system recirculation. If the pipe temperatures exceed 120°F, the FWE system is flushed per Operating Manual Procedure OM 2.24.4.Q "Steam Binding in Auxiliary Feedwater System". This procedure provides a means for flushing out the FWE system by throttling the FWE system flow to prevent a waterhammer from occurring.
- Temporary pressure gauges have been installed on all three auxiliary feedwater lines (A, B & C). These gauges are located in the piping segment upstream of the main feedwater system isolation check valves, and provide a means to check the FWE system for a potential steam pocket formation.
- The operators check the FWE system for noise/slugging and logs the pressure on the temporary gauges once per shift for indications of steam pocket formation in the FWE system. If indications of a steam pocket exists, then the FWE system is flushed per OM 2.24.4.Q to preclude the existence of steam pockets.
- Appropriate Operating Manual procedures have been revised to monitor the FWE system flow recorders for spiking after power changes of greater than 10%. Spiking on the FWE flow recorders has also been an indicator of steam pocket formation.
- Operating Manual Procedure OM 2.24.4.J "Auxiliary Feedwater Pump Start" has been revised to initiate inspection of FWE system for waterhammer damage following any automatic start of an auxiliary feedwater pump.
- The FWE pump Operating Surveillance Tests have been revised to ensure that the downstream check valves are properly seated following pump testing.
- Inspections of the FWE system piping inside and outside of containment will be performed following any significant noise/slugging occurrence.

The following long term actions will be implemented during the Unit 2 Fourth Refueling Outage.

- FWE system check valves (FWE-42A, 42B, 43A, 43B, 44A and 44B) will be modified to minimize seat and bonnet leakage.
- Temporary instrumentation will be installed on the FWE system to verify that the FWE check valve modifications have been effective and to quantify and assess any additional transient loadings.