

November 16, 2000

Mr. L. W. Myers
Senior Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Post Office Box 4, BV-A
Shippingport, PA 15077

Subject: BEAVER VALLEY POWER STATION, UNITS 1 AND 2
STAFF EVALUATION OF LICENSEE'S RESPONSE TO GENERIC
LETTER 96-06, "ASSURANCE OF EQUIPMENT OPERABILITY AND
CONTAINMENT INTEGRITY DURING DESIGN-BASIS ACCIDENTS",
(TAC NOS. M96777 AND M96778)

Dear Mr. Myers:

The Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 96-06 on September 30, 1996, to all holders of operating licenses for nuclear power reactors, except for those licenses that have been amended to possession-only status. GL 96-06 requested information from licensees related to the following three concerns:

- (1) Cooling water systems serving the containment air coolers may be exposed to the hydrodynamic effects of water hammer during either a loss of coolant accident (LOCA) or a main steam line break (MSLB),
- (2) Cooling water systems serving the containment air coolers may experience two-phase flow conditions during postulated LOCA and MSLB scenarios. The heat removal assumptions for design-basis accident scenarios were based on single-phase flow conditions, and
- (3) Thermally induced over pressurization of isolated water-filled piping sections in containment could jeopardize the ability of accident mitigating systems to perform their safety functions and could also lead to a breach of containment integrity via bypass leakage.

By letter dated January 28, 1997, Duquesne Light Company (DLC), the licensee at the time, provided its response as requested by GL 96-06 for Beaver Valley Power Station, Unit 1 (BVPS-1) and Unit 2 (BVPS-2). Information regarding affected containment penetrations and details was also provided in Licensee Event Report (LER) 50-334/96-009-01, dated January 27, 1997.

On November 13, 1997, the staff issued Supplement 1 to GL96-06, informing licensees about ongoing efforts and new developments associated with GL96-06 and providing additional guidance for completing corrective actions.

By letters dated June 30, 1998 (as revised by letter dated February 2, 1999), and December 13, 1999, the licensee provided its responses to the staff's requests for additional information (RAI) dated March 20, 1998, and October 8, 1999, respectively. The licensee also forwarded additional information regarding the adequacy of the design-basis accident thermal over pressure protection for containment penetrations via letter dated June 2, 1999.

DLC was the originator of all referenced licensee correspondence prior to December 3, 1999. On December 3, 1999, DLC's ownership interests in both BVPS-1 and BVPS-2 were transferred to the Pennsylvania Power Company, and DLC's operating authority for BVPS-1 and BVPS-2 was transferred to FirstEnergy Nuclear Operating Company (FENOC). By letter dated December 13, 1999, FENOC requested that the NRC continue to review and act upon all requests before the Commission which had been submitted by DLC. The staff continued its review and the following evaluation is provided.

Water Hammer and Two-Phase Flow:

Based on the information that the licensee provided in its letters dated January 28, 1997, June 30, 1998, and February 2, 1999, the staff understands that the containment air recirculation coolers (CARCs) will not experience waterhammer or two-phase flow conditions during a loss-of-coolant accident (LOCA) or a main steam line break (MSLB) with a concurrent loss of offsite power. The CARCs are not credited for accident mitigation and cooling water to the CARCs is automatically isolated on a containment isolation Phase B (CIB) signal which occurs at around 8 pounds-per-square-inch (gauge) containment pressure. The licensee has determined that boiling will not occur in the CARC fluid system prior to CIB actuation, and relief protection will protect the CARC fluid system from over pressurization following CIB actuation. While the Beaver Valley Emergency Operating Procedures would allow the CARCs to be used post accident at the discretion of the Nuclear Shift Supervisor/Emergency Director, operator training reinforces that the CARCs are nonsafety-related and are isolated on CIB actuation, and that systems and components that are isolated by a safety-related isolation signal, shall not be bypassed or overridden. Additionally, the licensee indicated in its February 2, 1999, letter that the Beaver Valley Severe Accident Management Guidelines would be revised to include a caution to consider the potential for waterhammer before using the CARCs following an adverse containment environment.

The staff finds this information acceptable to resolve the issue of susceptibility to waterhammer or two-phase flow during postulated accident conditions in the cooling water systems that supply the safety-related containment air cooling fan units at BVPS-1 and BVPS-2.

Thermally-Induced Over-pressurization:

The licensee performed a review of BVPS-1 and BVPS-2 containment penetrations, as discussed in its letter dated January 28, 1997, and LER 50-334/96-009-1, dated January 27, 1997, to determine the penetrations' potential vulnerability to a water solid volume

that may be subjected to an increase in pressure due to heating of the trapped fluid. Based on the review, the licensee identified all affected containment penetrations susceptible to thermally-induced over-pressurization and provided the following corrective actions that it had implemented to resolve the nonconforming containment penetrations. The licensee stated that at BVPS-1 it had:

- 1) installed relief valves on nine penetrations,
- 2) implemented administrative controls on ten penetrations to verify that these penetrations are drained prior to a plant restart, and
- 3) reviewed operating and emergency procedures for 14 penetrations and revised the procedures as necessary to maintain correct positioning of intervening valves to ensure flow path integrity for relief from over pressurization.

The licensee stated in its letter dated June 22, 1999, and LER 50-334/96-009-01, that at BVPS-2, only two penetrations were vulnerable to thermally-induced over-pressurization. The licensee implemented administrative controls with regard to these penetrations to verify that they are drained prior to a plant restart. The licensee determined that all other BVPS-1 and BVPS-2 penetrations are not vulnerable to thermally-induced over-pressurization and are in compliance with the applicable design codes, and therefore, did not require any corrective action.

In response to the staff's RAI dated October 8, 1999, with regard to six penetrations associated with the reactor vessel level instrumentation system, the licensee stated that the bellows can accommodate, without failure, the expansion of the trapped volume of fluid associated with the highest expected post-accident temperature increase as long as the fluid remains single-phase (i.e., pressure in the trapped volume remains above saturated condition). The licensee confirmed that for the design basis LOCA or MSLB conditions, pressure in the trapped volume will remain above saturation and the bellows will accommodate fluid expansion without failure.

The staff finds this information acceptable to resolve the issue of thermally-induced over-pressurization of piping runs penetrating the containment at BVPS-1 and BVPS-2.

Conclusion

Based on the information provided by the licensee, the staff finds the licensee's evaluations and corrective actions acceptable for resolving the issues of (1) susceptibility to waterhammer or two-phase flow during postulated accident conditions in the cooling water systems that supply the safety-related containment air cooling fan units and (2) thermally-induced over-pressurization of piping runs penetrating the containment as described in GL 96-06. The licensee has taken the requested actions and submitted acceptable information as requested by GL 96-06. Therefore, the staff considers GL 96-06 to be closed for BVPS-1 and BVPS-2.

Sincerely,

/RA/

Lawrence J. Burkhardt, Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-334 and 50-412

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Conclusion

Based on the information provided by the licensee, the staff finds the licensee's evaluations and corrective actions acceptable for resolving the issues of (1) susceptibility to waterhammer or two-phase flow during postulated accident conditions in the cooling water systems that supply the safety-related containment air cooling fan units and (2) thermally-induced over-pressurization of piping runs penetrating the containment as described in GL 96-06. The licensee has taken the requested actions and submitted acceptable information as requested by GL 96-06. Therefore, the staff considers GL 96-06 to be closed for BVPS-1 and BVPS-2.

Sincerely,
/RA/

Lawrence J. Burkhart, Project Manager, Section 1
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 Office of Nuclear Reactor Regulation

Docket Nos. 50-334 and 50-412

Enclosure: As stated

cc w/encl: See next page

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November 16, 2000

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