Jersey Central Power & Light Company

MADISON AVENUE AT PUNCH BOWL ROAD • MORRISTOWN, N.J. 07960 • 539-6111

June 25, 1971



Dr. Peter A. Morris, Director
Division of Reactor Licensing
United States Atomic Energy Commission
Washington D. C. 20545

Dear Dr. Morris:

Subject: Oyster Creek Unit No. 1
Docket No. 50-219
Core Spray System Water Hammer

The purpose of this letter is to report the results of our preliminary investigation of a water hammer condition in the core spray system which has resulted in abnormal pipe vibration during surveillance test pump starts.

During the preoperation test program, a water hammer condition was observed in the core spray system loops when the pumps were started. By changing the operating procedure, limiting the test valve opening, and providing a condensate fill and pressure regulating station for each of the system loops, the water hammer was substantially reduced. However, it was apparent at an early stage that this system would not be satisfactory because of leakage through the pump discharge check valves back into the torus. This leakage slowly raised the water level in the torus and resulted in a chromated water disposal problem. Thus, it was decided to design and install a jockey pump system that would keep the loops continuously filled. This new system uses the water in the torus and eliminates the chromated water disposal problem. In order to minimize the chromated water disposal problem and pipe vibrations during surveillance testing of the core spray loops until the jockey pump systems were installed, the pressure regulating system was isolated and the loops were manually filled prior to the monthly surveillance tests. On occasion, insufficient venting resulted in pipe vibrations during the surveillance testing initial pump starts. On one such occasion, a team of observers witnessed a startup of both loops. The B&D loop experienced the most vibration and the discharge pipe header movement at the pumps was reported to be approximately 2-1/2 inches. This was a visual observation; however, subsequent inspection of the piping has revealed paint scraping, insulation tears, and marks on an angle iron opposite a horizontal run in the discharge header that substantiates that the piping did move as much as 2-1/2 inches. Observations during pump starts show no movement downstream of the containment isolation valves. The rigid attachment of the

/S/ JGK/Staff 7/19/71
RAE
LK
DP



2968

2473

COPY SENT REGION 1

piping to the drywell essentially prevents motion from being transmitted to the piping inside the drywell. Operational tests on both the core spray pumps and the booster pumps indicate these components have not been affected by the water hammer.

The new jockey pump system has been installed and placed in operation for the B&D loop. This new system has eliminated the water hammer vibration for this loop. The A&C loop is presently being manually filled and vented and it is expected the installation of the jockey pump system will be completed in the near future.

Actions we have taken or plan to take to evaluate the adequacy of the core spray piping systems include the following:

1. A visual examination of the piping system including the pumps, piping components, and supports was made. No evidence of pipe buckling or distortion was noted. Evidence of pipe movement was indicated by minor paint scraping, insulation tears, and marks on an angle iron opposite a horizontal run in the discharge header.

2. A liquid penetrant examination was performed on portions of the piping that calculations indicated to be the highest stressed. These tests were conducted on an elbow, flanges, and a tee and on the welds adjacent to these components. No indications were found.

3. System modifications have been made to the B&D loop to assure that the discharge piping remains full of water at all times. This modification thus eliminates the air pockets and pump startup effects. Similar modifications are underway for the A&C loop.

4. Pipe flexibility analysis calculations have been made for the B&D loop to evaluate the moments, forces, and stresses throughout the piping system resulting from the water hammer induced displacements that have occurred in the past prior to the jockey pump modification. Preliminary results of the calculations indicate that a few portions of the system may have been stressed beyond the design stress intensity. These areas have been liquid penetrant inspected as discussed in 2 above. Using these results, elastic plastic fatigue analyses have been performed and compared on several different bases.* These analyses indicate a usage range for the highly

---

* 1. "Tentative Structural Design Bases for Reactor Pressure Vessels and Directly Associated Components" PB-151987 December 1958.

2. "Plastic Fatigue Analysis of Pressure Components" ASME 68-PVP-3, S. W. Tagart, Jr., May 1968.

3. Discussion to ASME 68-PVP-3 by B. F. Langer.

stressed components varying from a small to a significant fraction of the components fatigue life. Further, a comparison of the calculated loads and stresses in the system components with tests on similar components reported as part of the AEC's pipe rupture program, Contract AT(04-3)-189 with General Electric, indicates that only a very small fraction of the cycles to crack initiation (0.003 to 0.005) have been used. We are performing additional studies of the stress fatigue aspects to complete our evaluation of the piping components. In addition, we plan to conduct additional examinations and obtain other appropriate data on the components to insure that the minimum bases used in the analytical studies have been met.

We consider that the core spray system modifications we have completed on the B&D loop (and underway for the A&C loop) together with the examinations we have performed so far indicate that the core spray system is adequate for continued operation. We are continuing our examination of this system and we will keep you informed of the progress of our studies.

Very truly yours,

Ivan R. Finfrock, Jr.

Ivan R. Finfrock, Jr.
Manager, Nuclear Generating Stations

IRF/pk

cc: Mr. R. W. Kirkman, Regional Director
Division of Compliance