METROPOLITAN EDISON COMPANY SUBSIDIARY OF GENERAL PUBLIC UTILITIES CORPORATION

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April 30, 1974

Dr. D. F. Knuth, Director
Directorate of Regulatory Operations
Office of Regulation
United States Atomic Energy Commission
Washington, D. C. 20545

Subject: Three Mile Island Unit No. 1
Makeup Pump Bypass Orifices
Docket No. 50-289
License No. DPR-50

Dear Dr. Knuth:

You were notified on April 11, 1974 of a situation which could be considered reportable under 10 CFR 50.55(e), "Conditions of Construction Permits". This relates to the generic investigation made as a result of the erosion of the "B" makeup and purification recirculation orifice on Arkansas Power & Light's ANO-Unit 1.

Background

The makeup pump bypass orifices are multi-stage plate orifices which are used to control the recirculation flow around the makeup pump. Recirculation flow is required to maintain minimum flow through the pump during normal service. Communication between the recirculation lines is prevented by stopcheck valves. In accident service, the recirculation flow is valved off by ESAS actuated valves. The orifices were designed and manufactured by Bingham Pump Co.

Description of Incident

A pinhole leak in the "B" makeup pump recirculation flow orifice at ANO-1 was first noticed at a location approximately 1-inch below the upper weld where the orifice makes its downstream connection to the 2-inch recirculation line. Examination of the orifice after its removal from the line revealed nearly complete erosion of the last element at the discharge end of the orifice. Because the flow discharge from this last element was near the pipe wall, a portion of the pipe wall had also been eroded to the point of generating the pinhole leak observed. This penetration occurred only in the "B" line because of its extended operating time compared to the "A" and "C" lines.

Analysis of Incident

Investigation has identified that the leakage resulted from erosion of the orifice wall near the last stage of the orifice. The erosion was caused by high exit flow velocity at the last stage. The last stage is located eccentrically in the cylindrical orifice shell and near the wall of the orifice.

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The loss of integrity in the "B" recirculation line could have resulted in the loss of some core injection flow during normal operation and a significant loss of flow during emergency injection. In both modes, however, the remaining "A" and "C" injection lines were each available to deliver their design flow to the core. Only one of the three injection lines operating at design flow is required to provide core protection in the event of a LOCA. However, in the event of a single failure of a diesel generator (thus leaving only one HPI pump with an affected orifice) the design HPI flow could not be maintained.

Immediate Corrective Action

Since the TMI-1 makeup pumps and orifices are similar to those at ANO-1, B&W performed an ultrasonic investigation of the TMI-1 recirculation orifices on March 29, 1974 to determine if any wall erosion had occurred. The wall thickness measurements were made using 5 MHz pulse-echo "time of flight" technique. Sensitivity of these measurements is estimated 5 mils. Instrument calibration was obtained from an identical, unused orifice and from SS calibration discs of known thickness. The entire external surface of the orifice assemblies was examined. No wall thinning was found in the TMI-1 recirculation orifices.

Furthermore, having considered the operating-hours-to-failure on the ANO-1 orifices, and the fact that the TMI-1 orifices have withstood equivalent hours of operation without any sign of erosion, we have established a regular UT inspection interval for the TMI-1 orifices until new orifices of modified design are installed. The inspection interval will be once every two (2) weeks during system operation, which is about half the total-hours-to-failure of the ANO-1 orifices.

Future Corrective Action

A new makeup pump recirculation orifice has been designed to reduce the exit velocity at the last stage and to locate the last stage exit concentrically in the orifice shell. Babcock and Wilcox Co. is procuring, and will replace, the existing orifices at TMI-1 with those of the new design.

Very truly yours,

J. G. Miller
Vice President

CC: Mr. J. P. O'Reilly