METROPOLITAN EDISON COMPANY SUBSIDIARY OF GENERAL PUBLIC UTILITIES CORPORATION

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August 9, 1977
GQL 1044

Mr. B. H. Grier, Director
U. S. Nuclear Regulatory Commission
Office of Inspection & Enforcement
Region I
631 Park Avenue
King of Prussia, Pennsylvania 19406

Dear Sir:

Three Mile Island Nuclear Station Unit 2 (TMI-2)
License No. CPPR-66
Docket No. 50-320
Reactor Coolant Pump Seal Failure Potential
Following Loss of Offsite Power

On July 1, 1977, Mr. Lou Narrow and Mr. T. Rebelowski of your office were verbally notified of a situation which Metropolitan Edison Company considered may be reportable in accordance with the requirements of 10CFR50.55(e). This letter constitutes the required thirty-day follow-up letter and is submitted late per our letter of August 1, 1977.

Description

The Reactor Coolant (RC) pressure boundary along each RC pump shaft consists of three face seals. Two means are employed to provide cooling to the RC pump seals. One means, seal injection, provides cooling by passing RC make-up water along the pump shaft and into the RC system preventing hot reactor coolant from passing upward through the shaft seal system. The second means of cooling is provided by the intermediate closed cooling water. Reactor coolant is recirculated by an auxiliary impeller on the RC pump shaft and cooled by an auxiliary heat exchanger connected to each RC pump. This second system provides adequate cooling for the seal system provided the RC pump is running. Either of these two systems alone will provide adequate protection for the pump seals during normal operations.

If both seal cooling systems become inoperable, the possibility exists for the RC system pressure to force hot reactor coolant upward along the RC pump shaft and out the seal leakoff and/or seal return lines. The rate at which this occurs is dependent upon the RC system pressure and the initial conditions of the seal faces. The heat transmitted to the RC pump shaft sleeve and seal rings during the passage of reactor coolant creates thermal stresses

sufficiently large to cause the seal rings to fail when they reach a temperature of approximately 240° F. As a result, all three seal rings in one RC pump can fail, and the resulting leakage from that pump could be as much as 150 gpm.

Analysis of Safety Implication

Following a loss of offsite power, cooling accomplished by impeller recirculation is lost due to the loss of RC pump rotation. The cooling of the seals then becomes dependent on the only remaining cooling system; the seal injection system. The seal injection system will provide adequate cooling following the loss of offsite power if the makeup pump aligned for normal makeup service starts as required. The makeup pump, which receives power from an emergency diesel generator, is sequenced to start, come up to speed, and provide adequate seal injection flow to all four reactor coolant pumps within approximately 30 seconds. Any one of the following single failures: 1) failure of the isolation valve (MU-V378) in the seal injection line, 2) failure of the flow control valve (MU-V32) in the seal injection line, 3) failure of the diesel providing power to the two makeup pumps supplying seal injection; in combination with the loss of offsite power would result in a loss of both seal cooling systems. This in turn could lead to RC pump seal failures and possible reactor coolant leakage in excess of the remaining makeup (HPI) pump capacity.

The event described above would be classified as a small break loss of coolant accident. The results of this accident have been presented and referenced in the FSAR, Chapters 6 and 15. The resultant effect of this event on the health and safety of the general public is as reported in the FSAR.

Corrective Action

To eliminate the possibility of a loss of seal injection, the design will be modified to provide two separate, safety-grade sources of water to the seal injection header. This modification will provide a single failure-proof seal injection supply to the reactor coolant pumps following a loss of offsite power. The modification will be described fully in the appropriate sections of the FSAR. Plant modifications will be completed prior to initial fuel load.

Very truly yours,

J. G. Herbein
Vice President

JGH:JRS:mmn

cc: Dr. Ernst Volgenau, Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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