TOLEDO EDISON

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Docket No. 50-346

License No. NPF-3

Serial No. 687

February 9, 1981

Director of Nuclear Reactor Regulation
Attention: Mr. Robert W. Reid, Chief
Operating Reactors Branch No. 4
Division of Licensing
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Reid,

This letter is to document the applicable response to Item II.K.2.15 of NUREG 0737, Clarification of TMI Action Plan Requirements for the Davis-Besse Nuclear Power Station Unit 1 (DB-1). This item deals with the mechanical effects of "slug flow" on steam generator tubes. A generic evaluation was done by Babcock and Wilcox and is attached to this submittal. This evaluation is applicable for DB-1.

Very truly yours,

RPC:TJM:lab

attachment

cc: DB-1 NRC Resident Inspector

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Transitions from solid natural circulation to reflux boiling and back to solid natural circulation may cause slug flow in the hot leg piping. By use of analysis and/or experiment address the mechanical effects of the induced slug flow on steam generator tubes.

RESPONSE

The loads imposed on the tubes of the steam generator (SG) during the postulated "slug flow" have been conservatively evaluated and found to be acceptable. Based on very conservative assumptions, the end loading on each tube will be 21.5 $lb_f$ compared to a theoretical buckling load of about 700 $lb_f$.

It was assumed for this analysis that a water level has been established in the hot leg piping and inside the tubes of SG. The transient consists of a "front" of solid water impinging on the primary face of the upper tubesheet. The flow was assumed to be equal to full 100% power flow (about 70,000,000 lb/hr). The load is assumed to be a suddenly - applied load. The upper tubesheet is conservatively assumed to offer no resistance to the load and the lower tubesheet is assumed to be fixed so that the entire load is absorbed by tubes directly under the primary inlet nozzle. The flow is assumed to not follow the diffuser so that the velocity impinging on the tubesheet is the same as the velocity in the 36-inch nozzle. Hot leg temperature is assumed to be 605°F.

The velocity in the 36-inch pipe would be 64.4 ft/sec. By use of the momentum equation, the steady-state force on the upper tubesheet due to the velocity would be 16,080 $lb_f$. Assuming a suddenly-applied load, the momentary force would be 32,160 $lb_f$. There are about 1500 tubes in a 36-inch diameter circle. Thus the 32,160 $lb_f$ will result in 21.5 $lb_f$ per tube. Since the cross-sectional area of each tube is 0.070 in, the momentary axial compressive stress in these tubes would be 307 psi.