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50-289

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ADDITIONAL INFO RE REQUEST NO. 69 TECH SPEC CHANGE, OPERATING LIC. NO. DPR-50.

PLANT NAME: THREE MILE ISLAND -- UNIT 1

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METROPOLITAN EDISON COMPANY

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July 17, 1978
GQL 0747

Director of Nuclear Reactor Regulations
Attn: R. W. Reid, Chief
Operating Reactors Branch No. 4
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Docket No. 50-289
Operating License No. DPR-50
Technical Specification Change Request No. 69
(Additional Information)

In response to concerns identified by your Mr. G. B. Zwetzig, with respect to the subject Change Request, attached please find additional information, provided to Metropolitan Edison Company by Babcock & Wilcox.

Sincerely,

J. G. Herbein
Vice President-Generation

JGH:RJS:dkf

Attachment

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REGULATORY DOCKET FILE COPY

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Acc'd
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BORON REQUIREMENTSBackground

Technical Specification 3.2 applies to the operational status of the Makeup and Chemical Addition systems. The purpose of Technical Specification 3.2 is to assure capability for adequate RCS boration from all operating conditions to the cold shutdown condition (200°F). The present B&W standard practice for preparation of this technical specification is to specify boric acid inventory requirements based on core conditions of 70°F, no credit for Xenon, 1% $\Delta k/k$ subcritical margin, and highest worth CRA stuck fully withdrawn (all other CRA's fully inserted). The reactor is not allowed to be critical unless at least two (2) sources of boric acid solution are available and operable: the two sources are the borated water storage tank (BWST) and a tank(s) containing concentrated boric acid solution in the chemical addition system. The latter tank(s) may be a boric acid mix tank(s), concentrated boric acid storage tank(s), reclaimed boric acid storage tank(s), or boric acid addition tank(s). The limiting inventory of the BWST is set by LOCA considerations and is generally on the order of 350,000 gallons at 1800 ppm or 2270 ppm boron. However, the limiting inventory of the concentrated boric acid supply is set by the RCS boron concentration requirements for cold shutdown, as defined above. Therefore, the quantity of boric acid in storage from either of the two independent sources is sufficient to borate the RCS to a 1% $\Delta k/k$ subcritical margin in the cold condition with no xenon and highest worth stuck CRA at the most limiting time during the fuel cycle. For rodged plants the most limiting boric acid volume requirements occur just before control group 7 is withdrawn to provide excess reactivity for the latter fraction of the fuel cycle.

Statement of Concern

B&W first noticed the deficiency during November-December 1977, while performing a soluble boron shutdown analysis for one of their customers. This cycle was of particular interest since the utility was converting from rodged to unrodged (push pull) operation.

A comparison of Technical Specification 3.2 with the recalculated boric acid volume requirements revealed the boric acid volume storage listed was insufficient for the next cycle. Further investigations revealed the volume specification was inadequate for Three Mile Island, Unit 1.

Cause of Deficiency

The current specification for soluble boron requirements, i.e., 550 ft³ at 8700 ppm boron in both the boric acid mixing tank and the reclaimed boric acid storage tank, was calculated without considering the highest worth CRA stuck out of the core. The requirement for the volume of borated water determined from calculations assuming 1% shutdown margin at cold shutdown, the worst time in core life, highest worth control rod assembly fully withdrawn and no credit for xenon, is 776 ft³ at 8700 ppm boron in each of the aforementioned tanks.

Safety Evaluation

While the numbers provided in the revised technical specifications have increased, there essentially was no degradation in plant safety for the following reasons:

1. The BWST water volume required for the LOCA is well in excess of that required to bring a plant to a cold shutdown. Thus an adequate source of borated water existed at all times.
2. Plant operators are provided with a boron curve vs lifetime for each reload cycle which includes 1% $\Delta k/k$ subcritical margin at 70°F with highest worth stuck rod and no credit for xenon. During any shutdown the operator uses this curve to insure that the reactor coolant system contains sufficient boron while in the cold shutdown conditions.
3. During normal operations the concentrated boric acid storage tank level is kept above the technical specification limit.
4. The volumes and concentrations provided by B&W are conservative in that they are calculated for 70°F rather than the 200°F allowed by the specification to help account for minor variations from cycle to cycle. In addition, an additional 10% conservatism is applied to the volume requirement. Also B&W applies an additional 10% uncertainty on the control rod worths used in the calculations.

Corrective Action

Revised technical specifications which account for the increased boron requirements were submitted January 27, 1978. These volumes and concentration limits have been implemented, as indicated in LER 77-29/1T, December 30, 1977.

1493 236