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March 27, 1985
NRC/TMI 85-020

Docket No. 50-320

GPU Nuclear Corporation
ATTN: Mr. F. R. Standerfer
Vice President/Director, TMI-2
P. O. Box 480
Middletown, PA 17057

Dear Mr. Standerfer:

Subject: Internals Indexing Fixture Safety Evaluation Report, Revision 2

References: (a) GPU letter 4410-85-L-0011, Internals Indexing Fixture Safety Evaluation Report, Revision 2, dated January 16, 1985

(b) Criticality Report for the Reactor Coolant System, Revision 0, dated October, 1984

(c) NRC Response to Technical Specification Change Request No. 45 dated April 24, 1984

(d) NRC letter, Grant to Kanga, IIF Processing System Safety Evaluation, dated July 24, 1984

(e) Report 4430-84-007R, Revision 1, Hazards Analysis Potential for Boron Dilution of the Reactor Coolant System, dated November, 1984

This letter is in response to revision 2 of your Internal Indexing Fixture (IIF) Processing System Safety Evaluation Report (Reference a). The revision evaluated the impact of raising the lower limit of boron concentration in the Reactor Coolant System (RCS) from 3500 ppm to 4350 ppm. The lower limit boron concentration in the RCS was increased to encompass a more conservative criticality evaluation (Reference b) which was performed in preparation for defueling. Although it is not expected that the IIF processing system will be in place during defueling, the lower boron limit is being raised to add an additional margin of conservatism for core alterations which may be initiated prior to defueling.

The boron concentration in the reactor coolant system is being maintained at a minimum of 4950 ppm and evaluations (Reference c) have concluded that boron concentrations up to 6000 ppm can be accommodated without detriment to the system. The revision of the lower boron limit, therefore, has no direct

impact on the RCS. However, established safeguards which provide assurance that RCS delution would be detected and mitigated prior to going below 3500 ppm must be reevaluated to ascertain that any delution event can be corrected before the new lower limit, 4350 ppm, is reached.

RCS isolation, sampling and inventory control were the three primary techniques devised to protect against delution induced criticality. The existing evaluation associated with physical isolation of the RCS was not altered by the revision of the lower boron limit. However, sampling and inventory control procedures must be reevaluated to ensure that they adequately detect a dilution event before the primary system delution reaches the new lower limit.

Prior to operation of the IIF processing system, RCS sampling procedures will need to be revised to ensure that samples are drawn and analyzed with sufficient frequency to ensure that if processed water return flow to the RCS were unborated, the delution would be detected before the RCS boron concentration could be reduced to 4350 ppm. IIF processing procedures will be reviewed by the NRC staff to ensure that the sampling frequencies meet these criteria.

The existing water inventory monitoring procedures are based on the conservative assumption that an unborated water source would enter the cold leg and settle to the bottom of the reactor vessel. For a conservative analysis it is assumed that a critical fuel mass, which potentially could have been relocated to the bottom of the reactor vessel, would be subjected to the unborated water before the water mixed with the entire reactor vessel inventory. Reference (d) analyzed this scenario and concluded that a minimum volume of 4500 gallons of unborated water would be required to dilute the 14,000 gallons of water in the reactor vessel annulus and lower head from 4950 ppm to 3500 ppm.

Since reference (d) was written, additional analysis (Reference e) has shown that the density of unborated water at any temperature is less than the density of water containing a 4950 ppm concentration of boron. A dilution flow of pure water into the reactor vessel would, therefore, tend to rise and mix with the entire vessel inventory before contacting a potentially critical fuel geometry. The effective dilution volume in the vessel is actually 36,000 gallons rather than the 14,000 gallons assumed earlier. Using existing inventory control criteria, 4500 gallons of unborated water diluting 36,000 gallons of RCS at 4950 ppm would result in a mixture having a boron concentration in excess of 4350 ppm. Modifications of existing inventory control procedures are therefore not necessary because of the conservatism that currently exist.

On the basis of our evaluation we conclude that raising the lower limit of boron concentration in the RCS during IIF processing is a conservative measure and that redundant means are available to ensure that the RCS boron

concentration is maintained above the new lower limit of 4350 ppm. It does not reduce any safety margin or result in an increase in effluents to the environment. The impact of the proposed activity falls within the scope of the PEIS. We therefore, approve the proposed revision. RCS sampling procedures which are applicable during IIF processing as per Technical Specification 6.8.2 will be reviewed by the NRC site staff as part of the established on-site procedure review process to ensure that sampling frequencies are adjusted to support the new boron limit.

Sincerely,

William D. Travers
Deputy Program Director
TMI Program Office

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