GPU Nuclear

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5211-86-2171

Office of Nuclear Reactor Regulation
Attn: J. F. Stolz, Director
PWR Projects Directorate No. 6
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Stolz:

Three Mile Island Nuclear Station Unit 1 (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
Primary Coolant Chemistry Limit Changes -
Lithium, Sulfate and pH

The purpose of this letter is to advise you that GPU Nuclear Corporation has recently made changes to the TMI-1 administrative primary water chemistry limits identified in TR-008 (Reference 1), as follows:

	TR-008	Revised
Lithium	1.0-2.0(ppm)	0.25-2.0(ppm)
Sulfate(SO_4)	0.1(ppm)	Less than the smaller of 0.1 ppm or 0.1 x Li (ppm)
pH(25°c)	4.6-8.5	4.6-9.7

One of the purposes of water chemistry control is to minimize transport of radioactive species from the reactor vessel regions to components and systems external thereto. A coordinated lithium/boron chemistry in the primary coolant minimizes cobalt-60 transport. Chemistry aimed at maintaining essentially constant pH at reactor operating temperatures necessitates lowering the lithium concentration as the boron concentration decreases during the fuel cycle. Near the end of the fuel cycle lithium concentrations near 0.2 ppm are desirable from this point of view.

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The pH limits follow naturally from the lithium-boron allowable limits. The upper pH limit for pure lithium/boron solutions would be 9.6, however, this was raised to 9.7 in the administrative limits to allow for the presence of 0.5 ppm NH_3, which is normally present due to its radiolytic formation from dissolved nitrogen and hydrogen gas.

As discussed in TR-008, the sulfate upper limit and the associated minimum in the ratio of lithium (ppm) to sulfur (ppm) were established to preclude the potential for intergranular stress assisted cracking of Inconel 600 due to reduced sulfur species. The changes to the lithium and sulfate limits do not increase the potential for IGSAC, as discussed below, and result in a chemistry fully consistent with the rationale used to establish the TR-008 limits.

At all temperatures, sulfate within the specified limits is essentially harmless to Inconel-600 in any reactor coolant solution including zero lithium. At temperature less than 200°F, in the presence of reduced sulfur IGSAC initiation is not expected to occur even in the absence of lithium if the sulfur concentrations is less than .07 ppm. When the lithium concentration is equal to or greater than ten (10) times the sulfur concentration, or 3.3 times the sulfate concentration, IGSAC is inhibited. This is irrespective of the sulfur concentration.

The Long Term Corrosion Test Program confirmed the adequacy of the operational chemistry limits with the TR-008 sulfur levels. Reducing the allowable sulfur limit below that tested in the Long Term Corrosion Test, while maintaining a Li/S ratio of 10 further increases the margin for protection from damage.

In conclusion, the changes described above involve no adverse effects on safety, may result in reduced radioactivity transport and do not affect the potential for IGSAC.

Sincerely,

H. D. Hukill
Vice President, TMI-1

HDH/SK/pa(3998f)

cc: J. Conte
R. Thoma

Reference: GPUN Letter 5211-83-256, "Topical Report 008, Rev. 3, H. D. Hukill to J. F. Stolz, September 14, 1983.