

**Met-Ed / GPU**



Metropolitan Edison Company  
Post Office Box 480  
Middletown, Pennsylvania 17057

Writer's Direct Dial Number

April 29, 1981  
LL2-81-0109

THI Program Office  
Attn: Mr. Lake Barrett, Deputy Director  
U. S. Nuclear Regulatory Commission  
c/o Three Mile Island Nuclear Station  
Middletown, Pennsylvania 17057

Dear Sir:

Three Mile Island Nuclear Station, Unit 2 (THI-2)  
Operating License No. DPR-73  
Docket No. 50-320  
Submerged Demineralizer System

During discussions with members of your staff, you requested that we address the potential for inadvertent criticality in spent SDS ion exchange vessels due to the deposition of Uranium and transuranics onto the ion exchange media.

We have performed an analysis of the potential to accumulate a critical mass and have concluded that, because of the small quantities of fissile material in the Reactor Coolant System and the reactor building containment sump, criticality in the spent SDS liners is not possible.

In August, 1979, we obtained a sample of the water in the sump. Analysis of that sample revealed that it contained 0.00455  $\mu\text{g/ml}$  of solid uranium, 0.028  $\mu\text{g/ml}$  dissolved uranium, and  $3.3 \times 10^{-5}$   $\mu\text{g/ml}$  plutonium. Based on processing 600,000 gallons of sump water, assuming uniform distribution of both radionuclides, the total inventory of uranium in the sump would be approximately 73 grams and the total inventory of plutonium in the sump would be approximately 0.0749 grams.

Assuming that all uranium and plutonium is deposited in one vessel (highly unlikely) during SDS sump water processing, that one vessel would contain 2.96 weight percent uranium. A critical mass of this weight percent uranium would require approximately 2.2 kilograms U-235. Since only 73 grams of the material is present, criticality is not possible. Furthermore, for criticality to occur, 450 grams of plutonium 239 would have to be present concurrently (non-uniform slurry) with 700 grams of uranium 235 and 520 grams of uranium 233. Since only 73 grams is available, criticality is not possible. Therefore, we conclude that criticality from the presence of the radioisotopes alone or mixed is not possible.

The Reactor Coolant System contains a concentration of 100 ppb uranium and 0.24 ppb plutonium. These concentrations yield a total of 37 grams of mixed uranium and plutonium. Therefore, based on the previous discussions concerning criticality requirements, criticality is not possible.

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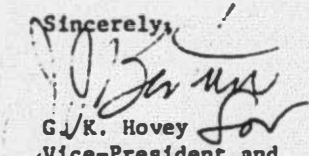
Mr. Lake Barrett

-2-

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We believe that this letter adequately addresses your concerns. Should you wish to discuss this matter further, please contact Mr. L. J. Lehman, Jr. of my staff.

Sincerely,

  
G. K. Hovey  
Vice-President and  
Director, TMI-2

GKH:LJL:djb

cc: Dr. B. J. Snyder, Program Director - TMI Office