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U.S. NUCLEAR
REGULATORY COMMISSION
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TMI 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 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Submerged Demineralizer System

In our April 24, 1981 submittal (LL2-81-0111) we stated:

"Available water radiolysis data for irradiated zeolite systems indicate that recombination will occur (under gamma flux field) and subsequent hydrogen/oxygen concentrations would be non-explosive."

This letter further elaborates on the above statement and provides a basis for it.

Experiments by K. K. S. Pillay (NE/RWM-80-3, "Radiation Effects on Ion Exchangers Used in Radioactive Waste Management," Department of Nuclear Engineering, Pennsylvania State University, University Park, PA 16802) and analysis using the computer program MAKSIMA CHEMIST (M. B. Cowar, D. V. Hanely, and N. R. Chaplin, Atomic Energy of Canada, LTD. Report AECL-6413, 1979) indicate that recombination occurs and equilibrium pressure is low.

Pillay irradiated eight capsules containing wet zeolite. Six capsules yielded hydrogen gas concentrations in the range 0.6 vol% to 1.3 vol% with oxygen present at 24.1 vol% to 36.9 vol% at total gas pressures of 11.6 psi to 20.3 psi. The other two capsules yielded hydrogen concentrations of 3.1 vol% and 4.5 vol%; however, in these capsules the oxygen was depleted (0.5 vol% to 1.3 vol%). Scaling Pillay's exposure rate to the dose rate corresponding to 60,000 Ci/vessel yields hydrogen concentrations of .74 vol% to 1.6 vol% (6 samples) and 4.5 vol% to 5.6 vol% (2 samples). Such gas mixtures (with the corresponding scaled oxygen concentrations) are non-explosive. Pillay's data also suggests the presence of absorbed nitrogen which was released after the capsules were sealed. Absorbed gas in the SDS vessels would be unlikely. In absence of such gas, Pillay's experimental data still predicts a non-explosive mixture.

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Mr. Lake Barrett

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The MAKSIMA CHEMIST computer code computed equilibrium hydrogen concentrations in the range 5 vol% to 14 vol% and oxygen concentrations in the range 18 vol% to 20 vol% with equilibrium gas pressures less than 1.18 atm. Hydrogen is flammable in the range 4 vol% to 72.2 vol% and generally explosive in the range 14 vol% to 68 vol%. Explosion of the 14 vol% gas mixture would result in an over pressure of 5.15 atm, which would be safely contained. Furthermore, this explosion will not occur; no credible ignition source exists (the vessels are under water) and the zeolite will be continuously cooled by vapor recondensation.

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:vjf

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