GPU Nuclear

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US Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Dear Sirs:

Three Mile Island Nuclear Station, Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320
Disposal of Processed Water

The purpose of this letter is to provide you the results of GPU Nuclear's recent assessment of radionuclides which may be present in the processed water at TMI-2.

As discussed in GPU Nuclear letter 4410-86-L-0114 dated July 31, 1986, which requested NRC approval for disposal of processed water at TMI-2, certain radionuclides will be present in the evaporator effluent. Specifically, that submittal evaluated the population and environmental effects of tritium (H-3), strontium-90, and cesium-137.

GPU Nuclear letter 4410-87-L-0018 dated February 3, 1987, forwarded the results of analyses performed for GPU Nuclear by the Westinghouse Advanced Energy Systems Division Analytical Laboratories. That submittal provided additional information regarding the radionuclide content of selected processed water streams at TMI-2. Because these analyses provided information that was not previously available, GPU Nuclear undertook a comprehensive review of the radionuclides potentially present in the processed water and, based on the disposal scenario described in the July 31, 1986 submittal, may be a constituent of the evaporator influent.

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As part of this review, GPU Nuclear developed a list of particulate radionuclides (see attachment) based on the following criteria:

1. Radionuclides specifically identified in 10 CFR Part 61.

2. Greater than 0.1% of the core isotopic content, on a curie basis, eight (8) years following the TMI-2 Accident as determined by the ORIGEN computer code.

3. Greater than 0.1% of the core transuranic inventory, on a curie basis.

4. Reactor Coolant System activation products of practical interest as identified by the Babcock and Wilcox Water Chemistry manual.

Additionally, the attachment provides an assumed average concentration of each radionuclide potentially present in the evaporator influent (i.e., total curie content of the radionuclides in the various water sources divided by the total volume of processed water). In developing this list, GPU Nuclear used lower limits of detection (LLD) or the actual measured activities for the radionuclides listed. The activity of radionuclides for which no data were available were estimated by various means. For example, the europium, samarium, and promethium values were based on a ratio between the core isotopic ratios given by ORIGEN and the known LLD of Ce-144. This provides a maximum activity which could be present in the presence of no greater than LLD activity of Ce-144. This is a reasonable approach since these elements are all rare earths and are chemically similar. It should be noted that the concentrations listed on the table are average concentrations. Actual concentrations in specific water sources may vary from that listed.

Using the radionuclide concentrations listed, GPU Nuclear conducted a comparative evaluation of the potential off-site effects of these radionuclides, relative to Sr-90, based on the total dose commitment resulting from the ingestion pathway or summation of all pathways as available in the references. The dose due to exposure to the plume was not considered for this analysis since its contribution to an individual's total dose is several orders of magnitude less than the ingestion pathway. As noted in Section 8.1 of our July 31, 1986, submittal, Sr-90 was used as the basis for the relative assessment since it is the most radiologically significant radionuclide.

Based on the above assessment, the potential impact of each radionuclide was derived by multiplying the known or calculated activity or the LLD listed on the attachment by pathway dose conversion factors from the TMI-2 Off-site Dose Calculation Manual or the Total Dose Commitment values from EPRI NP 3840 to obtain an indication of the relative impact of the isotope (see Attachment). Based on this review, three (3) additional isotopes were identified for which the off-site dose contribution exceeds 1% of the off-site dose from Sr-90. These isotopes are C-14, Tc-99, and I-129. However, values listed can only be considered an indication of the order of magnitude of the relative impact. The difference in critical organ for the various radionuclides makes direct addition of the ratios incorrect. For example, although I-129 is estimated to

have an approximate impact of 19% when compared to Sr-90, it does not indicate that the dose to the individual would increase by 19%; the critical organ dose calculated for Sr-90 is applied to the bone whereas the dose from I-129 would be to the thyroid.

With the exception of the special case of I-129, as noted above, this analysis also reaffirms that the LLD's established for the various radionuclides listed herein are sufficiently low to ensure that the environmental impact at those concentrations would be insignificant (i.e., less than 1% of the relative contribution from Sr-90).

Considering the potential contribution of these three additional radionuclides to off-site dose resulting from disposal of the TMI-2 processed water by evaporation, GPU Nuclear has concluded that the off-site environmental consequences remain well below regulatory limits (i.e., 10 CFR 50, Appendix I) and the potential impact to the population and the environment remains insignificant. We are confident that your analysis of these data, in support of finalization of the PEIS, will support this conclusion.

Sincerely,

F. R. Standerfer
Director, TMI-2

FRS/JJB/eml

cc: Regional Administrator - Region 1, Dr. T. E. Murley
Director - TMI-2 Cleanup Project Directorate, Dr. W. D. Travers

ATTACHMENT
4410-87-L-0023

AVERAGE CONCENTRATION OF RADIONUCLIDES POTENTIALLY PRESENT IN TMI-2 WATER FOR EVAPORATION

Radionuclides	Concentration (uCi/ml)	Relative Off-site Dose Impact Compared to Sr-90
H-3	1.3 E-1	<0.01 [2]
C-14	1.0 E-4	0.50 [3]
Mn-54	<4.0 E-8	<0.01
Fe-55	4.8 E-7 [1]	<0.01
Co-58	<4.0 E-8	<0.01
Co-60	4.8 E-7	<0.01
Ni-63	<6.0 E-7	<0.01
Zn-65	<9.8 E-8	<0.01
Sr-90/Y-90	1.1 E-4	1.00
Tc-99	1.0 E-6	0.20
Ru-106/Rh-106	<3.3 E-7	<0.01
Ag-110M	<5.6 E-8	<0.01
Sb-125/Te-125m	2.3 E-6	<0.01
I-129	<6.0 E-7	0.19 [4]
Cs-134	8.8 E-7	<0.01
Cs-137/Ba-137m	3.6 E-5	<0.01
Ce-144/Pr-144	<2.1 E-7	<0.01
Pm-147	<4.8 E-6 [1]	<0.01
Sm-151	<1.1 E-7 [1]	<0.01
Eu-152	<3.8 E-10 [1]	<0.01
Eu-154	<4.4 E-8 [1]	<0.01
Eu-155	<1.1 E-7 [1]	<0.01
U-234	<1.0 E-8	<0.01
U-235	<1.2 E-8	<0.01
U-238	<1.2 E-8	<0.01
Pu-238	<1.2 E-8	<0.01
Pu-239	<1.4 E-8	<0.01
Pu-240	<1.4 E-8	<0.01
Pu-241	<6.5 E-7 [1]	<0.01
Am-241	<1.2 E-8	<0.01
Cm-242	<1.0 E-7	<0.01

1 Calculated concentration

2 H-3 ratio is based on food pathway. Since tritium is present in a gaseous form, it also has a inhalation pathway constituent. As total H-3 impact was evaluated in the July 31, 1986 submittal, it was not further evaluated here.

3 Ratio listed is for C-14 if present in a carbonate or organic form. If C-14 is present as a dissolved gas (e.g., CO_2), the ratio would be <0.01.

4 The relative off-site dose impact compared to Sr-90 listed for I-129 assumes it is present at LLD (i.e., 6.0 E-7); therefore, 0.19 is a maximum value. The actual relative off-site dose impact for I-129 would be less than this value.

5 < means less than.