50-320
(part of
7 of 9
package)
TERA

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

April 12, 1979

TO: B. Grimes, NRR, TMI-2 Site

FROM: F. J. Miraglia, Coordinator Team B

Attached is primary coolant sample analysis information you requested.

This material was developed by S. Bland and F. Kantor.

Frank J. Miraglia,
Team B Coordinator

P

SUBJECT: PRIMARY COOLANT SAMPLE ANALYSIS 4/12/79

Discussion

The first sample (100 ml) of the primary coolant was taken at approximately 1700 on March 29. Direct radiation readings of the sample were 1,000R/hr on contact (70-80R/hr at one foot and 10-30R/hr at three feet).

A secondary primary coolant sample (60 ml) was collected at approximately 0730 on April 10. Direct radiation reading of the sample was 17R/hr at 5 inches. (Note: Sample was in lead pig; it is assumed that the reading was with the top plug off). This sample was split with the licensee; NRC sent sample to Bettis, Savannah River Laboratory, and ORNL for analysis. (As of the time of the memorandum, the results from Bettis had not been received).

Evaluation

The enclosed table is an evaluation and comparison of the analysis of the two primary coolant samples. This table is an update and simplification of a preliminary table that was informally sent to B. Grimes at 1200, 4/12/79.

In determining the fraction of the core inventory in the primary coolant, a total primary coolant inventory of 7.4×10^5 lbs. (3.8×10^8 ml) was assumed (reference, NRC Appendix I Evaluation). It should be noted, however, that approximately 9×10^8 ml of make-up water (BWST) was added to the primary system during the early hours of the event (0400 to 2400 on 3/28).

This addition to the primary system yields a large volume of water (primary coolant and BWST water) in the containment sumps, some of which was pumped out to the auxiliary building. If it is assumed that this sump water is at the same concentrations as the primary coolant samples, the fraction of the core inventory that is in this total coolant (1.2×10^9 ml including sump water) is about a factor of 3 higher than the inventory fraction calculated by assuming only the normal primary coolant inventory (3.8×10^8 ml). However, this approach will over-estimate the fraction of the core in the coolant, since the gross fuel failures occurred some time after the blowdown of the primary system to the sumps had initiated. Therefore, the actual fraction of the core inventory that has been lost to the coolant is probably somewhere between the value presented in the table and the higher value calculated when considering the make-up water.

The core inventories that were assumed for the analysis were from ORIGIN computer code runs which were performed using the actual TMI-2 fuel history. However, an incorrect computer run (wrong value for MTU) was used in determining the decayed core inventories for the 1st sample analysis evaluation. For comparison purposes the previous, incorrect values have been included in the table.

For short lived radionuclides (I-131, Cs-136), the first computer run calculates core inventories about a factor of 1.2 higher than the 2nd computer run. For long lived radionuclides the difference is negligible.

The core inventories for the first sample analysis have been decay corrected (2 days) to roughly correspond to the analysis time. The second sample core inventories have also been decay corrected (14 days to correspond to the analysis.

		1st Primary Coolant Sample 3/29/71 Battis				2nd Primary Coolant Sample - 4/10/71					
		1st CABLEN RUN-WRONG MTU		2nd CABLEN-CORRECTED MTU		SRL		ORNL		Battis	
Nuclide	T½	Coolant Concentration (μc/cc)	Fraction of Core in Coolant	Coolant Concentration μc/cc	Fraction of Core in coolant	Coolant Concentration (μc/cc)	Fraction of Core in Coolant	Coolant Concentration (μc/cc)	Fraction of Core in Coolant	Coolant Concentration (μc/cc)	Fraction of Core in Coolant
I-131	8d	1.3×10^{-4}	0.065	1.3×10^{-4}	0.088	4.6×10^{-3}	0.08	8.2×10^{-3}	0.155		
I-133	20.8h	6.5×10^{-5}	0.08	6.5×10^{-5}	0.080						
Cs-134	2Y	6.3×10^{-1}	0.06	6.3×10^{-1}	0.068	7.7×10^{-1}	0.076	8.2×10^{-1}	0.091		
Cs-136	13d	1.8×10^{-2}	0.08	1.8×10^{-2}	0.10	1.2×10^{-2}	0.12	1.1×10^{-2}	0.12 ~~0.012~~		
Cs-137	30Y	2.8×10^{-2}	0.10	2.8×10^{-2}	0.11	3.2×10^{-2}	0.11	3.3×10^{-2}	0.13		
Sr-89	50d	5.3×10^{-5}	0.00003	6.3	0.00003	1.5×10^{-3}	0.009	6×10^{-2}	0.0042		
Sr-90	28Y							5×10^{-1}	0.022		
Ru-106	368d	2.0×10^{-2}	0.019	2.0×10^{-2}	0.022						
Ba-140	12.8d	2.0×10^{-2}	0.0006	2.0×10^{-2}	0.0006	1.7×10^{-2}	0.00093	2.9×10^{-2}	0.0018		
La-140	40h					1.4×10^{-2}	0.00085	1.6×10^{-2}	0.00086		
Mo-99	66h					1.3×10^{-2}	0.0107	1.79×10^{-2}	0.017		
Te-132	78h	2.0×10^{-2}	0.0008	2.0×10^{-2}	0.0017						
Ce-144	280d					1.05×10^{-2}	0.0001				
Ba-La-140	0.35 (equilibrium)					9.1×10^{-1}	0.55				
Xe-133		3.6×10^{-4}	1	3.6×10^{-4}	1×10^{-10}	$< 1 \times 10^{-3}$	$< 1 \times 10^{-6}$				
U						< 0.001 ppm		< 10 ppb			
H^3	12Y							1.2	0.1		

600 96