NON-PROPRIETARY

ATTACHMENT TO LETTER DATED
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Questions

1. Was a mass balance made of the iodine used in the iodine-pool DF experiments?

2. For the burnups greater than 33.000 MWD/MTU, is the DF valid?

3. What was the core inventory of Krypton-85 at 20.000 MWD/MTU?

Responses

1. Examination of Table 3-1, WCAP-7518-L indicates that the decontamination factor, DF, was determined by consideration of the measured amount of iodine in solution M_S, following a test and the measured amount of iodine that escaped from the solution, M_V. The DF is then $\frac{M_V}{M_S + M_V}$. Care was taken to assure that all the iodine not in solution, and hence must be in the vapor phase, was accounted for. Multiple scrubbers, tubing and teflon gaskets in the vapor collection space were all analyzed for iodine to assure that it all was accounted for. Hence the measured values given in the table sufficiently describe the parameters necessary for a DF calculation.

2. WCAP-7518-L considered total volumes of fission gases formed plus helium fill gases in the fuel pins for assembly arrays of 14 x 14 and 15 x 15 at burnups up to 42,000 MWD/MTU for a lead assembly. The maximum total gas for a lead assembly at this burnup was calculated to be [ ]$^+$ std. cu. feet. (a,c)

   This analysis has now been extended to consider 17 x 17 standard fuel, 17 x 17 optimized fuel and 15 x 15 fuel. Expected volumes of gas expected in an assembly were calculated for various high burnups. For these calculations it was assumed that all rods in the lead assembly achieved the same burnup. In actual practice such is not the case; some pins in the assembly would have a lesser burnup and hence less total fission gas would be produced.

   To assure a conservative calculation of the amount of gas in an assembly, uncertainties were added to the calculated fission gas production.

   Table 1 summarizes the calculated total gases expected for the various assemblies. It may be seen that for a 15 x 15 fuel array a total of [ ]$^+$ std. cu. ft. of gas is expected at a burnup of 53,352 MWD/MTU. (a,c) Lesser amounts of gas are expected in 17 x 17 and 17 x 17 optimized fuel assemblies at comparative burnups.

Since the experiments conducted in WCAP-7518-L were simulations of 15 x 15 fuel assemblies, the analyses were extended to consider this greater volume of [ ]+ ft.^{3}. (a,c)

Figure 1 is a plot of the volume of gas and the expected pressure in a fuel pin for a 15 x 15 assembly. The linear relationship between gas volume and pressure has been extrapolated to show an expected pressure of 1582 psi at the [ ]+ ft.^{3} volume. Figure 2 is a replot of Figure 3-10 from the original WCAP. In this plot, the DF corresponding to a pressure of 1582 psi would be approximately 600. (a,c)

These extrapolations indicate that the DF values of 100 assumed for a fuel handling are valid for high burnup fuel, and are conservative.

3. The core inventory of Krypton-85 at 20,000 MWD/MTU is 3.8 x 10^5 Curies.

TABLE 1

VOLUME OF GAS IN LEAD ASSEMBLY FOR VARIOUS FUEL TYPES

Type of Fuel	Burnup Assumed (MWD/MTU)	Volume of gas in assembly (ft.^{3} at STP)
15 x 15	[	] +
17 x 17 Standard		
17 x 17 Optimized Fuel		(a,c)

TEST RELEASE VOLUME (SCF)

FIGURE 1

BUBBLE DECONTAMINATION FACTOR

READY-

FRAME 01

(a,c)

FIGURE 2