UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

July 13, 1971

Memo to Files
THRU: Charles G. Long, Chief, PWR Project Branch No. 2, DRL

PURGE DOSE CALCULATIONS FOR THREE MILE ISLAND UNIT NO. 1
(DOCKET NO. 50-289)

The increment in dose at the site boundary due to the necessity for H_2 purge for TMI-1 has been calculated as follows:

1. Purge starts at 40 days after the accident

2. Purge rate is 11.6 cfm for continuous purging

3. Reduction factors for iodine include:

   a. 4 for release & plateout (TID-14844)
   b. 20 for sprays
   c. 10 for purging through filters

4. Diffusion factor is 2.9×10^{-5} sec/m^3 (Safety Guide #4 at 610 m, for 4-30 day meteorology)

5. P = 2535 MWt

6. I-131 inventory airborne in containment at 40 days after LOCA is:

   $(2535)\ (2.51 \times 10^4)\ \ (1/4)\ \ (1/20)\ \ (e^{-\lambda t}) = 2.56 \times 10^4$ Ci

7. Dose rate, per hour, at start of purging is:

   $R = (11.6 \text{ cfm}) \cdot (60 \frac{\text{min}}{\text{hour}}) \cdot (2.56 \times 10^4 \text{ Ci}) \cdot (1.48 \times 10^6 \frac{\text{rad}}{\text{Ci}}) \cdot$
   $(3.47 \times 10 \frac{-4\text{m}^3}{\text{sec}}) \cdot (2.9 \times 10^{-5} \frac{\text{sec}}{\text{m}^3}) \cdot (10^{-1} \text{ for filters}) \div$
   $2 \times 10^6 \text{ ft}^3$

   $R = 1.4 \times 10^{-2}$ Rem/hour

1486 148

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8. Infinite dose rate $I = \frac{1.4 \times 10^{-2}}{\lambda} = 1.4 \times 10^{-2} \frac{(193)}{.693} = 4$ rem

   The 4 rem figure does not consider dilution inside containment due to makeup, which would lower the dose value to <3 rem.

9. If the annual average X/Q of 6×10^{-6} were used instead of the 4-30 day value, the dose rate would be reduced by a factor of 5.

10. If an ultimate decontamination factor of 1000 were assumed, instead of the 80 (4 release and plateout X 20 spray) the dose would be decreased by a factor of 12. (It is believed that the factor of 1000 represents the upper limit attainable with the use of a sodium thiosulfate spray system).

11. Equivalent calculations for whole body dose rates with 4-30 day meteorology show that for a continuous 11.6cfm purge rate, the whole-body dose is about 1.6 rem.

It appears that Met-Ed purge dose rates are less than 10% of part 100 guidelines.

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1486 149