



Docket Nos. 50-500
50-501

Serial No. 2-140

February 22, 1979

LOWELL E. ROE
Vice President
Facilities Development
(419) 259-5242

Director of Nuclear Reactor Regulation
Attn: Mr. Robert L. Baer, Chief
Light Water Reactors Branch No. 2
Division of Project Management
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Baer:

At the 220th ACRS meeting on August 3, 1978, during discussion on the application for construction permits for Davis-Besse Nuclear Power Station Units No. 2 and 3, a question was asked Toledo Edison Company on the effect of recycling of liquids on in-plant exposures due to the build up of tritium. See Page 96 of the transcript where Dr. Lawrowski requests that we supply information to the Staff. The attachment shows the results of our study on this subject.

Yours very truly,

A handwritten signature in cursive script, appearing to read 'Lowell E. Roe'.

LER:RES

Attachment

dh d/l

cc: Chairman, Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

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ATTACHMENT TO TOLEDO EDISON COMPANY LETTER
DATED FEBRUARY 22, 1979, SERIAL NO. 2-140

TRITIUM EXPOSURE ANALYSIS

In response to a question asked at the 220th ACRS meeting of August 3, 1978, the effect of recycling of liquid radioactive waste on in-plant occupational exposures due to the resultant build up of tritium has been examined, and a brief analysis has been performed for zero and one hundred percent recycle cases.

Since tritium is a weak beta emitter, tritium concentrations in piping and equipment throughout the plant have a relatively insignificant effect on exposures due to direct radiation. The predominant source of tritium exposure is expected to be in areas where there is significant evaporation of tritiated water such as the spent fuel pool area and the containment (during refueling operations.) It should be noted that even in these areas, the major contribution to the tritium dose is inhalation rather than direct radiation. Equilibrium tritium concentrations are, to some extent, self-limiting since even for a maximum case of one hundred percent recycle the plant would still lose tritium due to evaporation.

In the past four years, two studies were performed by our architect/engineer, for other PWRs, to determine in-plant tritium concentrations and tritium exposures resulting from recycling of liquid radioactive waste. These studies indicated an equilibrium tritium concentration in the spent fuel pool and refueling pool of approximately 2.0 $\mu\text{Ci/cc}$ (based on a tritium production rate of 1470 Ci/yr for one unit) for the one hundred percent recycle case. For the zero percent recycle case, in which all liquid radioactive waste (including shim bleed) is discharged after processing, it is conservatively estimated (based on the same tritium production rate) that the equilibrium tritium concentration in these pools would be less than 0.2 $\mu\text{Ci/cc}$.

Applying these concentrations to the Davis-Besse plant, and using conservative assumptions, analysis shows that for the range of zero to one hundred percent recycle, tritium doses in the spent fuel pool area would vary between 0.68 and 6.8 Man-rem per year for each unit, and in the containment this variance would be between 1.66 and 16.6 Man-rem per year for each unit. Summing these contributions results in an in-plant occupational tritium exposure range of 2.34 to 23.4 Man-rem per year for each unit corresponding to zero to one hundred percent recycle. This is relatively small when compared to the 200-400 Man-rem per year exposure typical for operating plants.

jh d/9