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DATE December 1, 1943

TO M. D. Whitaker DEPARTMENT
FROM W. R. Kanne DEPARTMENT

This document has been approved for release to the public by:

IN RE: Stack Gas Activity

Dwight Hamlin 12/1/45
Technical Information Officer Date
ORNL Site

There has been considerable interest in the significance of the stack gas activity from the pile, and I should like to make the information pertaining to it available to you. The chambers used in the 115 annex were calibrated at Chicago by irradiating a sample of pure argon with cyclotron slow neutrons. This gas was admitted to the chamber and its decay was followed with a calibrated Beckman microammeter. The direct result of this calibration is that the nvt to which normal air is subjected is 1.3×10^{20} times the ionization current in amperes collected by the chamber. This result does not involve the use of a cross section, but it assumes that argon is the only substance activated. If the argon cross section is assumed to be 1×10^{-24} cm² one can arrive at the result that 10-12 curies of activated argon per cc give 1.28×10^{-11} ampere.

A number of decay curves have been run on pile air samples and half lives of 110 to 115 minutes have been obtained, without any indication of appreciable short or long lived activity. The half life obtained indicates argon 41.

There is, however, a discrepancy between the activity indicated by the ion chamber with pile air flowing through it and that to be expected on the basis of the above calibration and power calibration of the pile. When operating at 500 kw with an air flow of about 50,000 cfm 7 x 10⁻¹⁰ amp is observed while reasonable assumptions about the nvt would indicate that about 2 x 10⁻¹⁰ amp should be observed.

The calibration indicates that under the above operating conditions there are 5.5×10^{-11} curies per cc in the gas. Parker has given 4×10^{-12} curies per cc as the 8 hour tolerance concentration for an infinite hemisphere of this gas. The gas is then considerably above this tolerance. However, the conditions implied in this tolerance are fortunately not ordinarily satisfied. If these calibrations are correct it would nevertheless be possible to approach radiation tolerances. An amount of gas to give an effectively infinite hemisphere is discharged from the stack in one to two half lives of the argon. If an unusually long "perfect" inversion should occur, it is conceivable that radiation tolerances might be approached. The temperature of the gas discharged from the stack is above that of the outside air, at worst mixing is still considerable, and inversions are apparently usually of short duration in comparison to the time required to discharge a volume of gas equivalent to an effectively infinite hemisphere. The stack gas should not be considered a hazard at the present time. It may be of interest that Parker has observed "detectable" quantities of radiation due to the stack gas.

CLASSIFICATION CANCELLED

DATE SEP 19 1963 *C*

For The Atomic Energy Commission

W. R. Kanne

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