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DOSE CONSEQUENCES FROM EXPLOSIONS IN BWR OFF-GAS SYSTEMS (TAR-542)

This memorandum is in response to your request for calculations to estimate the dose consequences at the fence boundary for explosions occurring in BWR off-gas systems (TAR-542).

Attached are copies of three memos which are the result of work similar to that requested in the TAR. Table A.1 (enclosed) is an extension of the Limerick doses (Table I, Attachment 1) to correspond to a release from the steam jet air ejector for one hour.

Several conclusions can be reached based on this work. The most significant contributor to a site boundary dose is the immersion dose due to the noble gas releases when the noble gas release rate is high. The average inventory in a 30 minute delay line would not be particularly significant, but for longer delay lines on older plants (the delay for lines discussed in Attachment 2 is four hours) this contribution may very well be significant. For augmented charcoal systems the dose from the charcoal beds may be as much as that from the air ejector plus the delay line.

Because the continuous release from the steam jet air ejector is a significant contributor to the dose for most plants, it is desirable to require expeditious shutdown of the plant when there are indications of failure of the off-gas system. We recommend the Technical Specifications for operating BWR's be modified to reflect this requirement and to provide unambiguous guidance to plant operators based on radiation levels and process parameters.

The calculations performed in Attachment 3 indicate that the dose contribution from the particulates could be comparable to the noble gas dose. The particulate dose could also be limited by an immediate plant shutdown.

In summary, offsite doses on the order of a few rem could occur under poor meteorological conditions as a result of off-gas system failure assuming previous operation of the plant at high off-gas rates. The principal contributors to the dose would be the immersion dose from noble gases and particulates.

ENCLOSURE 2

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R. Zavadoski has also reviewed the draft "Special Study of Explosions in BWR Off-Gas Systems" prepared by R. McDermott and returned it to him with informal comments.

This work and that in the attachment was performed by R. Zavadoski, J. Kohler, and E. Adensam of the Accident Analysis Branch.

Harold R. Denton

Harold R. Denton, Assistant Director
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Enclosure:
As stated

cc: w/encl.
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Table A.1

Estimated Dose Consequences

For a One Hour Release of Off-Gas

From a Failed Rupture Diaphragm*

Distance from Source, ft.	Wind Speed, m/sec	X/Q, sec/m^3	Dose, rem Immersion	Shine
2500	1.0	5.95×10^{-4}	1.2	0.004
2500	4.0	5.95×10^{-5}	0.31	0.014
2500	10.0	1.9×10^{-5}	0.16	0.036
1000	1.0	1.6×10^{-3}	6.1	0.007
1000	4.0	1.6×10^{-4}	1.4	0.029
1000	10.0	6.4×10^{-5}	1.0	0.072

*Based on 100,000 μc/sec at 30 minutes. The one m/sec case corresponds to Safety Guide meteorology, ground release; the shine dose is computed as a line source at 100 feet above ground.