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A Regulatory Analysis on Emergency Preparedness for Fuel Cycle and Other Radioactive Material Licensees

Final Report

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For application to fuel cycle and byproduct material licensees, the lower end of the range (1 rem) of the EPA's protective action guides is used in conjunction with calculations of releases and offsite radiation doses due to severe accidents, such as a major facility fire, to establish the need for a plan. Thus the lower range of the protective action guides is used to determine the need for offsite emergency preparedness.

The actual assumptions that were used for each facility type are discussed in separate sections in the remainder of this report. The reasons for selecting the assumptions are also discussed.

2.1.5 A Discussion of the Conservatism in the Calculations

The Commission's policy is that, "Emergency planning should be based on realistic assumptions regarding severe accidents."*

The doses calculated in this Regulatory Analysis have been conservatively calculated. Doses to people near a plant experiencing a severe accident are likely to be far below the doses in this analysis, probably by an order of magnitude or more, except in very unusual circumstances. The accident history of such facilities in the U.S. is that there is no known case of a member of the public receiving even as much as 1% of the doses calculated in this analysis as the result of an accidental airborne release from any nonreactor facility.** A number of factors which cause this analysis to be conservative are discussed below.

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*"U.S. Nuclear Regulatory Commission Policy and Planning Guidance - 1985," U.S. Nuclear Regulatory Commission, NUREG-0885, Issue 4, 1985, page 6.

**For a 1962 release of high-enriched UF_6 from the NFS plant, Erwin, Tennessee, a plume centerline dose equal to 4% of the 1-rem effective dose equivalent guide was calculated using conservative assumptions (no deposition, open field diffusion parameters, no wind direction shift, etc.) However, the report stated, "No specific information regarding the presence of individuals during the releases was available." Because no one is known to have stood on or near the plume centerline, we can say there are no known exposures exceeding 1% of 1-rem. The dose calculations are contained in an unpublished report, "Dose Assessment of Airborne Releases from NFS-Erwin Fuel Facility - 1972-1981," U.S. Nuclear Regulatory Commission, Region II, Atlanta, Georgia, May, 1983.

2.1.5.1 Conservative Factors

1. Entire possession limit assumed to be involved. In calculating the quantities of radioactive material for which an emergency plan would be needed, this analysis generally assumed that the licensee's entire or nearly entire possession limit would be involved. In actuality, most licensees at any particular time possess much less material than they are legally authorized to possess. In many cases the possessed material will be located at different locations and will not all be subject to release during a particular accident. For example, the National Institutes of Health is authorized to use and store licensed material in more than 1,000 different laboratories.

2. Worst-case release fractions. The release fractions due to fires (the accidents with highest potential release) were determined from experiments designed to maximize releases. In such experiments a finely powdered material is typically placed on top of a large amount of combustible material. Having the entire licensed inventory unenclosed on top of a large quantity of combustible material would be most unusual. Radioactive materials are usually within shielded "pigs" and kept in metal safes or well shielded hot cells or glove boxes. Amounts of combustible materials present are generally kept low.

3. No credit for engineered safeguards or response efforts. No credit is generally given for design or operating features that could reduce releases. No credit is given for sprinkler systems designed to stop fires. Generally, no credit is given for filter systems during a fire. No credit is given for fire fighting efforts to stop the fire before it reaches radioactive materials. Little or no credit is given for holding up the release of the material by means of deposition or plateout. For UF_6 releases outdoors, no credit is given for knocking the uranium out of the air using fire hoses.

4. The exposed individual makes no response. In the case of fires and UF_6 releases, the dose is calculated for a person who stands directly on the plume centerline for 30 minutes. Such a person would be standing in dense smoke or irritating acid fumes. Realistically, people can be expected to move from such positions to avoid smoke inhalation. People close in would only have to move about 20 meters to get completely out of the plume.

5. No plume-rise for smoke. Even where the assumed accident is a large fire no credit is given for plume rise due to buoyancy in calculating the quantities of radioactive material for which an emergency plan would be needed. The smoke is assumed to be released at and remain at ground level.