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 Office of Waste Operations  
 Office of Environmental Restoration  
 and Waste Management  
 U.S. Department of Energy  
 Trevion II, Mail Stop EM-35  
 Washington, DC 20585-0002

MAR 29 1994

Dear Mr. Coleman:

Per the verbal request of the National Low-Level Waste Management Program (NLLWMP) staff, the Nuclear Regulatory Commission staff has reviewed the report entitled "Analysis of the Legal, Regulatory and Technical Issues Associated with DOE Accepting Commercial Mixed Waste." As stated in the introduction, this report was developed by the NLLWMP for the Department of Energy (DOE) and will be used to determine if it is feasible, from a legal and regulatory perspective, for DOE to accept commercially generated radioactive mixed waste for disposal.

In general, staff agrees with the conclusions reached in the report, i.e., that from a legal, regulatory or technical perspective DOE can assume a role in helping manage some aspect of commercial mixed waste. However, staff questioned the methods used in the NLLWMP report to determine the unit cost of disposing of mixed waste and to estimate the volume of commercially generated mixed waste. The enclosed summarizes these and other comments raised during staff's review of the NLLWMP report.

Based on the results of the National Profile on Commercially Generated Low-Level Radioactive Mixed Waste and the NLLWMP report, it appears that a DOE role in the management of commercially generated mixed waste may be feasible and provide one potential solution to the mixed waste disposal issue. This report is an important step toward reaching that solution. If you have any questions or wish to discuss the enclosed comments, please contact me at (301) 504-2560.

Sincerely,

John H. Austin, Chief  
 Decommissioning and Regulatory  
 Issues Branch  
 Division of Low-Level Waste Management  
 and Decommissioning  
 Office of Nuclear Material Safety  
 and Safeguards

Enclosure: As stated

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U.S. NUCLEAR REGULATORY COMMISSION  
STAFF COMMENTS ON  
"ANALYSIS OF THE LEGAL, REGULATORY, AND TECHNICAL ISSUES  
ASSOCIATED WITH DOE ACCEPTING COMMERCIAL MIXED WASTE"

1. The two primary arguments in favor of the Department of Energy (DOE) accepting commercial mixed waste for disposal are the estimated low volume of commercial mixed waste and the relatively high unit cost for commercial mixed waste disposal (see Executive Summary, page iii). Although the Nuclear Regulatory Commission staff agrees that cost estimates for a commercial mixed waste disposal facility are highly speculative at this time, staff believes that the unit disposal cost reported in Section 4 may be overestimated by an order of magnitude. Consequently, the basis for concluding that the cost of mixed waste disposal capacity development is prohibitively high may need to be re-examined. Staff is also concerned that the type of technology chosen, the economic model used, and the annual volume of mixed waste requiring disposal reported in the National Low-Level Waste Management Program (NLLWMP) report may have distorted the cost estimates.

The report states that about 10,000 ft<sup>3</sup>/yr of commercially generated mixed waste will require disposal at a cost of about \$7,000/ft<sup>3</sup> in a disposal facility developed solely for the disposal of mixed waste. In developing the unit cost estimate for mixed waste disposal, the report bases its estimate on earth mounded concrete bunker technology using an oversimplified economic model. It is not readily apparent in the report why this technology or economic model was selected. An earth-covered above grade concrete vault design has been identified by both the NRC and Environmental Protection Agency (EPA) (Joint NRC-EPA Guidance on a Conceptual Design Approach for Commercial Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities, August 3, 1987) as being able to meet both agencies' requirements. NRC staff believes the design described in the joint guidance better reflects the design that would be used for commercial mixed waste disposal. NRC staff would have preferred the use of the conceptual design presented in the joint guidance as the basis for the cost estimate, especially because the facility is intended to represent a disposal facility for commercial mixed waste.

A life-cycle present value analysis for this technology was developed by the NLLWMP in a report entitled "Economics of a Small-Volume Low-Level Radioactive Waste Disposal Facility," (DOE/LLW-170, April 1993). Based on this report, an annual disposal rate of 10,000 ft<sup>3</sup>/yr results in a unit disposal charge of \$643/ft<sup>3</sup>. The cost of hazardous waste permitting would likely increase that unit disposal charge to approximately \$700/ft<sup>3</sup>, which is an order of magnitude smaller than the report.

Enclosure

The report states that a new "standard" low-level waste (LLW) disposal facility could cost on the average of \$110 million whereas the \$7,000/ft<sup>3</sup> was based on developmental costs of \$46 million. In taking the average, the report used the facility developmental costs of the Illinois and North Carolina low-level radioactive waste disposal facilities. Both of these facilities are expected to dispose of over 100,000 ft<sup>3</sup>/yr of radioactive waste. The developmental cost for these facilities would be expected to be very large compared to the 10,000 ft<sup>3</sup>/year facility described in the NLLWMP report because of the larger land area required for these facilities, as well as the increase in costs associated with licensing and constructing a larger facility. Consequently, using this as the basis for estimating average developmental costs for the mixed waste disposal facility would tend to overestimate the costs.

In the case where a new mixed waste disposal facility is added to an existing or new low-level radioactive waste disposal facility, the report estimates that mixed waste disposal costs would be on the order of \$740/ft<sup>3</sup> for all the mixed waste generated in the U.S. However, the methodology used to develop this estimate incorporated the same assumptions that were used to develop the estimate in the case discussed above. As such, both cases may warrant re-examination.

Staff also questions the use of direct proportionality based on waste volume (a linear model) in estimating unit cost for the development of a disposal facility. For example, in the first case discussed above, the NLLWMP indicates the cost for a single compact to develop a mixed waste disposal facility would be \$106,000/ft<sup>3</sup>, which illustrates that unit costs are very sensitive to waste volume. Other studies, such as DOE/LLW-170 cited above and a study by Rogers and Associates Engineering Corporation entitled "Conceptual Design Report, Alternative Concepts for Low-Level Radioactive Waste Disposal" (DOE/LLW-60T, June 1987) have shown that the relationship between unit cost and waste volume typically is non-linear. Because of the sensitivity of the cost/waste volume relationship, staff believes that the report should discuss the rationale for using direct proportionality to develop unit cost estimates for waste disposal.

In addition, the report's economic model sums the developmental, closure, surveillance and institutional costs, with one year's operating costs and divides this figure by the volume of waste that will be disposed of in one year. A more realistic and conventional approach would be to amortize the developmental, closure, surveillance and institutional costs over the life of the facility, instead of requiring recovery of these costs in one year of operation.

Further, the report does not compare either the total or unit costs for disposing of commercially generated mixed waste to the cost for disposal of commercial low-level radioactive waste. Such a comparison would have been useful as a benchmark for the mixed waste disposal costs. The report also does not compare the cost of disposing of commercial mixed waste in a DOE facility to disposal of the waste in a commercial mixed

waste disposal facility. NRC staff expects that these comparisons would help demonstrate a significant economic advantage to licensed generators if DOE accepted commercial mixed waste for disposal.

2. In Part 1, the report focuses on the legal and technical issues associated with DOE accepting mixed waste from States belonging to regional waste disposal Compacts. The report appears to exclude from consideration waste generators in States that do not belong to a low-level radioactive waste disposal Compact. If facilities in unaffiliated States were not included in the analysis, the feasibility of DOE's acceptance of commercial mixed waste from these generators is not clear. The report should include unaffiliated States, or indicate that generators in these States were not included in the report and provide a rationale for their exclusion.
3. Pages 1 and 2 list the assumptions used in developing the report's conclusions. One assumption is that commercial mixed waste disposal facilities will not be available. This neglects to consider the Envirocare facility in Clive, Utah. While this facility's waste acceptance criteria preclude accepting all mixed waste, some mixed waste can be disposed of at the facility (Envirocare is listed as a disposal facility in Section 3 of the report). The rationale for excluding this facility and the potential implications of its exclusion should be discussed in the report.
4. Section 2.1.1.2 of the report outlines the types of NRC licensees that may enter into agreements with DOE under the Atomic Energy Act of 1954. However, the types of licensees outlined in the report does not appear to include byproduct material licensees. Currently a significant portion of NRC licensees hold byproduct material licenses. If the report did not consider facilities that hold byproduct material licenses, the conclusion that most NRC licensees could enter into agreements with DOE to accept mixed waste could be in error. If byproduct material licensees were included in the development of the report, it should be revised to reflect their inclusion. However, if byproduct material licensees were not included in the report, the report should clarify this and discuss the rationale for their exclusion.
5. NRC and EPA developed the National Profile on Commercially Generated Low-Level Radioactive Mixed Waste (NUREG\CR-5938) which estimated the volume of mixed waste generated and in storage in 1990. NUREG\CR-5938 reported that approximately 140,000 ft<sup>3</sup> of mixed waste were generated in 1990, and approximately 75,000 ft<sup>3</sup> were in storage as of the end of 1990. The NLLWMP report indicates that approximately 136,000 ft<sup>3</sup> of commercial mixed waste were generated in 1990 and approximately 47,000 ft<sup>3</sup> of mixed waste were in storage, even though the two reports used the same database to develop estimates of mixed waste volumes. Based on staff's discussions with DOE and NRC contractors that developed the two reports, it appears that the NLLWMP developed commercial mixed waste volumes using only the waste volumes that were reported as discrete numbers in the National Profile database, while NRC's contractor included the maximum volume when mixed waste was reported as



a range of volumes. For example, if a facility reported 5 ft<sup>3</sup> of mixed waste generated in 1990 both reports would report this as 5 ft<sup>3</sup>. However, if a facility reported 5-10 ft<sup>3</sup> of mixed waste the NLLWMP report would have reported no mixed waste generation by this facility, while the National Profile would have reported 10 ft<sup>3</sup> for the facility. Weighting factors were then applied to the "as reported" waste volumes to estimate the total national mixed waste generation rate (weighting factors ranged from 1.02 for nuclear utilities to 31 for some medical licensees).

The difference in data recording, coupled with the impact of the application of weighting factors to the reported waste volumes, appear to account for the differences in the estimated volume of mixed waste in the two reports.

Staff is concerned that inconsistencies in the reported volumes of commercial mixed waste summarized in the two reports could lead readers to question the validity of either, or both, reports. In addition, attempts to reconcile these inconsistencies, or questions on the validity of either report stemming from the inconsistencies, could delay DOE's decision on whether to accept commercial mixed waste for treatment or disposal. Although the reported volumes of commercial mixed waste cited in the two reports is not significantly different, NRC staff would have preferred that the NLLWMP report would have used the volumes reported in NUREG\CR-5938.

Finally, the report cites the volume of commercial mixed waste developed using the National Profile database as the annual commercial mixed waste generation rate. NRC and EPA have cautioned that the volume of mixed waste reported in the National Profile represents the volume of mixed waste generated in 1990 and that the data, as an indicator of future mixed waste generation, should be used with caution. As such, the report may not adequately forecast the volume of commercial mixed waste generation for the future. Such a forecast is important in view of the higher disposal cost predicted and problems with availability. Rising costs, leading to the use of volume reduction technologies by waste generators, have resulted in a decline in the volume of low-level radioactive waste disposed. Such a phenomenon suggests that a similar pattern may follow for mixed waste and should be taken into account in estimating the cost of disposal.