NEW INCENTIVES FOR WASTE PROCESSING BASED ON 10 CFR PART 61

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INTRODUCTION

This paper discusses some of the new incentives for low-level radioactive waste (LLW) processing based on the proposed 10 CFR Part 61. The underlying rationale for these incentives were developed with specific attention on experience gained from past disposal practices and the systems approach adopted in the proposed rule for future disposal of radioactive waste.

The proposed rule, 10 CFR Part 61, Licensing Requirements for Land Disposal of Radioactive Waste, was published about 8 months ago and an Environmental Impact Statement (EIS) in support of the regulation was published in September 1981. The comment period on the rule and the EIS ended in January and the rule is expected to be finalized this summer. From the comments received on the EIS and the rule, there appears to be a consensus on the timeliness and the need for this rule. As always, a few comments described the rule as too conservative and a few others as not conservative enough.

The Dames & Moore team, prime contractor to the NRC in this effort, was supervised by O.I. Oztunali and is under contract to contribute to the finalization of the rule.

BACKGROUND

From a historical perspective, shallow land burial has been the predominant method of LLW dispoal since the beginning of the Federal Atomic Energy Programs in the 40's. Although some limited controls have been applied to waste form, packaging, and disposal facilities, the natural characteristics of the disposal environment were principally relied upon to provide confinement of the waste over the long term.

In retrospect, it is apparent that the characterization of the sites and related assessments of a site's ability to confine the waste were not fully considered in the past. Moreover, the broad range of types of LLW with diverse and types of LLW with diverse and ill-defined chemical, physical, and radiological characteristics, the past practice of burying diverse waste types in a single trench, and the minimal consideration given to waste form and packaging were major contributing factors to the difficulties experienced at some of the existing disposal sites. Furthermore, the lack of consistent siting practices guided by the application of viable environmental principles and the lack of a workable delineation of institutional issues such as financial responsibility have also contributed to these difficulties.

This all implies that the lack of regulatory standards, guidance, and requirements against which the performance of current and future land disposal sites and current and future waste forms could be uniformly evaluated was an important contributing factor to the existing crisis atmosphere in waste management.

PERFORMANCE OBJECTIVES

One of the most important guiding principles of the proposed regulation is "we must learn from past experiences." There have been several negative experiences associated mainly with the management of the waste form and the disposal environment associated with land disposal of radioactive waste. All these experiences have been incorporated into the systems approach adopted to define the requirements of land disposal of radioactive waste.

This systems approach is formulated in the proposed regulation through the implementation of four performance objectives (PO).

1. Protection of population from potential releases of radiation (migration PO).

2. Protection of individuals from inadvertent intrusion (intruder PO).

3. Protection of individuals during operations (operational PO).

4. Stability of the disposal system after site closure (long-term PO).

This fourth performance objective addressing the stability of the disposal system is probably the most significant aspect of the proposed regulations and was not fully considered in the past. The term stability implies both the physical and institutional stability and encompasses the waste form stability, long-term stability of the disposed waste mass, and ability to maintain passive long-term care. A very significant corollary to these performance objectives is that the performance of the disposal system be predictable into the future with a high degree of confidence.

Satisfying these performance objectives with the required degree of confidence necessitates the control and optimization of all the components of the low-level waste management and disposal. These components are:

1. Waste form, contents, and packaging

2. Site selection, design, operations, and closure, and

3. Post-closure and institutional requirements.

There are several barriers available in these components. Barriers are properties of the system which can be controlled and/or altered with the existing technology and which prevent release of and/or contact with the waste. Waste form, contents, and packaging are extremely important components in the systems approach since they are commonly perceived to contain "barriers" that are controllable with a much greater degree of confidence than the barriers in other components.

WASTE PROCESSING INCENTIVES

Waste processing denotes application of techniques such as volume reduction, process control of the source, solidification, and improved packaging in order to modify waste properties to be more predictable over the long-term. For example, process control programs can achieve reduction in the overall volume of waste generated, reduction of radionuclide concentrations, result in better waste forms, provide control of free-standing liquids and quality, and reduce the amount of chelating chemicals in the waste. Similarly, solidification can achieve stability, physical forms which are easier to handle, and better chemical forms. With the availability of high integrity containers, improved packaging can substitute for some of the other types of waste processing. All of this contributes significantly to the attainment of the performance objectives and the predictability of the system.

Waste processing results in higher impacts at the waste generator both in the form of costs and possibly occupational exposures. To balance these impacts, however, there are several positive aspects (incentives) that must be considered. Two of the more obvious incentives, reduced transportation and disposal costs, are attributable to waste processing which results in a volume reduction. However, based on the estimates given in the EIS on 10 CFR Part 61, these two savings do not provide sufficient financial incentive for volume reduction, so that waste form improvements must also be considered. The benefits of improved waste form, content, and packaging are eloquently and somewhat exhaustively discussed in the EIS on 10 CFR Part 61, and the draft Branch Technical Position on Waste Form. Some of these incentives are as follows:

1. Easier compliance with DOT regulations.

2. Minimization of free liquids and control of their characteristics precluding difficulties during transportation, disposal, and after disposal.

3. Elimination of chelating chemicals from the waste thereby resulting in acceptance and/or lower disposal costs.

4. Easier handling and documentation at the waste generator and at the disposal site, i.e., manifesting, certifying, and handling.

5. Improved waste properties regarding its interaction with transfer agents such as wind and water, i.e., less dispersible waste form and lower leaching potential before and after disposal.

6. Alleviation of some of the negative aspects of limited available disposal capacity.

7. Possibly lower disposal costs for improved waste forms.

8. Increased stability of the waste form.

Stability of the waste form is one of the cornerstones of the proposed rule and the regulators are well aware that the public has been given sufficient cause to regard stability as a viable means to assure that the negative experience at Maxey Flats, Sheffield, etc. will not be repeated.

Waste form instability is one of the better documented "inadequacies" of past practices. For example, trench subsidence investigations have indicated that a significant amount of subsidence occurs 0-3 years after disposal and that increased incidences of subsidence may occur 10-14 years after waste disposal. This unpredictable behavior with the ensuing long-term societal committment of resources appears to be one of the major roadblocks to wide acceptance of near surface disposal as a viable disposal method despite the lack of such problems at Barnwell and other places.

Furthermore, in all probability, the benefits to be gained from improved waste form will eventually be reflected in the disposal costs of the waste. The NRC states that, since the stability requirement for low activity wastes (Class A) would probably require expensive processing, segregation appears to have a cost/benefit advantage in spite of possible increased costs of disposal site stabilization. In addition, long-term care costs should be considered. For example, it is highly likely that stable Class A wastes will cost less to dispose than unstable Class A wastes since they would provide an excellent shielding layer on top of the Class B wastes. It may even be possible that, considering all factors, Class B wastes will cost less to dispose than Class A wastes.

CONCLUSION

Existing waste management practices are in a marked state of change due to state initiatives, a lack of disposal capacity, and economic considerations. As a result of new incentives provided by the proposed rule this state of change is likely to continue for some time and to be paralleled by overall improvements in the performance of shallow land disposal sites.