NCRP Report 152 Performance Assessment of Near-surface Facilities for Disposal of Low-level Radioactive Waste
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This NCRP report is not strongly oriented to the regulatory regime that applies in the United States, though this topic is adequately covered and appropriately related to ICRP and IAEA recommendations. Rather, it is a comprehensive and well-informed discussion of the technical issues that arise in undertaking performance assessments of near-surface disposal systems. However, it also emphasises that performance assessment is not an end in itself, but rather a procedure intended to inform judgements on whether compliance with regulatory performance objectives can be demonstrated.

The heart of the report is the discussion of performance assessment models in section 5. Following a discussion of the overall types of system to be modelled, the concept of a module-based assessment model is introduced. The discussion that follows is organised on a modular basis. Appropriate cautions are presented in the various sections. Thus, for example, it is tempting to assume that infiltration through cover materials is limited to being no greater than the hydrologically effective rainfall at a site. However, as the authors point out, subsidence of the cover materials following vault degradation can lead to localised higher infiltration rates.

The authors take an appropriate approach to the use of mathematical formalism. Rather than presenting comprehensive derivations and general mathematical formalisms, the authors provide text descriptions of processes, illustrative equations that clearly display the principles involved, and useful empirical relationships. A particularly useful section relates to models for the degradation of concrete, which compiles information on a wide range of processes and relationships that I have not seen gathered together elsewhere. Similarly, readers will find it useful to have information on various source-term models gathered together in a single report.

The authors are also careful to emphasise that it is often best to avoid complex modelling approaches when developing a robust safety case. For example, although they present a discussion of complex methods for modelling unsaturated flow, they caution that, at the present time, models of unsaturated flow through fractured or highly structured media are not considered practical for use in performance assessments of low-level waste disposal facilities.

Perhaps the most innovative section of the report relates to the conduct of uncertainty, sensitivity and importance analyses. The authors emphasise that the literature and experience developed in this area should be used with caution, as special issues arise in the context of post-closure radiological performance assessment. In particular, they propose that uncertainty and sensitivity analyses should be directed to informing an overall importance analysis, defined as an integration and interpretation of results obtained from the performance assessment process for the purpose of identifying assumptions and parameter values which, when changed within credible bounds, can affect a decision about regulatory compliance. My only concern with this section is that it sometimes assumes more knowledge of the reader than other sections. For example, topics such as fuzzy set theory and possibility theory are mentioned, but not explained. However, the references cited provide appropriate pointers to the underlying literature.

Finally, the report is completed by a useful glossary, with extended definitions, a very comprehensive reference list and a helpful index.

NCRP Report 152 is not light reading and I would not recommend it to radiation professionals who wish to obtain an overview of approaches to post-closure performance assessments of near-surface radioactive waste disposal facilities. However, for practitioners in this area, it is an extremely valuable resource that will be much consulted and cited throughout the world. My copy is dog-eared already.

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