Nov. 13, 2007
NRC Staff Review
of
Nuclear Energy Institute
Generic FSAR Template Guidance for Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors, NEI 07-11, Rev. 0

I. Background

NEI has developed a guidance document presenting a generic method in conducting cost-benefit (C-B) analyses for inclusion in the submission of design certifications and combined license applications. The purpose of the guidance (NEI 07-11 template) is to standardize the conduct of such analyses and facilitate their preparations for the applicant, and expedite the staff's review and evaluation process.

II. Staff Preliminary Comments

The staff has conducted a preliminary review of NEI 07-11 and notes the following observations:

1. The template does not present an update of the methodology described in RG 1.110, draft, March 1976. In the public meeting of Oct. 18, 2007, NEI explained that it would take a significant level of effort to revise the methodology of App. A and update the parameters and their bases presented in App. B. As result, the NEI template applies the method and parametric values of the current version of RG 1.110.

2. The C-B analysis applies a value of $1000 per person-rem, as stated in Part 50 App. I, Section II.D - see page 5 of template. The C-B analysis did not consider the updated value of $2000 per person-rem discounted, as presented in NUREG-1530 (1995) and NUREG/BR-0058, Rev. 4 (2004).

3. The C-B analysis did not make any adjustments for inflation (from 1975 to 2007) and the cited costs are based on non-inflated 1975-dollars - see page 5 of template. Similarly, the C-B analysis did not address changes in radwaste processing technology since RG 1.110 was issued. Finally, costs should be discounted as well for consistency with the approach of NUREG-1530.

4. In its approach, the C-B analysis states that collective population doses around currently operating reactors range from about 0.0015 to 16 person-rem total dose due to both liquid and gaseous effluents - see page 5 of template. The presentation of population doses does not make any distinction in differentiating doses from sites with single or multiple units. Given that new ESP, DCD, and COL applications express radiological impacts on per unit basis, the use and relevance of collective doses from currently operating units should be qualified between sites that have single and multiple units.

5. In its approach, the C-B analysis applies a conservative approach by assuming that each system reduces doses by 100%, while stating that there are no radwaste equipment that are effective in totally eliminating releases and population doses - see page 6 of template. This part of the analysis should

reconsider this assumption and note that with tritium present in liquid and gaseous effluents, there is no reasonably effective technology that will remove tritium from either effluent stream. For radioiodines, the analysis should qualify that the use of charcoal delay beds in OGS offer nearly 100% removal of radioiodines for that effluent stream alone, given the large amounts of charcoal typically used in such systems (e.g., see ESBWR DCD).

6. Regarding the technologies being used to treat various effluent streams, the template should acknowledge and present a discussion on the use of process technologies that were not available or have evolved since the issuance of RG 1.110. For example, some applicants will be including evaporators and centrifuges in treating liquid wastes (e.g., see Areva DCD) and existing plants are using ultra-filtration in removing specific radionuclides (e.g., see STP units 1&3). Accordingly, the template should discuss current and emerging technologies not considered in RG 1.110 and address the ramifications of their use, comparative costs if purchased currently, and magnitude and direction of the impact on the dose threshold derived in the template for liquid effluents. A similar evaluation should be considered for systems used to treat gaseous effluents.

7. The template should include a subsection presenting a series of sensitivity analyses for a few key parameters. Such analyses should consider ramifications associated with:

   a. current labor rates against that given in RG 1.110.
   b. current operating costs against that given in RG 1.110.
   c. current direct, indirect, and maintenance costs against that of RG 1.110.
   d. capital recovery factors for skid-mounted equipment with a service life of much less than 30 years than is assumed in RG 1.110, given that skid-mounted radwaste treatment systems are now replaced frequently.
   e. the use of larger holding tanks than is assumed in RG 1.110, given that DCD applications (e.g., AP1000 and ESBWR) are now incorporating tanks on the order of 30,000 gallons for liquid wastes.
   f. the use of larger amounts of charcoal media in OGS than is assumed in RG 1.110, given that DCD applications (e.g., ESBWR) are now commonly incorporating tanks to hold over 200 tons of charcoal media.

8. Suggested updates for the C-B analysis spreadsheet included as an attachment to the template. The suggested updates should include:

   a. changing the unitized input to “1” for multi-unit sites since ESP, DCD and COL applications present results on a unit basis in quantifying the amounts of radioactive materials contained in effluents and doses.
   b. adding a cell that converts total annual costs to equivalent person-rems for each listed technology augmentation.
   c. adding a global cell that would offer the means of evaluating a range of dollars per person-rem.
   d. analyses that apply the liquid and effluent treatment systems described in the DCDs of the ABWR, AP1000, and ESBWR designs as baseline comparisons which would be useful for COL applicants and staff review.
   e. a parallel spreadsheet for assessing costs per man-rem for the thyroid, given the requirement of Section II.D of Appendix I to Part 50.