UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 8, 1997

Dr. Paul W. Pomeroy, Chairman
Advisory Committee on Nuclear Waste
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Pomeroy:

I am responding to your letter of April 3, 1997, to the Chairman on Reference Biosphere and Critical Group issues at the proposed high-level waste (HLW) repository at Yucca Mountain (YM). In this letter, the Advisory Committee on Nuclear Waste (the Committee) provided definitions and assumptions that generally apply to the reference biosphere and critical group concept and offered suggestions regarding the application of these concepts in establishing defensible, performance-based regulations and standards for a potential YM site.

In your letter, you note that the Committee considers reference biosphere and critical group specification an important element in establishing a rational basis for determining exposure scenarios at this site. The staff agrees with the Committee on this issue because 1) the approach limits unbounded speculation of future events, 2) the National Academy of Sciences panel recommended this approach for YM, and 3) this approach has gained broad international acceptance. We also agree with the Committee that establishing a clear basis for the definition of the reference biosphere and critical group will be a key component in a dose- (or risk-) based HLW regulation and that the reference biosphere and critical group should be established on a site-specific basis. The staff considers the Committee's general definitions and assumptions to be a reasonable foundation for addressing the issues of reference biosphere and critical group.

We also agree with the Committee's recommendations for the development of the reference biosphere and critical group except for the fourth principle for defining the critical group. The staff believes that guiding principle four, which recommends calculating a dose (or risk) distribution to the population surrounding YM, in addition to calculating the dose (or risk) to the average member of the critical group, may be difficult to implement. As stated in the assumptions on page 3 of your letter, the future societal state around YM cannot be predicted with any confidence, over thousands of years. In conducting analyses of long-term performance, the goal is not to predict the future, but to evaluate a reasonable range of possible outcomes based on current knowledge. Both the reference biosphere and critical group are stylized approaches for calculating the potential impact of released material and are a constrained but well defined set of information and assumptions based on present knowledge of the system. Calculation of a comprehensive risk map for an assumed population surrounding YM could lead to unconstrained speculation about lifestyles and sizes of groups that will not receive the highest doses. Definition of the critical group will require an evaluation of the present-day habits, characteristics, and locations of populations in the vicinity of YM that are likely to receive the highest doses.

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As noted by the Committee, dose- (or risk-) based regulations that require calculation of doses (or risks) far in the future use the critical group approach as a surrogate for the most highly exposed members of the public. Although this is in contrast to the deterministic approach commonly used for operating facilities that uses the maximally exposed individual, a different regulatory approach is now considered appropriate for estimates of exposure far in the future. The critical group approach is already being proposed, in NRC regulation, when exposures far in the future need to be considered. For example, the draft final rulemaking for decommissioning of nuclear facilities uses a dose-based regulatory approach, with the dose limit being established for the average member of the critical group.

The staff appreciates the Committee's recommendations on the use and specification of the reference biosphere and critical group approaches and finds them supportive of our ongoing efforts. As we continue our work on these, in terms of total system performance and our participation in the International Atomic Energy Agency Program on Biosphere Modelling and Assessment, we will keep the Committee informed on the use of these approaches in the development and application of waste disposal regulations.

Sincerely,

L. Joseph Callan
Executive Director
for Operations

cc: Chairman Jackson
Commissioner Rogers
Commissioner Dicus
Commissioner Diaz
Commissioner McGaffigan
SECY