

RULEMAKING ISSUE NOTATION VOTE

November 16, 2001

SECY-01-0206

FOR: The Commissioners

FROM: William D. Travers
Executive Director for Operations

SUBJECT: PROPOSED RULE: 10 CFR PART 63: SPECIFICATION OF A
PROBABILITY FOR UNLIKELY FEATURES, EVENTS, AND
PROCESSES

PURPOSE:

To request Commission approval to publish a notice of proposed rulemaking that would amend 10 CFR Part 63.

BACKGROUND:

The radiation protection standards established by the U.S. Environmental Protection Agency (EPA) in 40 CFR Part 197 (66 FR 32074; June 13, 2001) include limits on what the U.S. Department of Energy (DOE) must consider in performance assessments. DOE's performance assessments shall not include consideration of "very unlikely" features, events or processes (FEPs), which EPA defines to be those FEPs that are estimated to have less than one chance in 10,000 of occurring within 10,000 years of disposal. In addition, EPA's standards direct the U.S. Nuclear Regulatory Commission (NRC) to set limits on DOE's consideration of "unlikely" FEPs, or sequences of events and processes, in the required assessments for demonstrating compliance with the human intrusion and ground-water protection standards. EPA did not define unlikely FEPs in its standards, but, rather, left the specific probability of the unlikely FEPs for NRC to define.

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In the Staff Requirements Memorandum (SRM) [Attachment 1] approving publication of final Part 63 - "Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada," dated September 7, 2001, the staff was directed to initiate an expedited rulemaking to establish the annual probability of occurrence that defines an unlikely FEP. Additionally, the staff was directed to consider whether a range of values, or a single specific value, should be used, as well as the appropriate numerical value(s). This paper transmits a proposed rule carrying out that direction.

DISCUSSION:

EPA's standards for disposal include an individual protection standard, a human intrusion standard, and ground-water protection standards. EPA's standards also prescribe that DOE should exclude "very unlikely" FEPs from the performance assessments used to determine compliance with the three postclosure standards (i.e., individual protection, human intrusion, and ground-water protection). The performance assessments used to determine compliance with the human intrusion standard and the ground-water protection standards evaluate the robustness of the repository system to the consequences of human intrusion and the degradation of the ground-water resource, respectively. Consistent with the specific purposes of these two standards, EPA prescribed specific conditions to be used in determining compliance with the human intrusion standard and the ground-water protection standards including the exclusion of not only "very unlikely" FEPs but also "unlikely" FEPs. Although EPA's final standards did not specify a numerical value to quantitatively define unlikely events, the preamble to the standards described that exclusion of unlikely (FEPs) is intended to focus these assessments on the expected or likely performance of the repository. For example, the preamble states: (1) "[t]he assessment of resource pollution potential is based upon the engineered design of the repository being sufficiently robust under expected conditions to prevent unacceptable degradation of the ground-water resource over time" (66 FR 32114; June 13, 2001); and (2) the term "undisturbed," which is used in connection with demonstrating compliance with the ground-water protection standards, means the "disposal system is not disturbed by human intrusion but that other processes or events that are likely to occur could disturb the system" (66 FR 32104; June 13, 2001).

Part 63 specifies that unlikely FEPs can be excluded from the performance assessments used to demonstrate compliance with the standards for human intrusion and ground-water protection. The Commission explained in its rulemaking establishing Part 63 that it "...considers a frequency for unlikely FEPs would fall somewhere between 10^{-8} to 10^{-4} per year..." but that it had decided not to provide a specific quantitative value for defining the term "unlikely" in final Part 63. Instead, the Commission stated that it "...plan[ned] to conduct an expedited rulemaking to quantitatively define the term 'unlikely.' Consideration will be given to whether a range of values or a single specific value should be used as well as the appropriate numerical value(s)" (66 FR 55734; November 2, 2001).

The staff has considered whether the probability for unlikely FEPs should be defined as a single value or a range of values. A single value would be used as a probability limit, such that each FEP with a probability less than the specified limit is considered unlikely. A probability range would be used to define the spread of probability (i.e., upper and lower values) that represents unlikely FEPs. Although both approaches specify an upper value for probability, a probability range provides a more complete description of the spread of probability that is identified with unlikely FEPs. The Commission is not aware of any disadvantages to using a range and

therefore is specifying a probability range because it provides a better characterization of the range of probabilities associated with FEPs than what would be provided by a single number.

Assigning specific numerical values to a qualitative term such as “unlikely” is complicated by the subjective nature of this term. As a first step, the staff found it useful to describe three broad categories to represent the entire probability range for what could occur at the Yucca Mountain repository site. These three categories are very unlikely, unlikely, and likely. Very unlikely FEPs have been described in the EPA standards as FEPs with such low probability of occurrence that they need not be considered in any performance assessments for Yucca Mountain. As mentioned previously, the EPA standards quantitatively define very unlikely FEPs as those FEPs with less than a 0.01 percent (i.e., one in 10,000) chance of occurring within the 10,000 year compliance period (i.e., annual probability of 10^{-8}). In a qualitative sense, likely FEPs are those FEPs that can be reasonably expected to occur during the 10,000 year compliance period. From a probabilistic perspective, any FEP with an annual probability of 10^{-4} or higher would have a high probability of occurring (i.e., approximately a 60 percent or higher chance of occurring within the 10,000 year compliance period)¹. However, likely FEPs should include not only FEPs very likely to occur, but also those that are reasonably likely to occur. Given uncertainties in estimating the occurrence of FEPs over a 10,000 year time period, the staff believes a prudent decision is to consider FEPs with 10 percent or greater chance of occurring within the 10,000 year compliance period as likely FEPs. Thus, unlikely FEPs are defined as those FEPs with less than a 10 percent chance, but greater than or equal to a 0.01 percent chance of occurring within the 10,000 year compliance period (i.e. annual probability greater than or equal to 10^{-8} and less than 10^{-5}). As a matter of reference, current understanding of FEPs relevant to Yucca Mountain indicates that this designation would allow exclusion of igneous activity as an unlikely FEP, whereas a wide range of seismic events, fault movement, and rock fall would have higher probabilities than the upper bound for unlikely FEPs and would be included in the performance assessments for human intrusion and ground-water protection.

In arriving at this decision, the staff considered the merits of using a lower value for the demarcation between likely and unlikely FEPs. For example, a 1 percent chance of occurring over the 10,000 year compliance period (i.e., annual probability of 10^{-6}) would also be considered unlikely. It is somewhat subjective whether a qualitative term such as “unlikely” should be quantitatively defined as less than a 1 or a 10 percent chance of occurring. Selection of an appropriate value needs to consider the context of the performance assessments (i.e., robustness of the repository system to the consequences of human intrusion and the degradation of the ground-water resource). As mentioned previously, the focus of the performance assessments for human intrusion and ground-water protection is to be on expected conditions. The staff considers that an FEP having a 1 percent chance of occurring is neither expected nor likely and, therefore, an inappropriate value for the lower bound for likely events. The staff believe a lower bound for likely FEPs of a 10 percent chance of occurring within the compliance period is consistent with the intended focus for these two standards. Although “unlikely” FEPs would not be considered in the performance assessments for human intrusion and ground-water protection, these FEPs are required to be considered in the performance assessment for the individual protection standard.

¹ Any FEP with an annual probability of 10^{-4} would be expected to occur once over a 10,000 year period. An expectation that an FEP would occur does not guarantee such an occurrence. Thus, the probability of an occurrence would necessarily be less than one. In fact, using the laws of probability, the probability of one or more such occurrences is 0.63.

The staff is aware that defining a general, qualitative term such as “unlikely” with specific numerical values could lend itself to inappropriate application of this quantitative definition in other NRC regulatory matters that use the term “unlikely.” To ensure the definition for the term “unlikely” FEPs is not inappropriately used elsewhere, the proposed rule explicitly states that the definition for the term “unlikely” is intended to apply specifically and exclusively to the proposed repository at Yucca Mountain and is not intended to suggest or imply precedent for NRC regulations, applicable to different NRC-licensed facilities or activities, that use the term “unlikely” in significantly different contexts (e.g., compliance periods of tens of years and higher dose limits).

STRATEGIC PLAN GOALS:

The proposed rule should make the licensing process for the proposed repository more effective and efficient by clarifying what assumptions DOE’s performance assessments must be based on. This should also reduce the burden on the license applicant by eliminating analyses of unlikely conditions that are unnecessary for purposes of standards that address only expected conditions. The proposed rule should contribute to maintaining high-level waste disposal safety and protection of the environment. A more efficient licensing process should enhance public confidence, and stakeholder and public input into the process should be greater.

RESOURCES:

The resources needed to complete this action are estimated to be 0.8 FTE for FY 02, which are already reflected in the budget.

COORDINATION:

The Office of the General Counsel has no legal objection to the proposed rulemaking. To accommodate the expedited schedule for this rulemaking directed by the SRM, the normal review and concurrence process was bypassed. The Offices of the General Counsel, Chief Information Officer, and Administration were asked to review this paper. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objection.

RECOMMENDATIONS:

That the Commission:

1. Approve the proposed amendment to specify a probability for unlikely FEPs for publication in the Federal Register (Attachment 2).
2. Certify that the proposed rule, if promulgated, would not have a significant economic impact on a substantial number of small entities.
3. Note:

- a. That the proposed amendment will be published in the Federal Register, allowing 75 days for public comment.
- b. That the Chief Counsel for Advocacy of the Small Business Administration will be informed of the certification and the reasons for it, as required by the Regulatory Flexibility Act, 5 U.S.C. 605(b).
- c. That a draft Regulatory Analysis has been prepared for this rulemaking (Attachment 3).
- d. That appropriate Congressional committees will be informed of this action.
- e. That a press release will be issued by the Office of Public Affairs when the proposed rulemaking is filed with the Office of the Federal Register.
- f. That resources to complete and implement this rulemaking are included in the current budget.

/RA/

William D. Travers
Executive Director
for Operations

Attachments:

- 1. SRM dated September 7, 2001
- 2. Federal Register Notice
- 3. Draft Regulatory Analysis

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