



OFFICE OF THE
SECRETARY

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

September 4, 2002

COMMISSION VOTING RECORD

DECISION ITEM: SECY-02-0135

TITLE: FINAL RULE: 10 CFR PART 63:
SPECIFICATIONS OF A PROBABILITY FOR
UNLIKELY FEATURES, EVENTS, AND
PROCESSES

The Commission (with all Commissioners agreeing) approved the final rule as noted in an Affirmation Session and recorded in the Affirmation Session Staff Requirements Memorandum (SRM) of September 4, 2002.

This Record contains a summary of voting on this matter together with the individual vote sheets, views and comments of the Commission.

A handwritten signature in black ink, appearing to read "Annette L. Vietti-Cook".

Annette L. Vietti-Cook
Secretary of the Commission

Attachments:

1. Voting Summary
2. Commissioner Vote Sheets

cc: Chairman Meserve
Commissioner Dicus
Commissioner Diaz
Commissioner McGaffigan
Commissioner Merrifield
OGC
EDO
PDR

VOTING SUMMARY - SECY-02-0135

RECORDED VOTES

	APRVD	DISAPRVD	ABSTAIN	NOT PARTICIP	COMMENTS	DATE
CHRM. MESERVE	X				X	8/13/02
COMR. DICUS	X				X	8/16/02
COMR. DIAZ	X				X	8/14/02
COMR. McGAFFIGAN	X					8/9/02
COMR. MERRIFIELD	X					8/12/02

COMMENT RESOLUTION

In their vote sheets, all Commissioners approved the staff's recommendation and some provided additional comments. Subsequently, the comments of the Commission were incorporated into the final rule as reflected in the Affirmation Session SRM issued on September 4, 2002.

AFFIRMATION VOTE

RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary
FROM: CHAIRMAN MESERVE
SUBJECT: **SECY-02-0135 - FINAL RULE: 10 CFR PART 63:
SPECIFICATION OF A PROBABILITY FOR UNLIKELY
FEATURES, EVENTS, AND PROCESSES**

Approved x^{w/edits} Disapproved _____ Abstain _____

Not Participating _____

COMMENTS:

See attachment.



SIGNATURE

August 13, 2012

DATE

Entered on "STARS" Yes ✓ No _____

Response 1.1: The Commission stated, in the proposed rulemaking (67 FR 3629; January 25, 2002) that the specification of a value to quantitatively define the probability for unlikely FEPs is complicated because of the subjective nature of the term "unlikely." The Commission did consider the merits of using an annual probability of 10^{-6} rather than 10^{-5} for the demarcation between likely and unlikely FEPs. These two probability values represent approximately a 1 percent and 10 percent chance of occurring over the 10,000 year regulatory period. The Commission considered a 1 percent chance of occurring (i.e., annual probability of 10^{-6} over 10,000 years) neither expected nor likely and, therefore, an inappropriate value for the demarcation between likely and unlikely FEPs (67 FR 3630; January 25, 2002). The Commission continues to believe an annual probability of 1×10^{-5} (i.e., 10 percent chance of occurring within the 10,000 year compliance period) is a protective and prudent value for defining the upper limit of unlikely FEPs and is retaining the proposed range for defining unlikely FEPs.

EPA has suggested that a probability value which represents the middle of a particular range (only when displayed on a logarithmic scale) contains some inherent justification for its selection. EPA also suggests that the NRC proposal, which is a factor of 10 less than an annual probability of 10^{-4} , may be considered too high by some, whereas the EPA recommended value of 10^{-6} , which is 100 times lower than 10^{-4} , is likely to be more acceptable. The issue is not whether a particular value lies within the middle of a range (when plotted in a particular manner), or that the value is 10 rather than 100 times less than another value. The issue for NRC is to determine an appropriate value that is protective of public health and safety and the environment, and consistent with EPA's standards. EPA's standards exclude unlikely FEPs from the required assessments for ground-water protection and human intrusion so that

annual probability value of 10^{-6} as the demarcation between likely and unlikely FEPs because this value represents a numerically similar difference (i.e., two orders of magnitude) between it and the probability for events nearly certain to occur within the 10,000 year period (i.e., an annual probability value of 10^{-4}). Whereas NRC's proposed value (i.e., an annual probability value of 10^{-5}) is only a factor of 10 (i.e., one order of magnitude) different from the probability for events nearly certain to occur.

Response 1.3: The performance assessments for evaluating individual protection for the proposed repository at Yucca Mountain evaluate performance probabilistically; therefore, the estimates of repository performance are represented by a range of values. The variation in repository performance results from including uncertainty and variability in the models and parameters of the performance assessment used to represent FEPs associated with the site conditions and the natural and engineered barriers of the repository. EPA's observation that the variation in estimates of repository performance and the difference between the EPA recommendation of an annual probability value of 10^{-6} and the probability of FEPs nearly certain to occur within the 10,000 year period (i.e., an annual probability value of 10^{-4}) are both two orders of magnitude does not justify EPA's recommendation, nor does it imply that NRC's proposed value of 10^{-5} is inappropriate. EPA has not provided information to support the relevance of this observation to the specification of a value for the demarcation of likely and unlikely FEPs. The performance assessments for Yucca Mountain involve complex models, for FEPs, that consider the uncertainty and variability in natural processes and the degradation of engineered materials. Performance assessments are expected to continue to evolve over time as new information is collected and evaluated and the variation in performance assessment

³ The staff believes that an annual probability value of 10^{-5} is acceptable, because it provides only a 6 percent chance that an event will occur.

Environmental Policy Act of 1969 or any environmental review under subparagraph (E) or (F) of Section 102(2) of such act.

VI. Paperwork Reduction Act Statement

This rule does not contain new or amended information collection requirements subject to the Paperwork Reduction Act of 1995. (44 U.S.C. 3501 et seq.). Existing requirements were approved by the Office of Management and Budget (OMB), approval number 3150-0199.

Public Protection Notification

If a means used to impose an information collection ^{requirement} does not display a currently valid OMB control number, NRC may not conduct nor sponsor, and a person is not required to respond to, the information collection.

VII. Regulatory Analysis

The Commission has prepared a regulatory analysis on this regulation. The analysis examines the costs and benefits of the alternatives considered by the Commission. It is available for inspection in the NRC Public Document Room, One White Flint North, 11555 Rockville Pike, Rockville, MD 20852. Single copies of the analysis may be obtained from Clark Prichard, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, telephone (301) 415-6203, e-mail: cwp@ nrc.gov.

disposal at a potential geologic repository at Yucca Mountain, Nevada, to be based on and consistent with a National Academy of Sciences (NAS) study of the technical bases for public health and safety standards governing the Yucca Mountain repository.¹ NRC was directed to modify its technical requirements and criteria for geologic repository disposal to be consistent with the new EPA standards. The EPA directed NRC to do so within 1 year of promulgation of the final EPA standards. NRC published proposed Part 63, "Disposal of High-Level Radioactive Wastes in a Proposed Geologic Repository at Yucca Mountain, Nevada", on February 22, 1999. (64 FR 8640) EPA published its proposed standards for Yucca Mountain, 40 CFR Part 197, on August 27, 1999 (64 FR 46976), and its final standards on June 13, 2001 (66 FR 32073). NRC published final Part 63, revised to conform to the final EPA standards, on November 2, 2001 (63 FR 55731). These are the regulations that DOE must meet in any potential license application for construction and operation of the repository. EPA's standards for disposal include an individual protection standard (40 CFR 197.20); a human intrusion standard (40 CFR 197.25); and ground-water protection standards (40 CFR 197.30). These EPA standards have been incorporated into NRC's regulations at 10 CFR 63.311, 63.321, and 63.331, respectively.

FEPs are features, events, and processes used to characterize the repository system. Probabilities for FEPs in the context of the potential geologic repository at Yucca Mountain primarily have focused on igneous activity, seismic events, fault movements, and rock fall. ^{At} ~~An~~ issue in postclosure performance assessments of the repository is ^{which} ~~what~~ FEPs should be considered in performance assessments. For the purposes of analyses for estimating compliance with the standards for human intrusion and ground-water protection, Part 63 does not specify a quantitative probability limit for unlikely FEPs that should not be considered.² However, in the "statement of considerations" for the final rule, the Commission noted that it considered the approach of specifying a value in the regulations " ... to be consistent with the intent of EPA's final standards and may revisit the question of specifying a numerical value by rulemaking in the future" (63 FR 55734). EPA supports the approach of establishing a

¹ National Academy of Sciences, Technical Bases for Yucca Mountain Standards, National Academy Press, Washington, DC, 1995.

² Section 63.342, "Limits on performance assessments," does specify a quantitative limit for very unlikely FEPs -- less than one chance in 10,000 of occurring within 10,000 years of disposal -- that should not be included in DOE's performance assessments.

application, it prefers to set this limit in advance, through the rulemaking process, so that it will have the advantage of public views on this question, and so that DOE, interested participants, and the public will have knowledge, before the license application, of what probability the Commission would find acceptable.

Alternatives Considered:

(1) No action. Make no change to Part 63. Leave the delineation of what constitutes unlikely FEPs to be resolved in the course of the review of DOE's license application. The determination of ^{which} unlikely FEPs should be excluded from the analysis of ^{compliance with the} ~~the consequences~~ of human intrusion and ground-water protection ^{standards} would not occur until the license application review stage of the licensing process.

This alternative would require no current resources to conduct a rulemaking, or otherwise revise NRC's regulatory guidance. However, this issue could be subject to contention in the licensing review. Resolving this issue could require a significant amount of future staff time from both NRC and the other parties involved in the licensing review.

(2) Amend 10 CFR 63.342 to include a probability limit for unlikely FEPs that should not be included in DOE's performance assessments for human intrusion and ground-water protection. The probability limit proposed would classify unlikely FEPs as those that are estimated to have less than one chance in 10 of occurring within 10,000 years of disposal, but at least one chance in 10,000 of occurring within 10,000 years of disposal (the upper limit of very unlikely FEPs).

This alternative would clearly delineate those FEPs that DOE must include in its evaluation of the effects of human intrusion and its evaluation of ground-water protection. This would provide clearer requirements for the content of the license application. This would allow DOE's license application to concentrate on these effects rather than to speculate on what constitutes unlikely FEPs, some of which might not be determined to be relevant as a result of the licensing review. It would also allow other parties to the review to know in advance what unlikely FEPs would be excluded, allowing them to more sharply focus their resources. The end result would be a more efficient licensing process.

AFFIRMATION VOTE

RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary
FROM: COMMISSIONER DICUS
SUBJECT: **SECY-02-0135 - FINAL RULE: 10 CFR PART 63:
SPECIFICATION OF A PROBABILITY FOR UNLIKELY
FEATURES, EVENTS, AND PROCESSES**

Approved Disapproved Abstain

Not Participating

COMMENTS:

See attached comments.

Aneta Joy Dicus
SIGNATURE

August 16, 2002
DATE

Entered on "STARS" Yes No

Comments of Commissioner Dicus Regarding SECY 02-0135

I commend staff for their efforts in providing the Commission with the final Part 63 rule amendment in such a timely manner and for detailing a well thought out approach to defining unlikely features, events, and processes (FEPs) in the context of Yucca Mountain's 10,000 year post-closure compliance period. Given the uncertainties in being able to estimate the occurrence of natural FEPs over a 10,000 year time-frame, I support staff's recommendation to specify a probability range of values between 10^{-5} to 10^{-8} , rather than a single probability value. I believe that this approach will allow for appropriate consideration and better characterization of the range of possible scenarios associated with unlikely FEPs at the Yucca Mountain repository site.

Attachment 1

Draft Final Rule

SUPPLEMENTARY INFORMATION:

I. Background

NRC published a proposed rule, "10 CFR Part 63: Specification of a Probability for Unlikely Features, Processes, and Events," on January 25, 2002 (67 FR 3628), and requested public comments. ^{That} ~~The~~ proposed rule defined the term "unlikely" in quantitative terms. This action was taken to allow NRC to implement EPA's final standards for a potential repository at Yucca Mountain, Nevada. On November 2, 2001 (66 FR 55732), NRC published ^a ~~its~~ final rule,

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We are now finalizing one particular action that specifies a probability for
10 CFR Part 63, governing disposal of high-level radioactive wastes in a potential geologic repository at Yucca Mountain, Nevada. [^] These are the regulations that the U.S. Department of

Energy (DOE) must meet in any license application for construction and operation of a potential repository. As mandated by the Energy Policy Act of 1992, Pub. L. 102-486, NRC's ~~final~~ rule adopts the radiation protection standards established by EPA in 40 CFR Part 197 (66 FR 32074; June 13, 2001). EPA's standards for disposal include an individual-protection standard (40 CFR 197.20); a human-intrusion standard (40 CFR 197.25); and ground-water protection standards (40 CFR 197.30). These EPA standards have been incorporated into NRC's regulations at 10 CFR 63.311, 63.321, and 63.331, respectively.

DOE's performance assessments are required to consider the naturally occurring features, events, and processes (FEPs) that could affect the performance of a geologic repository (i.e., specific conditions or attributes of the geologic setting; degradation, deterioration, or alteration processes of engineered barriers; and interactions between natural and engineered barriers). EPA's standards include limits on what DOE must consider in performance assessments undertaken to determine whether the repository will perform in

** unlikely features, processes, and events.*

compliance with the standards (40 CFR 197.36). EPA's standards state that DOE's performance assessments shall not include consideration of "very unlikely" 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 require NRC to exclude "unlikely" FEPs, or sequences of events and processes, from 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. The Commission explained in its rulemaking establishing Part 63 that it "...fully supports excluding unlikely FEPs from analyses for estimating compliance with the standards for human intrusion and ground-water protection..." and that it "...plan[ned] to conduct an expedited rulemaking to quantitatively define the term 'unlikely'" (66 FR 55734; November 2, 2001).

A Inset ① from page 3 and Inset ② from page 19.

X ~~On January 25, 2002, the Commission published for comment a proposed rule to~~
~~quantitatively define the term "unlikely" (67 FR 3628).~~ *A* Unlike the broader purposes served by the performance assessment for the all-pathway individual-protection standard, the performance assessments used to determine compliance with the human-intrusion standard and the ground-water protection standards serve narrow, focused objectives. In the case of the performance assessment for human intrusion, the purpose is to evaluate the robustness of the repository system, assuming the occurrence of a prescribed human-intrusion scenario. In the case of the performance assessment for ground-water protection, the purpose is to evaluate potential degradation of the ground-water resource. Although EPA's final standards did not specify a numerical value to define unlikely FEPs in quantitative terms, the preamble to the

and (3) understanding and addressing uncertainties in the quantitative estimates for the probabilities of FEPs is preferred over selection of more conservative screening values.

The Commission acknowledges that selection of a more conservative value (i.e., annual probability of 10^{-6}) for the demarcation between likely and unlikely FEPs could provide additional assurance by considering a broader range of FEPs. Such an approach, however, would ^{not be} ~~sacrifice~~ ^{consistent with} the intent that the required assessments focus on likely behavior. EPA, in describing what level of expectation will meet the standards, has pointed out negative aspects of an overly conservative approach (e.g., conservatism can bias analyses and deflect attention from questions critical to developing an adequate understanding of the FEPs) (66 FR 32102; June 13, 2001). The Commission understands that EPA believes its recommendation (i.e., annual probability of 10^{-6}) is "reasonably" conservative. However, the Commission views EPA's recommendation, which would identify FEPs with as little as a one-in-a-million chance of occurring in a year (i.e., one percent chance of occurring over 10,000 years) as likely FEPs, ^{as} ~~is~~ overly conservative and thus not appropriate. The Commission, as well as other commenters (see Comments 4 and 5), support the annual probability of 10^{-5} (i.e., 10 percent chance of occurrence over 10,000 years) as a reasonably conservative value for the demarcation between likely and unlikely FEPs. The Commission continues to believe the specification of an annual probability of 10^{-5} is consistent with the focus on likely performance for the assessments of ground-water protection and human intrusion.

There will be uncertainty in estimating performance of any geologic repository, including the uncertainty in estimating the probabilities of FEPs. NRC's regulation for Yucca Mountain contains specific requirements for addressing uncertainty in estimating performance, which

EPA's intent for the assessments for ground-water protection and human intrusion is to focus on the likely performance of the repository; thus, unlikely events are to be excluded from these two assessments (see Response 1.2). Unlikely FEPs should not be included in the assessments for ground-water protection and human intrusion, because inclusion would inappropriately emphasize the contribution of these less likely FEPs when determining the likely behavior of the repository. Exclusion of low-probability FEPs ensures that the assessments for ground-water protection and human intrusion are as intended (i.e., on likely repository performance).

Ground water is an important resource, and potential contamination of ground water is evaluated in all three assessments (i.e., ground-water protection, human intrusion, and individual protection) required by regulations and standards. More specifically, the assessment for ground-water protection must demonstrate compliance with stringent safety standards [e.g., 0.04 millisievert/year ^(mSv/yr) (4 millirem/year (mrem/yr))] for the potential contamination of drinking water. The assessment for individual protection must demonstrate compliance with a 0.15 mSv/yr (15 mrem/yr) exposure limit from all potential exposure pathways (e.g., drinking contaminated water, consuming crops that are assumed to be irrigated with contaminated water, consuming animal products that are assumed to be raised with contaminated water and feed) and include unlikely FEPs. The assessment for human intrusion must demonstrate compliance with a 0.15 mSv/yr (15 mrem/yr) exposure limit from all potential exposure pathways, and assume that a human intrusion results in a borehole that provides a direct pathway for water to transport waste to the water table (i.e., the ground-water resource). The Commission considers the multiple and overlapping assessments for ground-water protection, individual protection, and human intrusion, and the associated standards, to provide a

mrem/yr) from all pathways] used for individual protection. Although the EPA standards clearly state “unlikely” FEPs are not to be included in the assessment for human intrusion and ground-water protection (40 CFR 197.36), the performance assessments for individual protection, ground-water protection, and human intrusion provide a comprehensive evaluation of FEPs to inform the licensing decision. Regardless of which aspect of repository performance is the largest risk contributor, the regulatory requirements for all assessments must be met.

Comment 2.5: The possibility of multiple intrusions into the repository should be considered as a likely event and included in the evaluation of human intrusion rather than the “single” intrusion prescribed in the EPA standards and adopted in NRC’s regulations.

Response 2.5: The State raised a similar concern (i.e., consideration for multiple intrusions) during the public comment period for Part 63. The Commission addressed this issue when it finalized Part 63, ^(66 FR 32100; June 13, 2001) stating:

Another related issue is whether the stylized calculation should consider multiple intrusions. The final EPA standards resolve this issue in favor of a single intrusion. Moreover, in its findings and recommendations, NAS [National Academy of Sciences] argued against analyses of whether and how often exploratory drilling would occur at Yucca Mountain because of the complexities associated in such assessments. Simply stated, the NAS felt that no one can accurately predict the characteristics of future human society and their technology. In the context of human intrusion, estimating the probability of exploratory drilling for a given resource relies on an ability to predict certain economic and technical factors that influence supply of, and demand for, that resource.

proposal of an upper bound of one chance in ten of occurring within 10,000 years (i.e., 10^{-5} annual probability) for unlikely FEPs is a reasonable and conservative approach.

During the development of
Response 3.1: In the proposed rulemaking, NRC considered an annual probability of 10^{-4} for the demarcation between likely and unlikely FEPs, but ultimately decided on a probability of one chance in ten of occurring within 10,000 years (i.e., annual probability of 10^{-5}) as a prudent value, given the uncertainties in estimating the occurrence of FEPs over the very long compliance period.

The Commission was careful to point out that its specification for unlikely events was in the context of very specific assessments (i.e., those made to assess compliance with ground-water protection and human-intrusion standards) over a long time frame, and this specification was not intended to suggest or imply precedent for other significantly different applications that used the term "unlikely" (67 FR 3630; January 25, 2002). Similarly,

significantly different applications such as requirements for the safety assessment of the operational period (e.g., significantly shorter time period, inclusion of worker activities) should not imply a precedent for specifying a value for unlikely FEPs.

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4 NEI Comments

NEI supports NRC's proposed probability range for defining unlikely FEPs. NEI stated that the proposed definition of unlikely FEPs will facilitate a reasonable and prudently conservative analysis of these aspects of repository performance (i.e., ground-water protection and human intrusion).

5 Exelon Generation Comments

AFFIRMATION VOTE

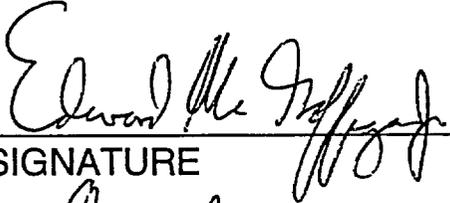
RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary
FROM: COMMISSIONER MCGAFFIGAN
SUBJECT: **SECY-02-0135 - FINAL RULE: 10 CFR PART 63:
SPECIFICATION OF A PROBABILITY FOR UNLIKELY
FEATURES, EVENTS, AND PROCESSES**

Approved Disapproved _____ Abstain _____

Not Participating _____

COMMENTS:



SIGNATURE
August 9, 2002

DATE

Entered on "STARS" Yes No _____

AFFIRMATION VOTE

RESPONSE SHEET

TO: Annette Vietti-Cook, Secretary
FROM: COMMISSIONER MERRIFIELD
SUBJECT: **SECY-02-0135 - FINAL RULE: 10 CFR PART 63:
SPECIFICATION OF A PROBABILITY FOR UNLIKELY
FEATURES, EVENTS, AND PROCESSES**

Approved Disapproved Abstain

Not Participating

COMMENTS: *No additional comments.*



SIGNATURE
8/12/02

DATE

Entered on "STARS" Yes No