

# Bechtel National, Inc.

Engineers - Constructors

Fifty Beale Street  
San Francisco, California

Mail Address: P. O. Box 3965, San Francisco, CA 94119



DOCKET NUMBER

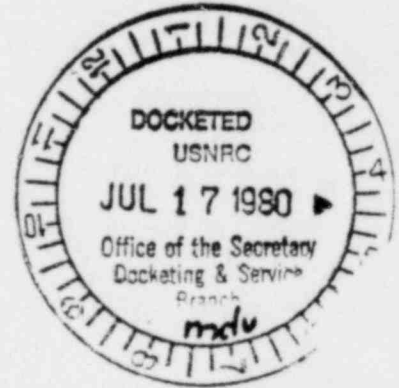
PROPOSED RULE

PR-60 (19)  
(45 FR 31393)

Secretary of the Commission  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Attention: Docketing and Service Branch

Subject: Advance Notice of Proposed Rulemaking  
on Technical Criteria for Regulating  
Geologic Disposal of High-Level  
Radioactive Waste



Gentlemen:

We appreciate the opportunity to provide comments during this formulative stage of developing technical criteria for regulating geologic disposal of high-level radioactive waste. In general, we are pleased that the NRC is developing such licensing criteria; however, we are disappointed with the unrealistic, arbitrary and imprecise nature of much of the current draft. We hope that the NRC final criteria will recognize the need for flexibility to allow greater realization of the benefits from existing geologic evidence, tested engineering practice, and future scientific innovation. In this regard, we request the NRC to take careful note of the information which will be generated and evaluated during the forthcoming Waste Confidence Rulemaking (44 FR-61372) and not to finalize these proposed technical criteria until that proceeding is complete, and the findings derived therefrom have been carefully considered.

Detailed comments from our review of the proposed technical criteria based on our engineering and construction experience are attached. In addition, we offer the following general comments which are more philosophical in nature and which underlie many of the more detailed comments of the attachment:

- Reasonable Assurance of Conformance to EPA Standards - The most significant of the overall repository performance objectives defined in Section 60.111 of the technical criteria is for the DOE to provide reasonable assurance that, after decommissioning, the isolation of the radioactive waste will conform to the applicable environmental standards established by the EPA. A major portion of this proposed rule deals with what the NRC considers to be necessary to provide this reasonable assurance. In dealing with this question, we believe that the NRC has placed undue emphasis on the nature of the uncertainties associated with transport of the waste through

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the geosphere to the exclusion of other important considerations such as: the extent to which uncertainties can be negated or made inconsequential by bounding analysis and design; the very large costs in both time and effort associated with quantifying and reducing uncertainties; and the incremental magnitude of risks associated with residual uncertainties. The deficiencies in the NRC approach are evidenced not only by the tone of the supplementary information and the excessive conservatism of the proposed criteria, but also by the working draft of the bases and rationale document which was placed in the NRC Public Document Room for inspection. This working draft deals almost exclusively with the uncertainties associated with geologic/hydrologic site characteristics, waste transport models, and supporting data. Little or no information or rationale is provided on the extent to which these uncertainties impact the risk to the public health and safety, or how these uncertainties when found to be safety significant can be reduced in importance by conservative design and analysis. Bechtel believes that the NRC requirements could be greatly simplified and the apparent excessive conservatisms removed if these additional factors in dealing with the question of reasonable assurance are given adequate attention.

- Codification of Models - The staff's position "not to require modeling to be the primary decision tool to determine the capability of the geologic repository to contain and isolate waste from the biosphere", as stated in the Supplementary Information, is unfounded and inappropriate. Models are generally recognized as the primary means for assessment of all complex technological systems where neither direct experience nor recourse to experimental verification exists. They are the means to systematically and logically express the sum of our knowledge (both factual and judgemental) concerning the behavior of a system under a postulated set of conditions. In addition, models can and should be used as a means to unify "expert opinion" so as to eliminate controversy and the imposition of arbitrary and capricious judgements on an ad hoc basis. Qualitative factors and judgements can be readily incorporated into models to assure that they provide conservative predictions of system behavior and adequately bound or account for the uncertainties of our knowledge. Furthermore, requirements can be established that require models to predict acceptable system behavior under a set of initial conditions that are extreme or even incredible. Consequently, the staff's arguments that models cannot accurately predict the behavior of a repository system do not detract from the fact that models can and should be used as the primary decision tool for system assessment.
- Retrievability - The likelihood of having to retrieve nuclear waste once a license has been granted and the waste has been emplaced in the geologic medium should be extremely small. In

fact, it is difficult to foresee any circumstances where this would be required. Paragraphs 60.111(a)(3), 60.132(b)(2), 60.132(c)(3), and 60.135 define design requirements for a retrievability period which extends 50 years beyond termination of waste emplacement operations, and require that the wastes be retrieved in about the same period of time as that during which they were emplaced. These requirements are much too conservative, have no apparent justification, are extremely costly with little or no benefit in terms of risk reduction to the public and, for some geologic media, are probably not obtainable. In the case of a salt repository, where creep allowance would be required, mining of a much larger cavity at greatly increased cost would be required, and maintenance of the mined opening to permit retrievability might be impossible. Furthermore, the additional excavation required would diminish the future isolation integrity of the repository. The 50-year requirement would probably rule out all soft rocks such as salt and shale which otherwise might serve as excellent repository media. As an alternative, a 10-year retrievability period is suggested.

- Waste Package Integrity - The requirement that the waste package integrity be maintained for 1000 years with full or partial water saturation of the repository area is excessively conservative and cannot be justified if the other requirements for siting and design of the repository system have been achieved. Such an occurrence should be incredible if the repository has been properly sited and designed. It should be noted, however, that even if the waste package should fail in considerably less than 1000 years due to hypothetical water intrusion, the consequences to the public health and safety would be negligible unless the geology/hydrology of the repository area also changed drastically in that short geologic time period. If such arbitrary and totally unfounded postulations are to be made, geologic disposal of nuclear waste may be ruled out entirely.
- As Low As Reasonably Achievable (ALARA) - ALARA should not be applied to a new technology where an experience base does not exist and cost-benefit analyses have not been performed. However, if the provision is retained in the regulation, guidance should be given for performing the cost-benefit analysis. An example of this type of guidance is indicated by the following statement from 10CFR50, Appendix I:

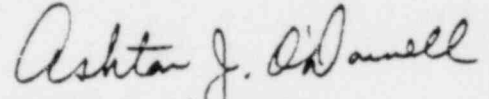
"...the applicant shall include in the radwaste system all items of reasonably demonstrated technology that, when added to the system sequentially and in order of diminishing cost-benefit return, can for a favorable cost-benefit ratio effect reduction in dose to the population....As an interim measure and until establishment and adoption of better values (or other appropriate

criteria) the values of \$1,000 per total body man-rem and \$1,000 per man-thyroid-rem (or such less values as may be demonstrated to be suitable in a particular case) shall be used in this cost-benefit analysis."

When the ALARA approach is used, it is generally recognized that a "de minimus" level has not been achieved. For waste repositories, it is expected that for most repository breach scenarios (with the possible exception of human intrusion) it can be shown that de minimus levels of radiation exposure will be achieved. For this reason it is recommended that the ALARA objective be deleted.

It is our hope that you will find these comments and those of the attachment useful in finalizing the proposed technical criteria for geologic disposal of high-level radioactive waste. Should you have any further questions on this important matter, I would be pleased to provide the assistance of my staff.

Very truly yours,



Ashton J. O'Donnell  
Vice President

AJO/tf  
Attachment

cc: John F. Ahearne

DETAILED COMMENTS ON NRC PROPOSED TECHNICAL CRITERIA FOR 10 CFR PART 60

Technical Criteria for Regulating Geologic Disposal of High-Level Radioactive Waste as published in Federal Register, Vol. 45, No. 94 - Tuesday, May 13, 1980.

Supplementary Information

1. The discussion contained in this section approaches the development of a HLW repository from a very negative point of view. The section portrays a lack of confidence on the part of the NRC to deal with uncertainties, and emphasizes potential shortcomings of geologic repositories by statements like "such disposal of HLW is separable into five distinct problem areas" when not all of the areas identified may be problems, "waste undoubtedly will have a significant interaction with the rock" which we would not expect to be true over the time frames of interest, "no way to reasonably limit the variety of human activities which might compromise a forgotten repository", "engineering against human intrusion is impossible practically", "the site should be geologically simple... so that the site can be easily understood", "mistakes will occur", and "human intrusion cannot be prevented." Such absolute statements are negatively oriented and could lead to public misunderstanding and lack of confidence. Both overly negative and overly positive statements that tend to prejudge the concept of geologic disposal should be avoided.

Section 60.2 - Definitions

2. The definition of items "important to safety" does not include engineered items which are important for assuring the long term isolation of the waste from the biosphere, e.g., the waste form, container and overpack. Should such items be considered within the definition of important to safety?
3. The definition of "important to safety" uses the words "without undue risk to the health and safety of the public". Due to lack of specificity, this qualitative definition has caused much difficulty in the licensing of reactors. It is recommended that the definition be quantified to specifically apply to items essential to the prevention or mitigation of the consequences of operational accidents that could result in exceeding some defined radiological release or exposure limits.
4. The term "unreasonable risk" is employed in Paragraphs 60.101(b) and 60.171(b). Is this intended to be the same as "undue risk" used in Paragraph 60.2 or to have a different meaning? Please clarify.
5. Paragraphs 60.133(b)(4)(iii) and 60.171(b) use the term "safety related", in one case referring to safety related structures, systems or components, and in the other to functions of structures, systems or components.

Are these intended to be the same as structures, systems and components "important to safety"? In 10 CFR Part 50 the nuclear industry has lived with an ambiguity between these terms for many years. It is recommended that the same conflict not be repeated in Part 60. It would seem that the requirements should consistently refer to functions of structures, systems and components important to safety, or it should be stated that the terms "important to safety" and "safety related" as applied to equipment functions are synonymous.

6. The term "single failure" is used in Paragraph 60.132(b)(8)(i) but is not defined. It is not clear whether this refers to an "active" failure or both "active" and "passive" failures. In nuclear plants, the single failure applies to a single active failure unrelated to the initiating event. Is this intended here? Single failure should be defined in Section 60.2.
7. The definition of "TRU waste" should be more specific since as currently defined spent fuel could be classified as either HLW or TRU waste. Is this overlap intended or are the definitions of TRU waste and HLW meant to be mutually exclusive as is implied by the criteria of Paragraph 60.111 (c)(3)?

#### Section 60.111 - Performance Objectives

8. 60.111(a)(1) - This paragraph specifies exposure or release limits during normal operation but does not specify limits for operational accidents. Should limits comparable to those of 10 CFR Part 100 apply? It should be noted that, due to the nature of potential releases from repositories under both normal and accident conditions, exposure limits need to be expressed in terms of dose commitments to critical organs for a defined time period.
9. 60.111(a)(3) - We recommend that the retrievability period be shortened to extend for no more than 10 years beyond the waste emplacement date. Such a requirement would appear to be as arbitrary as the proposed 50-year requirement, but would have the advantages of much reduced cost and assuring the continued viability of soft rock media, while still satisfying EPA requirements.
10. 60.111(a)(3) - The basis upon which a decision could be made to retrieve the waste is not clear. Certainly the decision could not be expected to derive from the monitoring program of Paragraph 60.137 in a 50-year period if the system had been found to satisfy regulatory requirements for long-term barrier performance. Rather such a decision to retrieve would have to be based on some other type of data or predicted environmental occurrence. However, in the highly unlikely event that a decision were made to remove the waste, the requirement to provide for retrievability within a time period that is about the same as that in which it was emplaced seems to have little or no justification considering the low probability of having to perform this operation and the

relatively large costs, difficulties, and timeframe associated with having to ship and dispose of the wastes at some other location. Therefore, it is recommended that the requirements for the retrieval timeframe be deleted from the overall retrieval requirement.

11. 60.111(c)(2) - The first paragraph of this section states that waste package integrity must be maintained for the first 1000 years given various water flow conditions including full or partial saturation of the underground facility. Paragraph 60.111(c)(2)(i) then requires that the design environment for the waste packages promotes the 1000-year package integrity without full or partial water saturation required. Thus, if the initial requirement ~~is~~ intended, the requirement of Paragraph 60.111(c)(2)(i) appears superfluous.

Paragraph 60.111(c)(2)(ii) is even more confusing in that it states that the 1000-year integrity requirement must be satisfied (presumably without water saturation) but that some of the waste dissolves soon after decommissioning. The statement is self-contradicting and should be deleted.

12. 60.111(c)(3) - After 1000 years, it should be assumed that the waste packaging (engineered system) has performed its required function and that it is then the function of the remaining barriers in conjunction with the leach rate of the waste material (waste form) to assure that the EPA criteria for radioactivity release to the biosphere are not exceeded. Thus, it is unnecessary and inappropriate to stipulate a maximum leak rate from the engineered system after 1000 years. This type of requirement adds nothing to the reduction of risk to the public since it is not likely to influence the waste package design, but it could cause considerable difficulty and delay in the licensing process assuming demonstration of the criteria is necessary. This same comment applies to the TRU waste packaging where the leak rate criterion is applied starting at decommissioning.

#### Section 60.121 - Site and Environs Ownership and Control

13. 60.121(c) - Limiting institutional controls to only 100 years is overly conservative. Although the controlling organizations of today may not be the same ones 500 years from now, it is not unreasonable to assume that there will be some controlling authority. Past history has shown that civilized and conscience authority has been present at least since the end of feudalism (1000 to 1200 A.D.). Hence, planned and planning organizations have been present for the past 700 to 900 years.

#### Section 60.122 - Siting Requirements

14. 60.122(a)(2) - "Geologic" includes "tectonic". If tectonic is segregated out, then other geologic aspects should be segregated also.

15. 60.122(a)(2) - The rule requires investigation and evaluation of "natural conditions" and "human activities" that can affect various repository activities. However, subsequent paragraphs (i), (ii), (iii) seem to be directed toward "natural conditions" only. It is recommended that combining the terms "natural conditions" and "human activities" should be avoided. They are very separate.
16. 60.122(a)(2)(i) - The paragraph requires the conduct of investigations over a radius of 100 km, however, the amount of detail required is not indicated. The investigations should be performed in much less detail beyond the first 2 km.
17. 60.122(a)(3) - The paragraph asks for "representative and bounding values" for "human activities and natural events" for three items. Two of the items, (ii) and (iii), ask for "demonstration" of natural events only, which is not compatible with "representative and bounding". It is recommended that sections (ii) and (iii) be combined and made a separate number, e.g. (4).
18. 60.122(a)(5) - The paragraph requests site investigations be done in such a manner to produce minimal adverse effects on long term performance. Early shafts, particularly on multiple sites as requested by the Commission, could produce significant adverse effects.
19. 60.122(a)(7) - The DOE is required to "continuously" assess and verify changes. An assessment and verification time period should be stipulated.
20. 60.122(a)(8) - The request is made to assess the site within 100 km radius using available literature. However, it is also requested to use geologic and geophysical information to evaluate mineral deposits. Is it the intention of the commission to require geologic or geophysical surveys if none are available? Furthermore, the resource assessment should be in far less detail beyond say the first 10 km from the center of the site.
21. 60.122(a)(9)(i) - The paragraph calls for characterization of fractures, etc., of the "host rock and confining units"; however, in some cases (e.g. granite) there may be no confining unit, and if there is it may not be within the "volume of rock" defined at the beginning of Paragraph (9).
22. 60.122(a)(9)(iii) thru (vi) - Is it intended that the term "in situ" imply a shaft to repository level to acquire data? If so, this intent should be clearly stated. However, we believe that in situ tests in shafts and drifts are necessary only for site validation purposes after site selection. It should be noted that in situ determinations in a host rock will not guarantee that the measured condition exists throughout the repository.



23. 60.122(a)(9) - The last paragraph of this section states that "the Department shall assume that the volume will extend a horizontal distance of 2 km...", whereas the first paragraph of this section indicates the applicant shall determine what volume of rock will be significantly affected by construction of the geologic repository. We believe that determining in situ properties for a volume at least 2 km from the limits of the repository and 1 km deep is excessive for this purpose.
24. 60.122(b) - The statement "the presence of any of the potential adverse human activities or natural conditions will give rise to a presumption that the geologic repository will not meet the performance objectives" is extreme and could rule out many excellent sites. There is no basis for this presumption from the presence of such activities or conditions.
25. 60.122(b)(2)(i) - The word "extreme" should be defined.
26. 60.122(b)(2)(ii) - "Karst features", "breccia pipes" and especially "insoluble residues" are not necessarily "extreme" bedrock incisions.
27. 60.122(b)(2)(iii) - Such evidences are often not extreme bedrock incisions.
28. 60.122(b)(2)(iv) - The term "near field" should be defined.
29. 60.122(b)(2)(v) - Having a "higher seismicity" is certainly not an extreme bedrock incision, and may not even be a potential hazard.
30. 60.122(b)(2)(vii) - A higher than regional geothermal gradient may not be extreme.
31. 60.122(b)(3)(iv) - A length of "a few hundred meters" is too vague and should be defined.
32. 60.122(b) - The section at the end of 60.122(b) that rebuts requirements stated earlier is confusing and should be incorporated in the individual sections.
33. 60.122(c) - Several references are made to a host rock possessing "to the extent practicable" certain characteristics (page 31402, middle column). While one can probably understand what the Commission is suggesting, the meaning is diffused with the use of "practicable". Rocks cannot possess favorable characteristics as practicable.
34. 60.122(c)(1)(i) - Requirement may be too stringent and not attainable.
35. 60.122(c)(1)(ii)(a) - "Long flow paths" should be defined. Does this imply distance or time? Time would be preferable.
36. 60.122(c)(1)(ii)(b) - "Surrounding confining units" need not possess inactive ground water circulation if there is little or no communication to the host rock.

37. 60.122(c)(2)(v) thru (vii) - These sections do not fit in 60.122(c)(2).

Section 60.132 - Design Requirements

38. 60.132(b)(4)(i) - The requirement to "minimize" the release of radioactive materials in effluents during normal operations should be deleted. The requirement to meet the requirements of 10 CFR Part 20 which requires ALARA has already been specified.
39. 60.132(c)(2)(ii) - A regulatory requirement for design optimization is inappropriate. It should only be necessary to demonstrate with reasonable assurance that safety and environmental requirements have been met.
40. 60.132(c)(6)(i) - This requirement should be deleted. The requirement implies that the definition of "important to safety" is not adequate for all components. If this is the case, the definition should be changed. Determining that certain components are important to safety by regulation in advance of design is not defensible.
41. 60.132(c)(6)(ii) - This requirement prejudices the design and prevents the DOE from using more desirable equipment or mitigating devices should they be available. At most, the requirement should specify a no-free-fall characteristic.
42. 60.132(c)(9)(ii) - "Geologic repository operations area" should replace the word "repository". This requirement also implies that water will be allowed to flow into or from the repository operations area. Please clarify.
43. 60.132(d)(3) thru (5) - The portions of these paragraphs that dictate techniques instead of specifying objectives and standards should be deleted. During the licensing review, the NRC can review the techniques or methods developed to meet the standards imposed.
44. 60.132(f)(3)(i) and (ii) - Change the concept of this requirement to one of reducing hazards and potential for errors to acceptable levels. The Department cannot demonstrate that minima have been achieved for these items.

Section 60.133 - Waste Package and Emplacement Environment

45. 60.133(a)(1) - Revise this requirement merely to give acceptable standards. Optima cannot be demonstrated.
46. 60.133(a)(5) - Revise this requirement. Delete the specification for waste package tests to verify performance objectives. This is not possible. Waste package life can be verified only by an analysis based on test data that indicate performance requirements are likely to be met. Delete the reference to 60.133(a)(2). It is not necessary to test waste packages to insure that site functions are not compromised.

#### Section 60.135 - Retrieval of Waste

47. 60.135 - Revise this requirement to say that the EPA standards covering release shall be met. Whether packages are intact and whether all material is recovered is immaterial. And it is impossible to predict and guarantee compliance. For example, there may be a very small fraction of waste packages that are not intact even at the time they are emplaced.

#### Section 60.137 - Monitoring Programs

48. 60.137(a) and (c) - Define the terms, "site" and "engineered elements of the geologic repository".
49. 60.137 - Delete the requirement to monitor through the period of institutional controls. This monitoring cannot verify in the short term that EPA standards will be met through millions of years. And in the short term of say, 1000 years, there is no undetected way enough nuclear material can be transported and released to exceed EPA standards. Monitoring prior to decommissioning should be sufficient.

#### General

50. The criteria requires the avoidance of resources that are economically exploitable, and in Paragraph 60.122(b)(2)(vii) includes as such a resource "... a high and anomalous geothermal gradient relative to the regional geothermal gradient". However, we also should acknowledge that the placement of heat-producing materials in a repository will build up the surrounding temperatures to a level that might be interpreted by a future explorer as just such a high and anomalous geothermal gradient. Thus, we must conclude that we can have administrative controls for longer than 100 years, or we must not entice the explorer by allowing temperatures to rise to the level that he might interpret as being of interest. The term "high" needs to be defined.

In this regard, it is perhaps important to categorize the wastes by a thermal characteristic, as well as the radioactive characteristics, with the distinction being the time period during which the surrounding media temperature will be increasing (due to a heat generation rate that is greater than the heat dissipation rate) and a time period after which the surrounding media will have essentially returned to normal background temperatures. (It always will be somewhat above ambient.)

51. We suggest that the Criteria should provide general guidelines defining technical criteria for a safe HLW repository. To attempt to include every conceivable qualification that may or may not occur or may or may not be important for the suitability of a site will invite never ending challenges from intervenors and a correspondingly unnecessary lengthening of the repository licensing process. For example, statements like "There is a fault or fracture zone, irrespective of age of

last movement, which has a horizontal length of more than a few hundreds of meters" (page 31402, line 28) is unreasonable as a technical criterion and is only a means by which an otherwise adequate site can be disqualified. It would be to the advantage of the program if those working to develop a safe repository could feel confident that the rules outlined in the 10 CFR Part 60 were directed toward licensing a repository, not away from it. Presently the NRC is working toward revising 10 CFR Part 100 to remove some of the specific details which the NRC has found are unrealistic or unnecessary. It seems that this type of problem should be avoided in 10 CFR Part 60.

52. There is need for improving the paragraph and respective subparts numbering system. As it now stands, referencing or finding a particular subpart is very cumbersome.