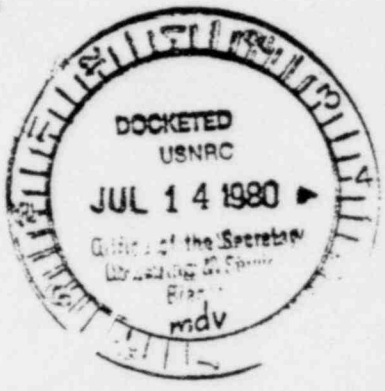
United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092

JUL 10 1980

In Reply Refer To:
EGS-ER-80/482
Mail Stop 760

DOCKET NUMBER
PROPOSED RULE PR-60 (12)
(45 FR 31393)



Secretary
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Sir:

We have reviewed the advance notice of proposed rulemaking on technical criteria for regulating geologic disposal of high-level radioactive waste as requested in the Federal Register of May 13.

On the whole the document represents significant progress toward defining technical criteria for high-level waste (HLW) repositories. The overall approach to development of the criteria appears to be sound and appropriately conservative for establishment of a regulatory framework for the licensing of a new technology. Considerations given within the supplementary information are well thought out and adequate, and a rule structured upon these considerations would likely address the important issues properly.

In particular, we believe that section 60.111(c), Performance of required barriers and engineered systems, represents a sound approach to licensing. It is sometimes stated that only the performance of the total waste isolation system is relevant to licensing and performance requirements. But assessing the total system, whether by models or some other approach, is an extremely complex undertaking subject to considerable uncertainty as the supplementary information points out. By requiring each major element in the waste isolation system to independently meet certain performance objectives, the proposed rules break the problem down into more manageable parts and allow for uncertainties in the performance of some components. The requirements stipulated for the major barriers in 60.111(c) should, when met, provide reasonable assurances that the short-lived fission products (especially Sr and Cs) will be isolated from the accessible environment. The prognosis for the longer-lived radionuclides will always be more uncertain than for Sr and Cs, but the longer-lived nuclides may present a lower risk.

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Acknowledged by card. 7/14/80 mdv

Page 31397, col. 1, part (3). In the first paragraph the phrase "so that the site can be easily understood" could be made more precise by substituting in future documents "so that geologic and hydrologic conditions can be easily extrapolated from one area to another."

Page 31397, col. 2, part (5). It would seem almost impossible from a practical standpoint to codify in the regulations the models to be used to simulate the geologic processes affecting the performance of a repository. However, in view of the fact that predictions of alternative possibilities cannot be made without modeling, the regulations should state that judgements of the adequacy of a site will be based in part on the results of modeling. The statement in the regulations regarding modeling should be more positive than merely allowing the use of models. It should make it clear that the use of appropriate models will be expected particularly for predictive purposes. Without such models there will be no sound basis for forming expert opinions as to overall site suitability.

The appropriateness of the various models for their intended purpose and the degree to which the models approximate natural conditions must be evaluated. We question the assumption that only "old models" will be used in the foreseeable future.

It appears inconsistent to permit the use of quantitative models to compare sites and designs, which involve evaluation of the same parameters and uncertainties as a licensing decision, but to downgrade their significance in a licensing decision. Models are an essential tool for evaluation although they may be insufficient as a sole basis for judgement.

Page 31398, col. 2, part (7). It is noted that human intrusion cannot be prevented and that such intrusion may be either deliberate or inadvertent. Is it suggested that design of the repository consider methods that would facilitate intrusion and recovery of the wastes? Extensive knowledge of the repository and its contents would seem to be the best way of protecting future generations from the deliberate intruder. It would seem fruitless to try to specify a time when either deliberate or accidental intrusion is most likely to occur or to try to define a "reasonable" period of time.

Page 31400, cols. 1 and 2, sec. 60.111. We support the performance objectives presented here. Although demanding, they seem to be attainable, though at considerable cost in funds and at a cost of several years delay in attaining operational status for a repository, when compared to the performance characteristics DOE formerly assumed.

Page 31400,col. 2, par. (3)(ii). We suggest the following insertion: "at a rate that is as low as reasonably achievable and in no case greater than an annual rate of one part in one hundred thousand" (addition underlined).

Page 31400, cols. 2 and 3, sec. 60.121. This section might be modified to specify that prior to granting a permit for normal and routine operations, DOE shall have acquired the lands. We doubt that lands need to be permanently

acquired by DOE during preliminary site characterization or even in situ characterization. We expect that several sites will need to be evaluated for each one found to qualify, and premature assignments to DOE could deny other valid use (such as grazing, timber, etc.) that do not have the potential to compromise the site for repository uses.

Page 31400, col. 3, sec. 60.122. The tenor of (a) is that only the simplest of geologic sites need be considered. This is too restrictive; rather the point should be that the knowledge acquired be complete and thorough, regardless of how difficult this was to do or how complicated the details may appear as they become understood. In reality, most "simple" sites have been and are subjected to very complicated geologic processes of recrystallization (WIPP), creep and/or folding (WIPP), emplacement as domes with differential flow between portions of the body, complex regional stresses and resulting fracture patterns, and so forth.

Page 31401, col. 1, pars. (ii) and (iii). How is it possible to present bounding values, etc., that affect "demonstration" of repository stability or nuclide isolation?

Page 31401, col. 2, par. (v). This paragraph should be augmented by specific reference to sorption properties ("K_D") determined in situ at the candidate site.

Page 31401, col. 2, par. (vi). Detailed characterization of this large volume of rock using available or foreseeable geophysical methods does not appear possible.

Pages 31401-31402, sec. 60.122(b). This part specifies those potentially adverse conditions which may result in the major components of the system not meeting the performance objectives of section 60.111(c). At this point, the language seems to depart from the sense intended in section 60.111 in that repeated references are made to the geologic repository (total system), not individual barriers. For example (p. 31401, col. 3, par. (1)(ii)), prior drilling to depths below the lower limit of the accessible environment will not affect the waste package and, depending on depth, may not affect the underground facility. It most likely would affect the geologic environment. It would sharpen up the regulations and make the potentially adverse conditions less sweeping if the following changes in language were made:

1) On page 31401, col. 2, last sentence: "The presence of any of the potentially adverse human activities or natural conditions will give rise to a presumption that <u>those barriers affected by the adverse human activity or natural condition will not meet the performance objectives of 60.111(c)</u>" (change underlined).

2) On page 31402, col. 1, par. 4, sentence 2: "A presumption that <u>any of the major barriers will not meet the performance objectives stated in 60.111</u> can be rebutted upon showing that the presence of the potentially adverse condition does not adversely affect the performance <u>of any of the barriers within the system</u>" (change underlined). As it stands, the applicant might argue that the waste package alone ensures that the system will perform as required and that therefore any adverse condition may be tolerated.

Page 31401, col. 3, par. (1)(vi). The statement about the effect on the regional ground-water flow system of large-scale impoundments is vague. The statement should specify which elements of the flow system might be affected and the extent of change that would be considered significant.

Page 31401, col. 3, par. (2)(i). The term "extreme" is vague in this context. The concern here, presumably that erosion might exhume the repository, should be stated explicitly.

Page 31401, col. 3, par. (2)(iii). With the exception of fracturing ("fracture zones" is not a process), the processes listed could result in structural deformation of the volume of rock in a repository. However, it should be stated that structural deformation is significant to the extent that it results in an increase in the hydraulic conductivity of the rocks (through fracturing), and the consequent increase in the rate of leaching and transport of waste radionuclides. Uplift or subsidence may not be harmful by themselves if they are not differential within the candidate area.

Page 31401, col. 3, par. (2)(iv). The phrase "near field of a fault" requires definition. In fact, the whole question of how to assess tectonic conditions and future tectonics could well be the subject of a Regulatory Guide.

Page 31402, col. 1, par. (vii). This criterion is questionable. We believe a more relevant criterion would be "There are geophysical indications of the presence of a magma body at depth." A cooling regime is as likely to have a high gradient as a warming regime, but would not be equally adverse.

Page 31402, col. 1, par. (3)(i). "Storativity" is somewhat an archaic word; "storage coefficient" clearly indicates the attribute intended.

Page 31402, col. 1, par. (3)(iii). Refer to our comment (above) regarding page 31401, col. 3, par. (1)(vi).

Page 31402, col. 1, par. (3)(iv). What is the basis for stipulating a horizontal fault length of "more than a few hundred meters?" There is no obvious relation between fault length and hydraulic properties.

Page 31402, col. 1, par. (4). Clarify as follows: "...Geochemical. The sum of the rock units ... exhibits ....".

Page 31402, col. 2, par. (4)(c), line 11. Clarification is requested as to what constitutes full documentation. Does this imply QA standards or some lesser set of records?

Page 31402, col. 2, par. (c), Favorable characteristics. The first paragraph contains the notion of isolating the waste from the accessible environment by restricting the access of ground water to the waste. A repository depth of 300 meters would place the waste below the regional water table in most of the United States. It must be assumed, therefore, that after some time the closed repository would be saturated. Of most significance is the travel time of ground water and its contained radionuclides from the repository to a discharge area or some other accessible part of the environment. The notion of restricting the access of ground water to the waste is meaningful only over the short

term with respect to an engineered barrier such as the waste container. The movement of the water and nuclides through the geologic medium is related to its natural characteristics and the effect, on the hydraulic conductivity of the medium, of stresses produced by the presence of the repository.

Page 31402, col. 2, par. (1)(ii)(b). What is meant by "inactive ground-water circulation?" Virtually all ground water is moving but rates of movement can range over 20 or more orders of magnitude.

Page 31402, col. 2, par. (1)(ii)(C). What is meant by near-normal pH?

Page 31402, col. 3, par. (iii)(a). This paragraph should read "very low ground-water content."

Page 31402, col. 3, par. (iii)(b). Stipulation of "prevent ground-water intrusion" is in clear contradiction of section 60.101(3) which assumes disposal in a saturated medium--by definition a zone where ground-water intrusion must occur. In reality, what is to be regulated is not the presence of water, but its movement. We suggest rewording: "(b) Retard circulation of ground water in the host rock."

A generalization about Section 60.122 is that in many ways these attributes resemble the general site acceptability criteria described on page 31397, item 4, last paragraph.

Page 31402, col. 3, par. (iii) (d). Low hydraulic gradients are commonly indicative of high permeability and rapid water movement. A low hydraulic gradient does not indicate a low rate of water movement. Conversely, a high hydraulic gradient does not imply rapid water movement. What is the intent here?

Page 31402, col. 3, par. (vii). Assuming that a reasonable range of climatic extremes can be postulated, it is difficult to conceive of a relationship between climatic change and tectonic characteristics.

Page 31403, col. 3, par. (b)(2). There is vagueness here as to whether the retrieved wastes were recovered because they failed themselves, or were recovered because of a failure of some other portion of the repository, or for an institutional reason. We believe there normally would be time to rig the special facilities required for failed canisters before retrieving them, but the present statement does not distinguish among the kinds of facilities needed as related to reason for retrieval.

Page 31404, col. 3, par. (5). Substitute the word "build" or "construct" for "design."

Page 31404, col. 2, par. (iv)(b) and (c). These two items should demand equally effective sealing. We believe that item (b) is so demanding as to be virtually impossible to attain: restoring the disturbed annulus about any hole or shaft to the same or higher performance as a barrier to migration than the original rock will be a heroic undertaking in general. Section 60.132(c)(2)(v) then prescribes how to do this task (with multicomponent seals), a suggestion that may be unwarranted in view of present (and possibly of future) understanding of borehole sealing technology. We suggest paragraph (v) be merged into other paragraphs.

Page 31405, col. 1, par. (5)(i) and col. 2, par. (9)(v). Both paragraphs deal with water-bearing rocks encountered in subsurface facilities. As written these are vague. It would be more appropriate to set limits to permissible potential inflows from aquifers. In the event of failure of the positive control device (linings, grouting, etc.), the repository might be flooded if the capacity of the water control system is exceeded. Furthermore, the potential inflow specifies the capacity of the devices that must be supplied to restrict the release of radionuclides through mine waters that must be routinely pumped or would need to be discharged to contain or recover from flooding.

Page 31406, col. 1, part (e). The quality assurance records demanded by section 60.171 are not integrated with this section. Must <u>all</u> the records demanded by section 60.132(e) meet QA standards?

Page 31407, col. 2, par. (5). This paragraph prohibits the presence of chemically toxic wastes, which is what many radioactive wastes are. The wording about the chemical toxicity of these wastes should be deleted or modified.

Thank you for the opportunity to comment.

Sincerely yours,

for H. William Menard
Director