



Department of Energy  
Washington, DC 20585

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Mr. Joseph J. Holonich, Director  
Repository Licensing and Quality Assurance  
Project Directorate  
Division of High-Level Waste Management  
Office of Nuclear Material Safety  
and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Dear Mr. Holonich:

On December 14, 1990, the U.S. Department of Energy (DOE) responded to the U.S. Nuclear Regulatory Commission's (NRC) objections, comments, and questions on the Site Characterization Plan (SCP). In a letter from the NRC on July 31, 1991, the staff evaluated DOE's responses and closed some of the open items.

Technical exchanges (TEs) between the DOE and NRC sometimes provide an opportunity for DOE to learn what information NRC needs to close open items; however, TEs are not the proper forum to agree that open items are closed. The recent technical exchange in Pasco, Washington, "Waste Form: Spent Nuclear Fuel" on February 25-26, 1992, focused on the status of DOE's research in the areas of fuel cladding and spent fuel oxidation and dissolution. As a follow-up to the information discussed at the TE, DOE has a supplemental response to Question 31 of the Site Characterization Analysis (SCA). Two outstanding concerns were identified in the NRC evaluation of DOE's response to Question 31 (enclosure 1). These were:

DOE's response does not provide any justification for their estimates of cladding failures. DOE does not indicate how spent fuel "leakers" would be identified and fixed prior to emplacement in the repository.

The December 14, 1990, response to SCA Question 31 (enclosure 2) was not meant to provide a definitive estimate of the time-dependent behavior of cladding failure in a repository environment. Insufficient research has been performed in characterizing spent fuel performance to conclusively identify failure mechanisms and rates for emplaced spent fuel. In addition, repository design has not progressed to a point where the expected spent fuel environment (e.g., temperature, chemistry, etc.) in the repository can be defined. The failure rates quoted for the performance allocation presented in the SCP were intended to bound expected failure rates based on engineering judgement at that time. This performance allocation

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is considered sufficient as a site characterization planning basis, which was the scope of the SCP. If any performance is allocated to the cladding in a licensing-basis performance assessment, it will be justified on the basis of information available from site characterization and waste form research at that time. With respect to damaged spent fuel pins, DOE will collect data on failed fuel from the owners and generators of spent nuclear fuel via the Nuclear Fuel Data Form RW-859 as required by the Standard Contract for the Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (10 CFR 961). DOE does not currently plan to identify or repair leaking fuel pins at the repository prior to packaging and emplacement.

DOE considers this amended response to be sufficient to resolve SCA Question 31, and considers this item closed for the purposes of NRC's review of the SCP.

If you have any questions, please contact Cori Macaluso of my staff at (202) 586-2837.

Sincerely,



John P. Roberts  
Acting Associate Director for  
Systems and Compliance  
Office of Civilian Radioactive  
Waste Management

Enclosures:

1. DOE Response to SCA Question 31
2. NRC Evaluation of DOE Response

cc: w/ enclosures

R. Loux, State of Nevada  
T. Hickey, Nevada Legislative Commission  
M. Baughman, Lincoln County, NV  
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QUESTION 31

It is stated that, for spent fuel, reliance (i.e., performance allocation) is placed on the cladding during the early years to limit the release of radionuclides with short half lives. How can performance allocation or reliance be placed on the cladding of those spent fuel elements which fail or "leak" during reactor operation? Will spent fuel "leakers" be identified and fixed prior to packaging for emplacement in the repository?

BASIS

- o During normal reactor operation, the cladding of a small percentage of the fuel elements can be expected to fail or leak, exposing the fuel elements to leaching conditions.
- o Existing spent fuel rod consolidation technology appears to damage the cladding of an additional small percentage of those fuel assemblies undergoing rod consolidation.
- o The spent fuel of those elements with damaged or failed cladding will be directly exposed to the leaching conditions of any water which may collect or develop in the repository horizon.

RECOMMENDATION

Provide justification for allocating performance to spent fuel cladding, given the knowledge that a small percentage of the spent fuel will have failed cladding on emplacement, and identify any plans to repair fuel with damaged cladding prior to emplacement.

RESPONSE

A tentative goal of <2 percent failed cladding for the first 100 years post-emplacement was set in the Site Characterization Plan (SCP) (Table 8.3.5.9-3). SCP estimates for this number increase with time (<5 percent for  $100 < t < 300$  years (50 percent for  $t > 300$  years). Current estimates of the initial fraction of failed rods are well below 2 percent of the inventory. Note that cladding is allocated performance, in part, to control the potential release of the released fission gas and the "gap inventory" of water soluble radionuclides such as cesium and strontium (see the discussion of Performance Measure for Cladding on SCP page 8.3.5.9-32). Pins with failed cladding will have already released their inventory of plenum fission gas and the gap inventory of fission products. The only remaining need to rely on cladding performance is to limit the oxidation of the fuel at elevated temperatures in air.

Section 8.3.4 Waste package program (Waste package postclosure compliance strategy, p. 8.3.4-4)

SCA QUESTION 31

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EVALUATION OF DOE RESPONSE

- o DOE's response does not provide any justification for their estimates of cladding failures.
- o DOE does not indicate how spent fuel "leakers" would be identified and fixed prior to emplacement in the repository.
- o The NRC staff considers this question open.