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NUCLEAR REGULATORY COMMISSION
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January 11, 2001

MEMORANDUM TO: Farouk Eltawila, Acting Director
Division of Systems Analysis
and Regulatory Effectiveness
Office of Nuclear Regulatory Research

FROM: E. William Brach, Director ***/RA/***
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

SUBJECT: DRAFT RESEARCH INFORMATION LETTER ON "BURNUP CREDIT FOR TRANSPORT AND DRY CASK STORAGE OF PWR SPENT NUCLEAR FUEL"

The Spent Fuel Project Office (SFPO) and Division of Waste Management have reviewed the Office of Nuclear Regulatory Research (RES) subject draft Research Information Letter (RIL). Comments from both divisions can be found in the attachment. We appreciate the efforts RES has given to the burnup credit topic. A lot of valuable information has been developed that will be useful to SFPO in rendering regulatory decisions. We continue our support of your activities to resolve the remaining issues on burnup credit to further enhance the staff and licensee guidance on this topic.

If you have any questions on the comments please contact Carl Withee, of my staff. He can be reached at 301-415-8534.

Attachment: Draft RIL comments

cc: J.T. Greeves, NMSS/DWM

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FROM: E. William Brach, Director *(Original Signed by*
Spent Fuel Project Office *M.W. Hodges for:)*
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Comments on
Research Information Letter RIL-000X

1. The basis for the cost benefit statements needs updating. More recent storage designs have fairly well optimized the capacity of storage casks where weight and pool size are now becoming the controlling factors without the use of burnup credit. Current designs have reached a capacity of 32 PWR fuel assemblies, which appears to be close to the practical limit.

2. The RIL characterizes Interim Staff Guidance No. 8, Revision No. 1 (ISG8R1), as restricting the use of burnup credit in certain areas. ISG8R1 does not prohibit the use of burnup credit in the identified areas. This ISG was prepared with the information on hand at the time to provide relief to licensees. The staff recognized that the ISG coverage would be expanded as more information became available. The ISG has limited initial coverage due to the limited technical basis available to the NRC. However, an applicant can request a wider range of burnup credit with adequate justification. As additional technical bases are developed the range of coverage by the ISG will be expanded. This comment applies to several places in the RIL.

3. The statement in the first paragraph of the Background section implies that dry storage casks are being designed to eliminate further handling once the canister has been loaded. At this time, the extent to which current storage canister designs will be accepted for burial in a repository without further fuel handling is not know. Therefore, one can not assume elimination of all future fuel handling.

4. In the second paragraph of the Background section, the RIL states that the radiation and thermal sources of assemblies considered for transport and dry storage have decreased. This is not correct. The typical burnup for the spent fuel has and continues to increase over time. For shielding purposes, the industry is mixing the fuel in a cask with shorter cooled fuel and/or high burnup fuel in the center and longer cooled fuel and/or low burnup fuel in the periphery. Thus, shielding as well as thermal considerations are becoming more complex and continue to be major factors along with criticality safety in the loading and design constraints for spent fuel casks.

5. The fourth paragraph in the Background section should be revised to make it clear that the reason we have no regulatory experience in the United States with the licensing of a burnup credit cask design is because no application for this has been received. ISG8R1 on burnup credit has been in place for a year and a half.

6. The discussion of selected issue Number 1 on cooling time needs to acknowledge the potential for future problems if the cooling time basis for burnup credit is allowed to be extended too far. For example, initially the reactivity of spent fuel decreases with cooling time but starts to increase after about 200 years. Thus, if a burnup credit design point is too far down the decay curve, it may create a regulatory issue if the fuel remains in the original canister for more than 200 years and could mean that the canister can't be used in the repository. Also, multiple loading curves based on cooling times will make the implementation more complex.

7. In the discussion of selected issue Number 3 on the bounding axial burnup profiles, there is no mention of the fact that virtually all of the data in YAEC-1937 are calculated profiles derived from core physics codes. The discussion does not mention the need to benchmark and establish the uncertainty in the data. This uncertainty needs to be estimated before one can assess how much reliance to place on the data. Also, The statistical argument provided in the report, applies when the sample size is large and random. Finally, the report implies that use of the data base will replace the need for burnup verification. This verification will be needed regardless of what profile is used.

8. The discussion of selected issue Number 4 on eliminating the loading offset as a function of enrichment needs to address the following three points. The first point revolves around the statement that the negative reactivity from fission products that are not currently included in burnup credit helps justify elimination of the offset. This point does not address the action to be taken if an applicant wants to include the negative reactivity of fission products in its burnup credit analysis. The second point involves the argument that more isotopic data will soon be available and thus the offset should be eliminated now. This argument seems to presuppose how much data will be available, how good the data will be, and what the data will show. Why not wait until we can assess the data before eliminating the offset? The third point is that the results of the French isotopic analyses using their 2D code and cross section library may not be appropriate. Isotopic data are needed for enrichments between 4.0 and 5.0 percent by each licensee to perform isotopic validation using their codes and cross sections. Additionally, it is not clear how one is to apply the argument about sensitivities. Finally, we find the first paragraph in the discussion confusing.

9. We want to provide a note of caution on the discussion of the burnup measurements in the section on progress and plans for other activities. It is very difficult to perform measurements that determine the burnup in an absolute sense. The measurements described in ISG8R1 can be calibrated against the reactor records, and thus, only check internal consistency in the reactor records and provide some protection against a misloading.

10. The attached report discusses Integral Burnable Absorbers (IBAs). The results presented show that fuels without IBAs are more reactive than fuels with IBAs after discharge. It is not clear why the burnable poison in fuel with IBAs is not fully depleted at some point during burnup. Reference 10 needs to be examined. If this is the case the RES recommendation may be appropriate.

    With regard to fuel assemblies with Integral Fuel Burnable Absorbers (IFBAs) being more reactive than those without IFBAs, the recommended options (i.e., including a small reactivity bias or relying on the bounding BPR effects) appears worth considering provided the effects of other rod types such as axial power shaping rods and fuel assemblies exposed to control rods are also included.