

March 1, 2004

Dr. James F. Mallay, Director
Regulatory Affairs
Framatome ANP, Inc.
P.O. Box 10935
Lynchburg, VA 24506-0935

Dear Dr. Mallay:

I am writing to reply to your letter of December 15, 2003, to Dr. Ralph O. Meyer of my staff about extending our cooperative research to include high-burnup fuel with M5 cladding. You expressed several reservations about continuing this cooperation based on three specific concerns with the current program on unirradiated M5 cladding. I want to address each of those concerns.

First, you expressed concern that some M5 specimens were etched prior to testing without your being informed of the procedure in advance. You had described this concern in an earlier letter to Dr. Meyer on May 5, 2003, in which you also stated that you found the result of considerable interest and asked for additional details (which were provided). I understand that you discussed this letter further with Dr. Meyer and indicated that a written reply on this matter was not necessary.

I have reviewed this situation and found that Dr. Meyer discussed this matter by phone with the lab, while lab personnel were in the middle of specimen preparation. It was his opinion that etching was relevant to determine if surface condition had an effect on high-temperature oxidation. He therefore encouraged the lab to try etching. In retrospect, it is clear that improvements could — and should — be made in the information flow between the laboratory, the NRC, and the cooperating partners in this program. We will make an effort to improve our communications to ensure that changes in procedures are brought to the attention of the technical committee members.

Second, you expressed concern that 10 CFR 50.46 has not been changed to include the M5 cladding alloy. In 2002, the NRC was considering a direct final rule to add M5 to 10CFR 50.46 when the staff realized that the comment period had ended before the staff became aware of a potential concern over the post-quench ductility of zirconium-based niobium alloys. Upon staff review, it was determined that a direct final rule would not be prudent, inasmuch as the public did not have an opportunity to comment on the significance (if any) of the newly identified concerns on post-quench ductility.

Given that other cladding materials with improved characteristics are expected to be developed in the next few years, the staff believes that it would be a more efficient use of agency resources to develop a rule that will allow the use of “zirconium-based cladding materials” that are defined by performance-based criteria, as discussed in SECY-02-0057. The Office of Nuclear Regulatory Research is currently conducting research to support the performance-based rule, and this research should be completed in FY2005. Using the results of this research, the staff plans to develop the technical basis to support the performance-based

criteria for zirconium-based cladding material. This work will also support a revision of the existing prescriptive criteria such that they could be applied to M5 as well as the other alloys currently mentioned in the rule. The proposed rule would then be issued for public comment in early FY2006, and the final rule would be issued as soon as possible thereafter.

Third, you expressed concern about the type of test that is being performed to assess the embrittlement criteria in 10 CFR 50.46(b). We are performing ring-compression tests as agreed at our meeting with your staff (also EPRI, Westinghouse, and ANL) last June. Since that time, EPRI and other industry representatives ask for a change from ring-compression tests to impact tests. Your recent letters support that request.

We agree that the basis for determining acceptance criteria in 10 CFR 50.46(b)(1) and (2) should not be changed at this time. However, during a meeting on this subject on October 24, 2003, industry representatives claimed that the original basis (ductility as measured by ring-compression tests) was changed in 1988 to a new basis (strength as measured by impact tests) as part of the best-estimate rule change in 10 CFR 50.46. We do not agree that this change took place.

The confusion arises from a staff report (NUREG-1230, 1988), which was cited as a reference for changes to 10 CFR 50.46 that were made in 1988. In that report, there is a recommendation that Chung and Kassner's criteria be used for predicting cladding failure due to thermal shock and fuel handling. These cladding-thickness criteria were based on their impact tests (NUREG/CR-1344, 1980), which have been cited as demonstrating that the current criteria (2200°F temperature limit, and 17% oxidation limit) are conservative with respect to cladding failure during quenching.

The criteria that were recommended in NUREG-1230 were never adopted. Changes to the rule in 1988 were confined to the specification of acceptable evaluation models in 50.46(a). The Statement of Consideration for the rule change (53 FR 35999) comments on the acceptance criteria in 50.46(b) and states, ". . . that the Commission did not give consideration to altering them in the final rule." Thus, our review of the record shows that the basis for the temperature and oxidation limits in 50.46(b)(1) and (2) was not changed in 1988. Therefore, the basis for the current regulation is still the retention of non-zero ductility rather than the maintenance of cladding strength. NUREG reports may contain results and recommendations, but they do not by themselves constitute agency positions or alter regulations.

Although the current effort was intended to result in minimal changes to the acceptance criteria in 50.46, the NRC is always open to suggestions for other changes. If Framatome is proposing to change the underlying basis for the regulation from ductility to strength, we are willing to consider changes to the regulation that reflect this approach. This approach would most likely require an assessment of LOCA-related loads as well as an assessment of fuel rod strengths. Load assessment is not currently in our research plans. Such a change would necessitate a revision of the scope, funding, and schedule of our cooperative research programs. We would welcome an industry initiative to define these loads and, if desired, to petition to NRC for a rule making under 10 CFR 2.802.

I hope that these comments are adequate to address your concerns. We value our cooperation with Framatome and urge you to resume discussions of an extension of our Memorandum of Understanding to cover high-burnup fuel rods with M5 cladding. As you are probably aware,

the addition of such fuel rods to our program at ANL is included in our recent updated program plan for high-burnup fuel. You may call me directly if you have any further concerns, or contact Dr. Meyer to arrange the management meeting you requested.

Sincerely,

/RA/

Farouk Eltawila, Director
Division of Systems Analysis and Regulatory Effectiveness
Office of Nuclear Regulatory Research

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