NUCLEAR ENERGY INSTITUTE

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Mr. William H. Ruland
Director, Division of Safety Systems
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: 10CFR50.46(b) Rulemaking - Revising the Emergency Core Cooling System (ECCS) Cladding Embrittlement Criteria.

Project Number: 689

Dear Mr. Ruland:

The purpose of this letter is to communicate our concerns regarding NRC's plan to revise the emergency core cooling system (ECCS) cladding embrittlement criteria defined in 10CFR50.46(b)(1) and (b)(2). The industry would support an appropriate rulemaking campaign, but does not believe that there is a sufficient safety concern to justify the current rulemaking schedule without first resolving several key technical issues.

The NRC initiated a test program at the Argonne National Laboratory (ANL) a number of years ago to investigate high burnup effects on fuel embrittlement under loss of coolant accident (LOCA) and post-LOCA conditions. Although the test program identified several new burnup-dependent phenomena, such as, 1) decrease in ductility with hydrogen pickup, 2) breakaway oxidation, and 3) inner surface oxygen uptake, the industry believes these new discoveries do not present a safety concern due to methodology conservatisms. Additionally, there is a lack of potential for high burn-up fuels to even reach limiting high temperatures during a LOCA. The industry's position on this subject has been communicated to the NRC and we believe that NRR agrees with our conclusion that this issue is not an immediate safety-concern. Nonetheless, we understand that the rulemaking is proceeding prior to completion of a number of key planned tests and resolution of several important industry concerns.

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The industry has identified three unresolved issues which must be addressed to reduce unnecessary licensee/vendor burden. The ACRS, in a letter to Chairman Klein dated December 18, 2008, noted and acknowledged the merit of these key industry objections. These issues are summarized below and described in detail in the attachment.

1. Including a cladding inner surface oxidation requirement without quantification of the phenomenon.
2. Including a periodic breakaway oxidation testing requirement when modern cladding alloys used in U. S. reactors show significant margin.
3. Uncertainty in the final treatment of the embrittlement changes in the region of the clad that may balloon and burst during a LOCA.

The industry does not believe the currently envisioned full scope implementation effort is justified from a public health and safety point of view, particularly in light of the unresolved issues. Furthermore, the current NRC rulemaking plan is limited to post quench ductility concerns. This area of post quench ductility is located away from the cladding region that will balloon and burst during a LOCA; thus, there is the possibility of another rule revision or additional requirements for the ballooned region in the future.

Elements of the proposed rule are expected to be released for public comment in July 2009, and the final proposed rule is expected to be provided to the Commission in August of 2010. The industry would support an appropriate rulemaking campaign, but does not believe that there is a sufficient safety concern to justify the current rulemaking schedule without first resolving the above technical issues. It is strongly felt that if the rulemaking process must proceed at this time, then the proposed rule change should remain at a high level (e.g., maintain 2% post-LOCA ductility). Such a change would allow compliance details to be specified in lower level documents; thus, providing the industry some flexibility during implementation. Additionally, this action would allow those details to be more readily changed as new information becomes available. The industry also feels it is very important that any new rule should include an implementation plan that takes into account the time required for new methodology development, licensing submittals, and NRC reviews.

The implementation costs of this proposed rulemaking, involving methodology changes and re-licensing, will be on the order of several hundred million dollars for the US fleet. Completing the rulemaking now before the open issues are resolved could add substantially to this cost due to the inclusion of unnecessary conservatisms that could limit plant operations. Depending on how the ballooned region is eventually addressed, the cost could double if another rule revision would require a licensee to demonstrate compliance again.

In conclusion, the NRC staff is proceeding with development of a rule change for 10 CFR 50.46(b) that is perceived to be pre-mature. We would be pleased to meet with your staff to discuss our concerns and the activities that are in place to address them.

If there are any questions regarding these comments, please contact me at 202.739.8137; jhr@nei.org or Gordon Clefton at 202.739.8086; gac@nei.org.

Sincerely,

James H. Riley

Attachment

c: Ms. Tanya M. Mensah, NRR/ADRO/DPR/PSP, NRC
Mr. Paul M. Clifford, NRR/ADES/DSS, NRC

Mr. Ken Yueh, EPRI

Comments/Recommendations

Projects are underway that should provide the additional data needed to address the unresolved technical issues related to the cladding embrittlement rulemaking. Our concerns and the activities underway to address the related issues are described below. Industry requests that the rulemaking be postponed until after this additional information is available.

The proposed rule includes a new requirement to account for cladding inner surface oxygen uptake in regions of the fuel rod far removed from the burst opening. The proposed rule assumes that this occurs at the same rate as the outside surface oxidation away from the region in the fuel that is predicted to balloon and burst during a LOCA. Evaluations of the impact of the inner surface oxygen uptake on post quench ductility have not been completed. Conservatively assuming the same impact as outer surface oxidation can significantly and unnecessarily penalize the industry without any safety gains. The industry is conducting tests to quantify the extent and impact of this phenomenon. This testing is scheduled to be completed in the summer of 2010.

The proposed rule will contain periodic testing requirements. These requirements were precipitated by the very short breakaway oxidation times observed in Russian zirconium based alloys fabricated via an electrolytic process. Western alloys, which do not use this electrolytic process, do not show short breakaway oxidation behavior and therefore there is insufficient justification to place periodic testing into the rule. The industry believes existing QA programs coupled with process qualification testing can provide sufficient controls against breakaway oxidation. The industry is conducting tests in an attempt to isolate the cause of short breakaway oxidation times observed in the electrolytic Russian E110 alloy. If this cause is applicable to cladding materials used in US plants, the industry will institute appropriate manufacturing controls. The tests should be completed in the summer of 2010.

The current NRC-NRR rulemaking plan is limited to the clad post quench ductility region away from the cladding region that will balloon and burst during a LOCA. This approach does not ensure the integrity of the entire fuel rod. With NRC-RES conducting further research into phenomena related to the ballooned region, the industry is faced with the possibility of a second round of rulemaking or additional requirements in the future that could further increase the industry burden. Absent of any imminent safety concern, the industry feels the current rulemaking effort must be delayed so that planned evaluations and tests can be completed. Results from these tests will allow for adequate disposition of the entire fuel rod within the context of the ECCS embrittlement criteria. In support of this effort, the industry also plans further study of the ballooned region and is in the process of consolidating and evaluating existing data in order to determine the extent of additional testing needs. This determination will be made by early 2010.