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Proposed Changes to the ECCS Regulations

Ref.: 1. NRC Memorandum, Ashok C. Thadani to Samuel J. Collins, "Research Information Letter 0202, Revision of 10 CFR 50.46 and Appendix K," June 20, 2002.

Introduction

A number of initiatives have been undertaken in the last few years to evaluate the appropriateness of the ECCS acceptance criteria associated with cladding temperature and oxidation contained in 10 CFR 50.46. Framatome ANP recognizes there is adequate basis for reconsidering these criteria because these portions of the regulation were developed more than 28 years ago and because much experimental work has been conducted since then on the behavior of cladding materials. In addition, Framatome believes regulations should be based on the "best science" available, where feasible. Despite these factors, however, Framatome ANP does not support the idea of making any major changes in the ECCS regulations.

Framatome believes that proven advanced cladding materials must be included in the regulation and is pleased that the NRC is proceeding to specifically incorporate M5 as an acceptable material. The NRC's decision to add M5 to 50.46 is a natural and expected outcome of the work Framatome performed to demonstrate the superior performance of this alloy.

Regulatory Options

The NRC has proposed several modifications to the ECCS-related regulations (see Reference 1). These changes could be incorporated as mandatory requirements or as options, which would permit the retention of current models. After due consideration, the latter approach is recommended in Reference 1.

Providing options is, at first glance, attractive because it avoids placing an obligation on the industry to make costly changes to its evaluation models. However, Framatome questions the advisability of taking this step, regardless of how benign it appears. First, a large effort would be required within NRR to conduct a rulemaking, and a similar effort would be needed by Research to technically support the proceeding. Second, even if a case were made that such an effort would have regulatory value, we doubt that licensees would be willing to make the sizable investment to pursue such options.

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Framatome ANP concludes that the time needed to institute the proposed changes or to incorporate significant changes into the various evaluation models would not be cost effective. In addition, we firmly believe that no change is required to ensure a more than adequate level of safety.

Among the criteria specified in 50.46 and in Appendix K related to ECCS criteria and analysis are the handling of decay heat and the limitations on calculated peak cladding temperature and cladding oxidation. The following discussion addresses these topics in the context of what is being proposed by the NRC.

Decay Heat

The conservatisms imposed by Appendix K were established for two reasons: (1) to ensure that uncertainties in the models were bounded, and (2) to address the general lack of knowledge possessed about LOCA phenomena at the time the rule was promulgated. One of the major conservatisms contained in the ECCS regulation is the 20 percent margin imposed on the calculation of decay heat. We recognize that this particular conservatism on a physical phenomenon that is well understood and characterized is probably excessive. There is certainly justification for reducing or removing this 20 percent margin. However, because of (2) above, there remains a valid basis for retaining this margin to cover other items that are not demonstrably conservative.

Framatome does not believe the effort required to make a change in the decay heat conservatism has a commensurate value for the future applications of approved Appendix K evaluation models. Framatome bases this position on two factors. First, the regulations already permit the option of reducing the 20 percent conservatism in best estimate models. Framatome has applied this option in its realistic LOCA model. The CSAU process used in the development of realistic methods provides useful information on which models in the code are conservative and which models have significant uncertainties. We conclude that resources are better spent on further refinements of realistic models rather than modifying an Appendix K model that contains several unrealistic features. Continuing to concentrate on realistic models provides opportunities to improve our calculational capabilities. Similarly, NRC resources would be better applied to reviewing realistic submittals rather than trying to modify Appendix K models.

Second, the NRC has stated that it will want to retain the overall conservatism of Appendix K models. To attain this goal, other areas of the ECCS analysis would have to be made more conservative, especially in those areas where assumptions and modeling techniques are not always demonstrably conservative. Making these types of changes would impose an unacceptable work load on both the NRC and its licensees. Establishing areas where the degree of conservatism could be increased would require substantial NRC staff resources, which in turn would result in having to make fundamental changes in every evaluation model—models that have been benchmarked and proven effective for many years. Pursuing this avenue of trading one less conservative assumption for an increase in conservatism of several other features as compensation is not appropriate from a regulatory, safety, or economic standpoint.

Peak Cladding Temperature and Cladding Oxidation

The two most significant criteria contained in 50.46 are the limits on peak cladding temperature of 2200F and the extent of local oxidation of 17 percent. These limits are broadly recognized as conservative. Reducing the amount of conservatism embodied in these two criteria is possible and is certainly attractive in establishing expanded operating limits.

As part of its overall initiative to risk-inform and performance-base its regulations, the NRC has proposed that these two criteria in 50.46 be made performance based. Although Framatome is very supportive of the NRC's performance-based initiative, we have severe reservations about applying the concept to a methodology containing arbitrary rules and assumptions that is designed to provide demonstrably conservative results. In addition, the cost to develop performance-based criteria and the cost to develop analytical tools to demonstrate compliance to these revised criteria would be large.

The calculation of peak cladding temperatures and the amount of cladding oxidation using current Appendix K evaluation models ensures a high degree of safety. Adding the sophistication of performance-based features to these models does not appear appropriate or cost-effective. Such an approach will generally reduce the degree of conservatism but with very limited advantages. At this time, Framatome does not believe this expenditure is justified by the potential benefit. Alternatively, the NRC and the industry can more fruitfully devote their time to the improvement of best estimate techniques.

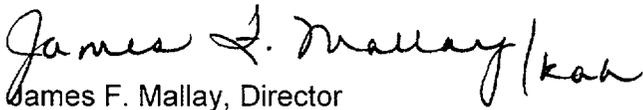
Another aspect of the oxidation criterion has to do with the correlation used to compare against the 17 percent oxidation limit. The suggestions being made concerning changes to Appendix K present two problems. First, it is recommended in Reference 1 that this comparison "should continue to be made with the Baker-Just correlation because that correlation was used in establishing the 17 percent limit." This statement is only partially correct; the 17 percent limit was based on a variety of sources, not solely Baker-Just.

Second, regulatory guide 1.157, which addresses best estimate calculations, endorses the use of the Cathcart-Pawel correlation; this position has been accepted by the NRC in approving best estimate models. The June 20 letter appears to contradict this endorsement.

Framatome believes that the present guidance contained in Appendix K and in regulatory guide 1.157 on this subject is appropriate and that changes are not needed or desirable.

Framatome has not completed its review of all the proposed changes, but notes that the discussion of items that are identified as non-conservative elements of Appendix K evaluation models has a number of problems that require further consideration. In summary, Framatome ANP does not believe there is a sound case for making any substantive changes in the current ECCS regulations regarding Appendix K evaluation models. Some of the changes being recommended have initial appeal, but on further evaluation, we conclude that none of the proposals has sufficient merit to justify the large investment required to institute them. Framatome believes that the current evaluation models and the rules that govern them provide more than adequate protection to the public and ensure a high degree of power reactor safety.

Very truly yours,

Handwritten signature of James F. Mallay in cursive, followed by the initials 'koh' in a smaller, less cursive script.

James F. Mallay, Director
Regulatory Affairs

cc: D.G. Holland
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