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A Joint Venture of GE, Toshiba, & Hitachi

Date: Feb. 15, 2001

Address Norm Lauben
U. S. Nuclear regulatory Commission
Office of Nuclear Regulatory Research

Subject: Draft Regulatory Guide DG-1096
Transient and Accident Analysis Methods.
Draft Standard Review Plan Section 15.0.2
Review of Analytical Computer Codes.

The draft regulatory guide DG-1096 [1] is a good description of the requirements for the review of new transient and accident analysis methodologies. It builds on the earlier Code Scaling, Applicability and Uncertainty (CSAU) methodology [3] and the Regulatory Guide 1.157 for best estimate Loss of Coolant Accident (LOCA) analysis [4]. By providing a detailed description of the requirement and expectations this guide has the potential to greatly simplify the review process for transient and accident analysis methods while still maintaining high quality. Thus the guide can create significant benefits to both U.S. NRC and the industry.

In general the draft regulatory guide is very well written, and I only have two significant comments:

Element 2 (see Figure 3 in Reference 1) describes the development of the assessment base. The scaling from separate effects tests (SET) and integral effects tests (IET) to full scale reactor conditions is an important element in this process. While scaling is a major concern for LOCA and other accidents, where full scale reactor data are not available, it is less of a concern for other events where full scale reactor data are available. For example, full scale reactor data are available for reactor transients or Anticipated Operational Occurrences (AOO), and therefore, while it may still be reasonable to justify the applicability of the models and correlations to full scale reactor conditions, scaling from SET and IET to full scale reactors is not needed, as full scale reactor data can be included in the assessment base. Therefore full scale reactor data should be included in the development of the assessment base for Step 7 of Element 2, and detailed scaling analysis should only be required when full scale data are not available.

The above comment also applies to the Draft Standard Review Plan Section 15.0.2,

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Section II.4 [2].

Section 4 of USNRC Regulatory Guide 1.157 [4] states that the overall calculation uncertainty should be accounted for such that the upper bound for critical safety parameters (e.g., the peak cladding temperature (PCT)) is determined at the 95% probability level. Regulatory Guide 1.157 does not specify how this is done, but leaves it to the applicant to justify the methodology. Appendix A of the Draft Regulatory Guide DG-1096 [1], tend to favor the development of a response surface combined with a Monte Carlo analysis as used originally in the development of the CSAU methodology [3], while other statistical methods for obtaining the 95% probability level are discouraged. In a discussion of the Order Statistics methodology as developed by GRS (Reference A-7 in DG-1096) it is stated: *"For example, 95%/95% limits require approximately 90 simulations regardless of the number of phenomena or processes selected as contributors. This feature is achieved through the use of unique statistical assumptions with respect to how the individual contributor uncertainty is sampled. There is not a strong non-proprietary precedence that could be used a priori by the USNRC in approving such a licensing or regulatory submittal to evaluate overall uncertainty. Accordingly, such submittals would initially require significant validation of the methodology."* This statement is not correct as the order statistics method is well established in statistics texts [5] and results from a straight-forward application of the binomial theorem. Furthermore the use of the order statistics method for uncertainty evaluations is well documented in the literature. References 6 through 13 are examples on this. Biases against non-CSAU-prescribed statistical techniques as evidenced by the above statement does not belong in the Regulatory Guide and should be removed.

For further discussion of these comments, please give me a call at (910) 675-6083.

Sincerely,

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