UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

June 15, 2004

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: DRAFT FINAL 10 CFR 50.69, “RISK-INFORMED CATEGORIZATION AND TREATMENT OF STRUCTURES, SYSTEMS, AND COMPONENTS FOR NUCLEAR POWER REACTORS”

Dear Chairman Diaz:

During the 513th meeting of the Advisory Committee on Reactor Safeguards on June 2-4, 2004, we reviewed the draft final 10 CFR 50.69, “Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors,” (Reference 1). Our Subcommittee on Reliability and Probabilistic Risk Assessment reviewed this matter during a meeting held on February 19, 2004. During these reviews, we had the benefit of discussions with the NRC staff and the Nuclear Energy Institute (NEI). We also had the benefit of the documents referenced.

CONCLUSIONS AND RECOMMENDATIONS

1. The final 10 CFR 50.69 should be issued.

2. We agree with the staff that Regulatory Guide (RG) 1.201, “Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance,” should be issued for trial use.

DISCUSSION

10 CFR 50.69 has been developed to allow licensees to implement an alternative regulatory framework with respect to “special treatment.” Special treatment refers to those requirements that provide increased assurance beyond normal industrial practice. Under this framework, licensees using a risk-informed process for categorizing structures, systems, and components (SSCs) according to their safety significance can remove SSCs of low-safety significance from the scope of certain identified special treatment requirements. Guidance for implementing 10 CFR 50.69 is contained in NEI 00-04, “10 CFR 50.69 SSC Categorization Guideline,” which the staff has conditionally endorsed in RG 1.201.

The high-level requirements for categorization and associated treatment of SSCs embodied in the proposed final 50.69 rule are appropriate and the final rule should be issued.

The guidance for implementing 50.69 included in NEI 00-04 and RG 1.201 provides an acceptable approach to the categorization, but some additional experience with the guidance is needed. Therefore, we support the staff’s proposal to issue the RG for trial use. Most of the conditions in RG 1.201 on the acceptance of NEI 00-04 can be addressed by relatively minor modifications and clarifications of NEI 00-04. The most substantial difference involves the monitoring of the performance of risk-informed safety class (RISC)-3 components.

In a Staff Requirements Memorandum dated March 28, 2003 (Reference 2), the Commission stated that "Relevant operational experience should be evaluated in an ongoing manner with the aim of reducing the uncertainty in assessing the effect of treatment on reliability and common-cause failures." 10 CFR 50.69(e)(1) requires the feedback of plant operational experience. The revised rule requires a monitoring program, but implementing such a program is a challenging task. RG 1.201 may not provide adequate guidance for implementing this program. Refining the guidance for implementing a monitoring program need not delay initial application of the rule and would benefit from experience gained from the trial use of RG 1.201.

In RG 1.201, the staff proposes the use of a threshold number based on the expected number of failures associated with the reliability values used in the categorization process and the observed number of failures over a period of time. This is not a technically sound approach. Perhaps the methods used in investigating operating experience to identify common-cause failures could offer insights into what should be done (Reference 3).

The NEI 00-04 guidance still addresses uncertainties only through sensitivity studies, limited to the parameters that appear in the probabilistic risk assessment (PRA). An Electric Power Research Institute (EPRI) study (Reference 4) showed that, in the cases studied, a rigorous parameter uncertainty analysis would not lead to a different categorization of SSCs from the one produced using point estimates based on mean values. In one instance, this was not true, i.e., a SSC was categorized as being of low-safety significance on the basis of point estimates, but of high-safety significance when uncertainty distributions were propagated rigorously. The EPRI sensitivity study, however, did agree with the rigorous results. These results are in general agreement with the conclusions regarding parameter uncertainties presented in Reference 5.

Both RG 1.201 and the NEI 00-04 guidance recognize that the conservative assumptions often made in PRAs for external events can result in values of importance parameters that misrepresent safety significance. Although internal events PRAs tend to be more realistic than external events PRAs, they do contain modeling assumptions that may result in incorrect estimates of importance parameters. For example, in the development of the Multiple System Performance Index, comparisons of importance parameters determined from the Simplified Plant Analysis Risk (SPAR) models and plant PRAs showed that values of the importance parameters were affected by model assumptions even though the overall core damage frequency (CDF) from the SPAR model and the plant PRA were in reasonable agreement, and the SPAR models had to be significantly revised to get agreement for the importance parameters. Despite this recognition and experience, the effect of model uncertainties on the importance parameters is not addressed in the current guidance beyond the instruction to treat values of the importance parameters determined from internal and external events PRAs separately and to use the highest value of the importance parameter determined from either PRA.

Even in the case of parametric uncertainties, there is no specific guidance on how the distributions for the parameters that are used for the sensitivity studies are selected. It is not clear whether they are plant specific or generic in nature.

The staff is developing general guidance on the treatment of uncertainties for PRAs. This guidance can perhaps be adapted for use in the categorization process and tested during the trial use period.

The choice of fixed screening values for the importance measures results in different ΔCDF and Δ large, early release frequency (LERF) for different plants. As we stated in our report dated October 12, 1999 (Reference 6): "It is evident that the absolute value of the baseline risk metric is a critical element in these evaluations and that the importance measures contain only relative information with respect to a given risk metric."

"The change in risk depends on this absolute value also, i.e., ΔCDF at two plants with different baseline CDFs, will be different for the same change in the unavailability of a component whose importance measures have the same value at these plants." Reference 5 states that "if we are interested in controlling the change in risk in an absolute sense, it does not make sense to have a universally fixed value of Fussell-Vesely as a criterion for risk significance," and "it is clear that it does not make much sense to define a universal criterion based on Risk Achievement Worth."

Despite these shortcomings in the determination of importance measures, the cross checks in the process provided by the Integrated Decisionmaking Panel and the requirement to compute the overall changes in CDF and LERF make the categorization process robust enough to proceed with trial use of RG 1.201. We would like to review insights gained from the trial use period.

Mr. Stephen L. Rosen did not participate in the development of this report.

Sincerely,

/RA/

Mario V. Bonaca
Chairman

References:

1. Memorandum dated May 17, 2004, from Catherine Haney, NRR, to John T Larkins, Executive Director, ACRS, Subject: Final Rule - Section 50.69 "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Plants."
2. Staff Requirements Memorandum dated March 28, 2003, from Annette Vietti-Cook, Secretary, to Chairman Diaz, NRC, Subject: Staff Requirements - SECY-02-0176 - Proposed Rulemaking to add new Section 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components."
3. "Guidelines on Modeling Common-Cause Failures in Probabilistic Risk Assessment," NUREG/CR-5485, November 1998.
4. EPRI Technical Report 1008905, "Parametric Uncertainty Impacts on Option 2 Safety Significance Categorization," Final Report, June 2003.
5. M.C. Cheok, G.W. Parry, and R.R. Sherry, "Use of Importance Measures in Risk-Informed Regulatory Applications," *Reliability Engineering and System Safety*, 60, 213-226, 1998.
6. Report dated October 12, 1999, from Dana A. Powers, Chairman, ACRS, to Greta Joy Dicus, Chairman, NRC, Subject: Proposed Plans for Developing Risk-Informed Revisions to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."