

June 1,2009

Dr. Mario V. Bonaca, Chairman  
Advisory Committee on Reactor Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

SUBJECT: DIGITAL INSTRUMENTATION AND CONTROL INTERIM STAFF GUIDANCE 5,  
"HIGHLY-INTERGRATED CONTROL ROOM-HUMAN FACTORS ISSUES,"  
AND INTERIM STAFF GUIDANCE 6, "LICENSING PROCESS"

Dear Dr. Bonaca:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your April 21, 2009, letter to Chairman Dale E. Klein. Your letter summarized the views of the Advisory Committee on Reactor Safeguards (ACRS or the Committee) on the revision of the Interim Staff Guidance (ISG)-5, "Highly Integrated Control Room-Human Factors," and the development of the ISG-6, "Licensing Process." The staff and I appreciate your continued interest and comments on the development of this guidance.

Since early 2007, the staff has been developing a number of ISGs through the work of seven task working groups under the direction of the NRC Digital Instrumentation and Control (I&C) Steering Committee. The ISGs provide additional guidance in the areas of digital I&C and human factors.

#### ACRS Recommendation No. 1

"Section 3, 'Crediting manual Operator Actions in Diversity and Defense-in-Depth (D3) Analyses,' of ISG-5 should be revised to incorporate additional guidance on the estimation methods of the time required for operator action. Increased rigor in the supporting analyses should be required as the difference between the time available and the time required for operator action decreases."

#### NRC Response

Your letter noted that the methods identified in Phase 1, "Analysis," of Section 3 of ISG-5, "Crediting Manual Operator Actions in Diversity and Defense-in-Depth Analyses," for estimating the time required to implement operator actions can be biased and that the associated uncertainties can be difficult to assess. The staff agrees with this observation but believes that the current guidance largely addresses this concern. Specifically, Phase 2, "Preliminary Validation," provides an independent confirmation of the time required estimate derived from Phase 1. In addition, the acceptance criteria for Phase 4, "Integrated Systems Validation," provides substantial incentive to ensure that licensees and applicants do not underestimate the time required for operator action.

Nevertheless, the staff agrees that bias and uncertainties in the analysis should be minimized particularly in circumstances where the margin between time available and time required for operator action is limited. Accordingly, in response to your recommendation, the staff will provide additional guidance, either through incorporation or reference, to ensure that estimates of time required are derived using methods that minimize the potential for bias. In addition, the staff will evaluate how to revise the guidance to address the concern that, as the margin decreases between estimates of time available and time required, there will be increasing potential for uncertainties and bias in the calculations to substantively misrepresent the adequacy of the margin and subsequently decrease confidence in the analysis. Specifically, the staff will evaluate the feasibility of tailoring the analysis and integrated system validation guidance based on the amount of margin between the time available and time required for operator action.

### ACRS Recommendation No. 2

“Draft ISG-6 should not be issued until Sections C and D are revised to specify that sufficient design detail be provided to ensure deterministic behavior and independence of each [digital] I&C safety train.”

### NRC Response

The NRC staff agrees with the importance of explicitly addressing determinism and independence between safety system trains. The NRC requires deterministic behavior of digital systems used in safety-related applications and expects the information required by ISG-6 to be sufficient to conclude that systems behave in a deterministic manner. Reviewer guidance is still being developed in ISG-6. The staff will ensure that the requirement for deterministic behavior is clearly stated in that guidance. The staff will also ensure that the guidance describes methods for determining that the software cannot enter into an undetermined state or that, if such an undetermined state is reached via software or hardware failure, the hardware-based watchdog timer will alert the operators.

The staff also reviews digital systems to ensure that each redundant channel or division is capable of independently performing its safety function. ISG-4, “Highly Integrated Control Room-Communication,” requires that communications processes must not be allowed to compromise the independence of the redundant channels or divisions. Reviewer guidance will be added to ISG-6 to clearly identify that requirement and to ensure consistency between ISG-4 and ISG-6. Further, the NRC staff agrees with the ACRS that all review areas, as described in Section C and Section D of ISG-6, should emphasize the level of detail needed by the NRC staff to ensure that the digital I&C upgrade meets the appropriate regulatory criteria. As such, the staff currently plans to revise Sections C and D to specify that sufficient design detail be provided to ensure deterministic behavior and independence of each digital I&C safety train before issuing draft ISG-6.

The staff and I appreciate the comments and recommendations provided by the ACRS. We look forward to continuing to work with the Committee as the staff completes the remaining ISGs and develops final regulatory guidance in the digital I&C area.

Sincerely,

/RA B.Mallett for/

R. W. Borchardt  
Executive Director  
for Operations

cc: Chairman Jaczko  
Commissioner Lyons  
Commissioner Klein  
Commissioner Svinicki  
SECY

The staff and I appreciate the comments and recommendations provided by the ACRS. We look forward to continuing to work with the Committee as the staff completes the remaining ISGs and develops final regulatory guidance in the digital I&C area.

Sincerely,

/RA B. Mallett for/

R. W. Borchardt  
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