

June 28, 2011

Dr. Said Abdel-Khalik, Chairman  
Advisory Committee on Reactor Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

SUBJECT: HUMAN FACTORS CONSIDERATIONS ASSOCIATED WITH EMERGING  
TECHNOLOGIES IN NUCLEAR POWER PLANTS

Dear Dr. Abdel-Khalik:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your letter dated May 24, 2011, which summarized the views of the Advisory Committee on Reactor Safeguards (ACRS) regarding human factors (HF) research activities associated with emerging technologies in nuclear power plants, in particular, HF in digital instrument and control (DI&C) systems. The letter concluded that "The human factors research program has developed valuable information that can be used to improve human performance and plant safety as new DI&C systems are introduced into nuclear power plants." The purpose of the ACRS letter was "to encourage continued research on the important issue of human factors considerations associated with emerging technologies in nuclear power plants and incorporation of this new knowledge in regulatory guidance."

**ACRS Recommendation:** The staff should identify areas where the concepts and understanding of factors affecting human performance with new DI&C systems can be incorporated in formal regulatory guidance documents.

**Staff Response:** With respect to HF in DI&C systems, the RES staff has established a research program to update existing Human Factors Engineering (HFE) review guidance documents (NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," NUREG-0711, "Human-System Interface Design Review Guidelines", and NUREG-0700, "Human Factors Engineering Program Review Model") and to develop technical bases and regulatory guidance for specific emerging technologies in nuclear power plant control rooms that affect DI&C systems, such as computerized procedures and human-system interface (HSI) automation.

Regarding staff work on the "Development of a concept of operations (ConOps) model for small modular reactors (SMRs)," the ACRS indicated that the work offered value to the staff's reviews and should be incorporated into formal regulatory guidance documents. The staff also plans to incorporate this guidance into the next revisions of NUREGs 0700 and 0711. Further, the staff is updating the Standard Review Plan (NUREG-0800) to create guidance specific to different types of advanced reactors, including SMRs, and the RES staff has started a project to develop a technical basis and enhance the guidance document (NUREG-1791, "Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)") for reviewing operator staffing exemption requests anticipated in SMRs.

In summary, the staff appreciates the comments and recommendation provided by the ACRS. The staff looks forward to continuing to work with the ACRS as the staff proceeds with current research efforts, develops final regulatory guidance, and develops new HF research initiatives addressing the safety aspects of DI&C systems.

Sincerely,

**/RA/**

R. W. Borchardt  
Executive Director  
for Operations

cc: Chairman Jaczko  
Commissioner Svinicki  
Commissioner Apostolakis  
Commissioner Magwood  
Commissioner Ostendorff  
SECY

In summary, the staff appreciates the comments and recommendation provided by the ACRS. The staff looks forward to continuing to work with the ACRS as the staff proceeds with current research efforts, develops final regulatory guidance, and develops new HF research initiatives addressing the safety aspects of DI&C systems.

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