May 18, 2010

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

Subject: ADVISORY COMMITTEE ON REACTOR SAFEGUARDS LETTER DATED MARCH 25, 2010, REGARDING DRAFT FINAL REVISION 1 TO DIGITAL INSTRUMENTATION AND CONTROL INTERIM STAFF GUIDANCE – 07

Dear Dr. Abdel-Khalik:

I am responding to your letter dated March 25, 2010, regarding the Advisory Committee on Reactor Safeguards (ACRS) meeting held March 4-6, 2010.

During the full committee meeting, the ACRS reviewed Draft Final Revision 1 to the Digital Instrumentation and Control Interim Staff Guidance (ISG) – 07 (DI&C-ISG-07), "Digital Instrumentation and Control Systems in Safety Applications at Fuel Cycle Facilities." We appreciate the committee's thoughtful and thorough review of the draft revision to this ISG, as well as the constructive recommendations.

The following addresses each of the committee's recommendations:

1. Revision 1 to DI&C-ISG-07 should not be issued as final until recommendation 2 is addressed.

   The Nuclear Regulatory Commission (NRC) staff will address the recommendation as presented in the ACRS letter, prior to issuance, as indicated below.

2. Revision 1 to DI&C-ISG-07 should be revised to state that any reduction in the level of rigorous management measures applied to redundant items relied on for safety (IROFS) relative to sole IROFS with the same design requirements, should be justified by a comprehensive analysis that identifies the common cause failure modes and other dependencies that must be mitigated or prevented to ensure reliable operation.

   The NRC staff will revise DI&C-ISG-07 as recommended by the committee.

   Note that in fuel cycle facilities, licensees do not normally rely on an active engineered control, such as a digital controller, as a sole IROFS. Federal Code 10 CFR Part 70, Section 70.64 requires that the design must incorporate, to the extent practicable, a preference for use of engineered controls over administrative controls to increase overall system reliability. Additionally, NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," states that passive engineered controls should be preferred for use (especially in criticality safety applications) over active engineered controls. Thus, where a sole IROFS has been proposed by applicants or

licensees for preventing or mitigating accident event sequences, the common practice is for the sole IROFS to be a passive engineered control. Nevertheless, the NRC staff agrees with the principle identified by the ACRS and will enhance the text of the ISG accordingly.

3. Future efforts should include development of a systematic approach for identifying dependencies and common cause failures (CCFs) in IROFS to enhance the effective application of graded management measures.

   Guidance has been provided within the section of DI&C-ISG-07 regarding "Independence of Controls Used as IROFS" regarding practical considerations for evaluation of potential CCF conditions for digital control systems. In this section, the occurrence of several different modes of potential CCF is discussed, and methods for coping with these potential failures are presented. One of the coping methods presented is the performance of a diversity analysis, as described in NUREG/CR-6303, "*Method for Performing Diversity and Defense-in-Depth Analyses of Reactor Protection Systems*," issued December 1994. Since the publication of this NUREG, the Office of Nuclear Regulatory Research (RES) has been conducting further research to develop a practical methodology for identifying the attributes and characteristics of diverse digital systems supporting the determination of what may be considered "sufficiently diverse." Also, the section of DI&C-ISG-07 describing practical considerations for evaluation of CCF conditions for digital control systems identifies several methods which may be used by licensees to ensure that the selection of IROFS for a particular event sequence prevention or mitigation function are designed, implemented, and maintained such that potential CCF conditions, such as common power supply, environmental or physical conditions, or vendor-identified in-service failures are addressed appropriately. Results from the RES work on diversity analysis methods will be utilized, as appropriate, for use in the licensing of fuel cycle facilities.

4. Future efforts should also include the development of an approach for structuring the individual scenario results of an Integrated Safety Analysis (ISA) to facilitate review and understanding of the associated risk significance.

   The primary purpose of the ISA is to systematically examine a facility's processes, equipment, structures, and personnel activities to ensure that all relevant hazards that could result in unacceptable consequences have been adequately evaluated and appropriate protective measures have been identified. The ISAs also provide risk insights and risk significance. The Division of Fuel Cycle Safety and Safeguards has, in fact, been using the ISAs to assess significance for the purposes of informing licensing and oversight activities. The list of accident sequences and IROFS in the ISA Summaries submitted to the NRC are typically grouped by unit process equipment, so that accident sequences involving the same IROFS appear together. Thus, for ISAs that use a quantitative method of likelihood evaluation, the staff has had little difficulty in summing sequences to determine risk significance. The NRC staff has proposed to the Commission (SECY-10-0031, "Revising the Fuel Cycle Oversight Process") to pursue a more explicitly risk-informed approach to its oversight program. This will likely involve enhancing staff's ability to assess risk significance. However, the current regulations

allow licensees considerable flexibility to attain compliance, and do not require many of the features that would be useful for risk significance determination. In addition to providing SECY-10-0031 to the Commission, the staff briefed the Commission on the Fuel Cycle Oversight Process on April 29, 2010. Subsequently, in the staff requirements memorandum related to April 29 Commission meeting (SRM100429, dated May 12, 2010), the Commission directed the staff to provide a paper comparing ISAs for fuel cycle facilities and Probabilistic Risk Assessments (PRAs) for reactors, including a critical evaluation of how ISAs differ from PRAs. The Commission further directed that the ISA/PRA comparison paper be reviewed by the ACRS prior to submission to the Commission. This paper is expected to provide additional insights into how ISA individual scenario results can be combined and supplemented by other quantitative and qualitative properties to implement the risk significance function as used to inform the oversight process.

Thank you for the committee's review.

Sincerely,

/RA/

R.W. Borchardt
Executive Director
for Operations

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

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