April 14, 2006

MEMORANDUM TO: Luis A. Reyes
Executive Director for Operations

FROM: Kenneth R. Hart, Acting Secretary /RA/

SUBJECT: STAFF REQUIREMENTS - SECY-05-0233 - PLAN FOR DEVELOPING STATE-OF-THE ART REACTOR CONSEQUENCE ANALYSES

The Commission has approved the staff's plan to (1) evaluate and update, as appropriate, analytical methods and models for realistic evaluation of severe accident progression and offsite consequences; (2) develop state-of-the-art reactor consequence assessments; and (3) develop an integrated, predictive, computer-based tool to assist decision-making in the event of a severe reactor accident.

The staff shall ensure that the updated study results include a written discussion (non-public if necessary) of the extent to which security-related initiating event scenarios are addressed by the release groups into which the spectrum of accident scenarios are binned and the completed and ongoing security assessments (i.e., phases 1, 2, and 3).

The staff should seek Commission approval prior to conducting analyses for security related events that are not captured by the spectrum of scenarios adopted for the consequence analyses. Such security related events may have been encompassed by the work undertaken in response to the events of September 11, 2001. Therefore, the staff should provide a summary of the benefits that would be gained from conducting this additional work in view of the security related analyses that have been completed or are under way. The Commission supports development of a non-public version of the study for security related events if analyses for such events are conducted.

The staff should complete this work through a coordinated effort by the Offices of Nuclear Regulatory Research (RES), Nuclear Reactor Regulation (NRR), and Nuclear Security and Incident Response (NSIR).

The staff's proposal to examine significant radiological release scenarios having estimated likelihoods of one in a million or greater per year, is an appropriate initial focus. This initial set of analyses should focus attention on the scenarios of greatest interest and provide useful insights into the effectiveness of current and postulated mitigation strategies. To the extent practicable, all new analyses should account for enhancements implemented by licensees in the areas of safety and security and should use state-of-the-art analytical tools for accident progression and consequence analyses. The staff should keep the Commission up-to-date on the results and status of the site-specific consequence analysis.

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The staff should use the improved understanding of source terms and severe accident phenomenology (e.g., containment failure modes, time of release, release duration, inventory release fractions), and credit the use of Severe Accident Management Guidelines (SAMGs) and other new procedures, such as mitigative measures resulting from B.5.b and other like programs, that were not in place when the earlier study was performed. The staff should also utilize updated and realistic plant specific information for other variables such as surrounding population, meteorology, and evacuation assumptions.

The staff should present its updated results using risk communication techniques to achieve an informed public understanding of the extent and value of defense-in-depth features including current mitigative strategies, and of the important analytical assumptions. In presenting these results, the staff needs to develop substantial improvements to the communication and presentation techniques that were used previously in NUREG/CR-2239 (1982 siting study); this includes a discussion of the differences between the state-of-the-art analysis and that reported in the NUREG/CR.

In the paper, the staff presents some of the results of its recent analyses as examples, but these have not fully benefitted from the staff's proposed new methodology, and therefore this paper should not be made public at this time. The results of the proposed analyses, and their underlying bases, should be made public as an important objective of this initiative. To better communicate the results to our stakeholders, the staff should properly characterize the uncertainties in the results and identify the significant influential inputs and assumptions.

In applying a screening radiological release frequency of 10^{-6} per reactor year (i.e., to analyze only those scenarios that have a release frequency of greater than 1 in a million), the staff should be careful to define release groupings such that release characteristics are representative of scenarios binned into those groups. However, where possible, the groups should also be sufficiently broad to be able to include the potentially risk-significant but lower frequency scenarios (for example, the interfacing systems LOCA scenarios that bypass the containment).

Potential offsite health effects are very dependent on the evacuation model used. Realistic site-specific evacuation scenarios should be incorporated and basis for the inputs on delay times, evacuation speeds, and fractions of non-evacuating population should be discussed.

As part of implementation of the plan, the staff should work with the ACRS on technical issues such as identification of accident scenarios to be evaluated, evaluation of source terms, credit for operator actions or plant mitigation systems, modeling of emergency preparedness, modeling of offsite consequences, and definition and characterization of analysis uncertainty.

In performing the consequence analysis, the staff should rely on currently available methods and models. Tasks such as the experimental validation of beyond readily available mitigative measures should be discussed with the Commission after results from the base case consequence analysis become available.

The scope of these analyses may include mitigation strategies that are required under section B.5.b of the Commission's February 25, 2002 Order to power plant licensees or any superseding regulation, and may further include additional strategies to which licensees have committed as a result of the previously completed and ongoing security assessments (i.e., phases 1, 2, and 3). The staff shall evaluate other significant and appropriate mitigation strategies for radiological consequences in a separate study, starting with scoping evaluations, and should keep the Commission fully informed of its progress with these evaluations during the periodic security briefings.

cc: Chairman Diaz
Commissioner McGaffigan
Commissioner Merrifield
Commissioner Jaczko
Commissioner Lyons
OGC
CFO
OCA
OPA