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

ACRSR-2259

June 18, 2007

Mr. Luis A. Reyes
Executive Director for Operations
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: DRAFT FINAL NUREG-1852, "DEMONSTRATING THE FEASIBILITY AND RELIABILITY OF OPERATOR MANUAL ACTIONS IN RESPONSE TO FIRE"

Dear Mr. Reyes:

During the 543rd meeting of the Advisory Committee on Reactor Safeguards, June 6-8, 2007, we reviewed draft final NUREG-1852, "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire." During our review, we had the benefit of discussions with representatives of the NRC staff and the Nuclear Energy Institute. We also had the benefit of the documents referenced.

CONCLUSION AND RECOMMENDATION

1. We agree with the staff that operator manual actions should be both feasible and reliable.

2. NUREG-1852 should be published as final after revision, as discussed below, and review by the ACRS.

BACKGROUND

The primary objective of fire protection programs at U.S. nuclear plants is to minimize the effects of fires and explosions on structures, systems, and components important to safety. To meet this objective, fire protection programs for operating nuclear power plants are designed to provide reasonable assurance, through defense in depth, that a fire will not prevent the performance of necessary safe shutdown functions, and that the release of radioactive materials to the environment during a fire will be limited.

To provide these assurances, at least in part, many plants plan to or already rely on local operator manual actions, i.e., actions outside the main control room, to maintain hot shutdown capability. Upon detecting a fire, operators may be required to take local manual actions to protect critical safety equipment or to align critical equipment to perform needed safety functions.

Paragraph III.G.1 of Appendix R to 10 CFR Part 50 states that one train of equipment needed to maintain hot shutdown conditions shall be free of fire damage. When redundant trains of equipment required for hot shutdown are in the same fire area outside of the primary containment, Paragraph III.G.2 of Appendix R specifies three acceptable methods that provide reasonable assurance that at least one means of achieving and maintaining hot shutdown conditions will remain available:

- Separation of redundant trains by a fire barrier having a 3-hour rating

- Separation of redundant trains by a horizontal distance of more than 6.1 meters (20 feet) containing no intervening combustible or fire hazards, together with fire detectors and an automatic fire suppression system

- Separation of redundant trains by a barrier having a 1-hour rating, coupled with fire detectors and an automatic fire suppression system

If none of these configurations exist, then Paragraph III.G.3 requires that alternative dedicated safe shutdown capability must be available. Paragraph III.G.3 allows operator manual actions as part of these alternative dedicated shutdown activities.

DISCUSSION

NUREG-1852 provides technical guidance to determine whether proposed operator manual actions are feasible and can be performed reliably under a wide range of plant conditions. If a licensee chooses to rely on operator manual actions and seeks NRC approval, this guidance will help the staff to ensure consistent review of those requests. To ensure that adequate safety is maintained, operator manual actions must be not only feasible but also reliable, because they are relied upon in lieu of passive fire barriers that have high reliability.

Feasibility will be assured if the licensee demonstrates that there is adequate time available for the operator to diagnose the situation and execute the manual actions needed to achieve and maintain hot shutdown after a single fire using functional and available equipment.

For a feasible action to be performed reliably, the estimate of the time available for action should be sufficiently greater than the time required to diagnose the situation and execute the manual actions. This extra time is a surrogate for directly accounting for sources of uncertainty such as variations in fire and related plant conditions that could affect both time estimates, factors that cannot be recreated in the demonstrations, and variability among crews leading to variations in operator performance. NUREG-1852 contains detailed discussions on the factors that should be considered in evaluating the uncertainties.

Significant judgment must be exercised in these evaluations. There are methods from risk assessments and human reliability analyses that can be adopted to help structure this judgment. For example, the search for scenarios initiated by fires can be facilitated by the use of event trees and the related methods contained in the NRC's A Technique for Human Event Analysis (ATHEANA) model and the Electric Power Research Institute's Revised Systematic Human Action Reliability Procedure (SHARP1) framework. The potential use of such methods should be mentioned in NUREG-1852.

The staff stated that, in many cases, ample time for action will be available and, therefore, a detailed evaluation using the criteria in NUREG-1852 will not be required. At the other extreme, cases in which the operator actions are complex and the available time is comparable to that for action, they expect many licensees will choose to submit a risk-informed request. This means that the evaluations listed in NUREG-1852 may be needed in a limited number of cases. A

section in the beginning of the report describing its intended use in context would be very useful to the reader who may be overwhelmed by the prospect of a detailed evaluation of all the criteria in all cases.

NUREG-1852 provides an example of an evaluation of a time margin. This evaluation was performed by a team that included operators and human reliability analysis experts, as well as fire protection specialists. The report should reflect this experience and provide advice as to the skills of the team that determines the time margin. To get this range of skills, it may be useful for the teams to include human reliability analysts and, possibly, probabilistic risk assessment practitioners. Such experts also bring an awareness of the potential for biases in expert judgments, which is noted in the report.

We are looking forward to reviewing the revised report.

Sincerely,

William J. Shack
Chairman

References:

1. U.S. Nuclear Regulatory Commission, Sandia National Laboratories, NUREG-1852, "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire," June 2007

2. Report to Nils J. Diaz, Chairman, U.S. NRC, from Mario Bonaca, Chairman, ACRS, "Draft Proposed Rule on Post-Fire Operator Manual Actions," dated November 19, 2004

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/RA/

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