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SUBJECT: WORKSHOP SUMMARY FOR INTERIM MANUAL ACTION  
ACCEPTANCE CRITERIA

On January 22-23, 2004, members of the Fire Protection (FP) staff conducted an internal stakeholder workshop with individuals from the Offices of Nuclear Reactor Regulation (NRR) and Research (RES), Sandia National Laboratories, and Science Applications International Corporation to discuss concerns expressed by the Advisory Committee on Reactor Safeguards (ACRS) on the acceptance criteria for operator manual actions (OMA). There was a lively discussion on several "background" issues, which included the following:

- Since there are no known probabilistic criteria for the current Title 10 to the *Code of Federal Regulations*, Part 50, Appendix R, III.G.2 (III.G.2) options (barriers/separation, detection/suppression), why would we need any for the OMA (operator manual actions) as part of III.G.2?
- ACRS' concern over the term "feasibility" seems correct since this implies merely the capability to do something, while "reliability" (or, equivalently, "feasibility with margin") incorporates not only capability but how well something can (and should/shall) be done.
- ACRS' desire for incorporating Human Reliability Analysis (HRA) quantification, to the extent they seemed to imply (e.g., probabilities), is beyond the current state of the art of HRA; however, some lesser degree of incorporating risk insights from HRA may be achievable (and became the focus of the rest of the meeting)
- OMA are restricted to actions performed outside of the main control room (MCR) and are purely preventive in nature (no "recovery" or "second chances" involved).
- What is an "action?" Is it merely one manipulation, such as pressing a button, or is it a composite of several, such as manually starting a diesel generator (DG) in the DG room?
- Is failure an option in regulatory space, i.e., can a rule allow failure, such as core damage, to occur, even at a vanishing probability?
- Will licensees ever run enough tests to permit benchmarking of human error probabilities for crews, etc., that could be used as surrogates for HRA values?
- Before endorsing a particular value based on HRA, one of the HRA techniques would have to be blessed and adopted, a long-range goal.
- The criterion on Demonstration establishes the feasibility of OMA; the criterion on Complexity and Number should focus on the reliability and is, therefore, the proper one for quantification (if quantification can be achieved).

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- If a numerical HRA criterion is possible, it has to be tied to core damage frequency, not the human error probability, since the other factors in the "risk" equation (fire frequency, conditional component/system failures, etc.) vary too much for the human error probability to be pinned down generically.

Based on the last item, the participants focused not on a specific, probabilistic criterion for the human errors themselves, but on conservative values that, if met, would virtually assure that the resulting human error probabilities would be very small and, therefore, acceptable if incorporated in a worst-case risk calculation. This could be accomplished by defining requirements on (1) the overall time line for fire and thermal-hydraulics for a given fire scenario and (2) the number of fire zones/areas in which one operator could receive credit for taking manual actions during a fire scenario. With "margins" on the first item (e.g., accomplish safe shutdown, including OMA, within 75 percent of the calculated time line) and limits on the second (e.g., one operator can be credited for taking OMA in no more than one fire zone/area during the scenario), both complexity and number are addressed and assure that OMA meeting the remaining acceptance criteria would be highly reliable.

Subsequent discussion questioned how restrictive the second requirement might be and if it should even exist. After all, the bottom line is attaining safe shutdown, whether one operator perform one action at a time, but sequentially in 10 fire zones/areas, or ten operators perform the same actions, one in each fire zone/area. Also, how would independent verification be factored in; would dependent errors, possible if the same operator performed multiple actions, defeat the purpose of the second requirement? After much discussion, it was decided to reduce the potential quantification to just the first requirement, namely demonstration that all crews under all conditions could accomplish the required safe shutdown, including the credited OMA, within the fire/thermal-hydraulic time line, minus some margin to account for variability among crews, conditions, etc. Basically, this "time margin" criterion could replace Complexity and Number since, when combined with the rest of the criteria, acceptability of the OMA is assured. However, there would need to be guidance on how often licensees would conduct drills, etc., to demonstrate compliance by all crews under all conditions, probably incorporated into the supporting guidance for the rulemaking.

Given that the concept appears to have potential merit, Erasmia Lois (RES) offered to investigate the appropriateness of such an approach by examining available models, data, etc., and come back with a plan for how to define what the margins should be along with their bases, the resources needed to implement the plan, and a schedule. She stated that the initial investigation can be completed by mid-February. Approaches may include the use of ANSI/ANS Standard 58.8, "Time-Response Design Criteria for Safety-Related Operator Actions," expert elicitation, existing HRA models/techniques, among others.

As a first cut, one would need to (a) review existing time reliability models (e.g., THERP, ASEP, HCR) to see if they can provide some ideas on how to assess a "generic" margin; (b) review the ANS Standard to see if it can be used to help assess generic margins; (c) consider if and how an expert elicitation process might be used to come up with judgmental but consensus general margins; and (d) "brain-storm" with other HRA specialists for possible other ideas or techniques that might be considered and/or used. Erasmia Lois (RES) believes that it would be possible to support this activity within the current schedule for the rule.

