

Technical Advisory Committee of the Nuclear Risk Research Center
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SUBJECT: RESEARCH ON HUMAN RELIABILITY ANALYSIS METHODS

Dear Dr. Apostolakis:

During the first meeting of the Technical Advisory Committee of the Nuclear Risk Research Center (NRRC), October 27-31, 2014, we met with representatives of the NRRC staff to review a proposed research plan for the development of methods and guidance for modern human reliability analysis (HRA).

Due to personal scheduling conflicts, only three of our members were present at the meeting on this topic. This report provides the consensus conclusions and recommendations from members Amir Afzali, Nilesh Chokshi, and John Stetkar. Because a majority quorum of our membership did not participate in the deliberations on this topic and concur with our conclusions and recommendations, this report should be treated as a minority opinion that has not benefitted from consideration by the full Committee.

RECOMMENDATIONS

1. The NRRC staff should review the literature that has been published in support of ongoing development of the Integrated Decision-Tree Human Event Analysis System (IDHEAS) HRA methodology. The staff should use that review to better focus their proposed research efforts.
2. The NRRC staff should explore possibilities for collaborative research with the U.S. NRC and EPRI to support completion and piloting of the IDHEAS methodology, with the objective of improving international consistency in modern HRA applications.

BACKGROUND

We understand that human reliability analyses in Japanese probabilistic risk assessments (PRAs) are currently performed according to the Technique for Human Error Rate Prediction methodology (THERP, NUREG/CR-1278). That methodology is widely acknowledged as outdated and inadequate for the assessment of human performance in situations that require highly skilled cognitive functions, such as an operating crew's response to a complex evolving event scenario.

The NRRC staff has developed a proposed research plan for the development of guidance for modern HRA methods. The first phase of the draft plan contains three major tasks. The second task indicates that a draft guideline would be prepared by approximately the end of March 2015.

DISCUSSION

We agree with the NRRC staff's conclusion that the THERP methodology is not well-suited for modern HRA applications. However, the staff's proposed plan may be focused too narrowly on anticipated short-term HRA applications for specific types of personnel actions during the advanced stages of an evolving event scenario. For example, it highlights a variety of severe accident mitigation actions that are not guided directly by a plant's Emergency Operating Procedures and simulator training.

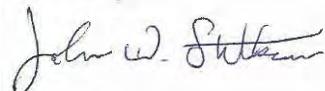
There is a need for improved assessments of personnel performance throughout the entire scope of PRA models, regardless of the specific type of actions (e.g., skill-, rule-, or knowledge-based) or the time during an event scenario when those actions are needed. Modern HRA methods emphasize an integrated scenario-based perspective for the evaluation of personnel performance.

Substantial research on the psychological foundations for human cognitive behavior has been conducted during the last ten years. Case studies of skilled personnel performance during challenging conditions in a variety of industries have validated an improved understanding of contextual factors and causal mechanisms that increase the likelihood of human errors. The U.S. Nuclear Regulatory Commission Office of Nuclear Regulatory Research and the Electric Power Research Institute (EPRI) are currently collaborating on the development of a hybrid HRA methodology (Integrated Decision-Tree Human Event Analysis System, IDHEAS) that combines the best practices from a variety of guidelines and methods. That project represents the international state-of-the-art in HRA methods development and quantification techniques.

The References for our report list a few of the most important work products from the IDHEAS research work, which contain citations to additional supporting research. The May 2014 Advisory Committee on Reactor Safeguards letter report provides an overview of the technical tasks that remain to complete development of the IDHEAS methodology before it is ready for pilot testing. The NRRC staff should use their review of this reference material to better focus their proposed research efforts. The staff should also explore possibilities for collaborative research with the U.S. NRC

and EPRI to support completion and pilot testing of the IDHEAS methodology with the objective of improving international consistency in modern HRA applications.

Sincerely,



John W. Stetkar
Chairman

REFERENCES

1. "Research Plan of Develop HRA Procedure Guide," NRRC Presentation to Technical Advisory Committee, October 28, 2014.
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6. U.S. Nuclear Regulatory Commission and Electric Power Research Institute, "An Integrated Decision-Tree Human Event Analysis System (IDHEAS) Method for NPP Internal At-Power Operation," Final Draft, September 30, 2013 (ML13354B698).
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