

CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: Quantitative Risk and Reliability Techniques, ABS Consulting Course 201
Project No. 20.06002.01.332
AI No. 20.06002.01.332.628

DATE/PLACE: June 12–16, 2006
Knoxville, Tennessee

AUTHOR: George Adams
Center for Nuclear Waste Regulatory Analyses (CNWRA)

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PERSONS PRESENT: Eight attendees from various organizations, such as the U.S. Nuclear Regulatory Commission (NRC), and industry were present. The lead instructor was J. Farquharson; some topics were led by P. Parikh.

BACKGROUND AND PURPOSE OF MEETING/TRIP: The purpose of the course was to obtain professional development training in the use of quantitative risk and reliability techniques. These techniques may be used to evaluate the reliability of potential safety systems (e.g., heating, ventilation and air conditioning, and crane systems) in preclosure surface facilities at the potential Yucca Mountain high-level waste repository.

SUMMARY OF PERTINENT POINTS AND ACTIVITIES: The training course was held over five days and consisted of both lectures and workshops. A brief summary of the main topics is provided below.

The initial part of the course was a review of hazard identification methods, which included discussions and workshops on the What-If and Hazard and Operability methods. It also included discussions on the Failure Modes and Effects Analysis technique. The What-If methodology is a brainstorming approach relying on a team of experts to evaluate systems and ensure appropriate safeguards are in place. The Hazard and Operability method uses a set of guide words to help the analyst identify potential deviations from normal operations. And, the Failure Modes and Effects Analysis technique is a method for evaluating individual components of a system in terms of the types of failure possible from these components and their resulting effect on system performance.

After the hazard identification review, discussions and workshops involving fault tree and event tree development were held. Discussions in this area involved assigning frequencies or probabilities to basic events in fault trees. Issues on (i) how common cause failure is included in fault trees and how it is quantified (e.g., beta factor method) and (ii) how the information generated from a fault tree is then used in an event tree were discussed. Participants asked questions concerning other quantification techniques (e.g., the alpha factor method) and certain other estimations (e.g., quantifying the fraction of unsafe failures versus fail-safe failures) used in fault trees.

In addition to fault trees and event trees, topics such as Layer of Protection Analysis and component reliability were discussed. Layer of Protection Analysis was presented as a method that could be used to conduct a simplified risk assessment. It is a method used to develop an order-of-magnitude estimate of the risk by considering the layers of defense against individual accident scenarios. In addition, a workshop was conducted on obtaining component reliability data from multiple sources and determining a value to be used for a risk assessment.


IMPRESSIONS/CONCLUSIONS: The training was an excellent opportunity to further my understanding of fault tree and event tree analysis. My initial interest in courses from ABS Consulting was in the area of Layer of Protection Analysis, which is taught as a separate course. This Quantitative Risk and Reliability Techniques course was especially beneficial because it contained some Layer of Protection Analysis information in addition to other methodologies.

PROBLEMS ENCOUNTERED: None.

PENDING ACTIONS: None.

RECOMMENDATIONS: I recommend that others working in the preclosure area attend this course.

SIGNATURES:




George Adams
Senior Research Engineer

6/29/2006

Date

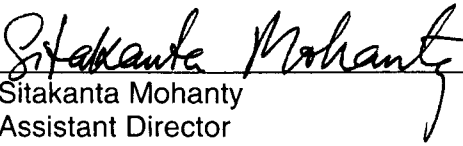
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