INDUSTRY EXPERT ELICITATION PROCESS FOR DEVELOPING SPURIOUS ACTUATION PROBABILITITES

Draft G is based on the paper "Use of Technical Expert Panels: Applications to Probabilistic Seismic Hazard Analysis" by Budnitz, Apostolakis, et al, November 1998. This is a summary of NUREG/CR 6372, "Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and Use of Experts." This approach is called the Technical Facilitator/Integrator (TFI) approach. Most of the generic process description is taken from this document. Comments related to the application of the process to this project are also provided.

Definitions

- Project Sponsor: Provides financial support, hires the study team including the project leader, and owns the study results. *For this project EPRI and NRC (if they participate) would be the Project Sponsors.*

- Project Leader: An individual or small team with managerial and technical responsibility for organizing and executing the project, oversees project participants, and assumes intellectual responsibility for project conclusions. *For this project a team comprised of EPRI, NEI, and possibly NRC staff would be the Project Leader*

- Technical Integrator (TI): An individual or team responsible for developing the composite representation of the informed technical community (community distribution) using the TI approach. This could involve deriving information from the open literature or consulting with experts. *The Technical Integrator for this project would be an individual, preferably an independent expert, who is very knowledgeable in developing such a composite representation.*

- Technical Facilitator/Integrator (TFI): An individual or team responsible for aggregating the judgments and community distributions of a panel of experts to develop the composite distribution of the informed technical community using the TFI approach. *EPRI and NEI do not plan to use a TFI in this process.*

- Resource Expert: A technical expert with particular knowledge of an important data set. *Resource experts for this project would include experts in fire PSA, cable construction and failure modes, circuit analysis, and electrical engineering. If possible, they should also represent a diversity of industry, regulatory, and independent interests.*

- Peer Reviewer: An expert capable of providing meaningful guidance to the Project Leader and the TI on the process and substance of the project, including the methods and process for the development of distributions. *Peer reviewers for this project should, if possible, be academic experts independent of regulatory considerations, but may*

include potential resource expert candidates not selected for that task.

- Influence Factor: A parameter or factor influencing the uncertainty surrounding each point estimate. *For this project, influence factors may include such parameters as cable design and construction (including conductor location and insulation material), temperature, test duration, heat release rate, and others.*

Four Possible Levels of Analysis

1. TI evaluates and weights models based on literature review and experience; estimates community distribution

2. TI interacts with resource experts to identify issues and interpretations; estimates community distribution

3. TI brings together proponents and resource experts for debate and interaction; TI focuses debate and evaluates alternative interpretations; estimates community distribution

4. TFI organizes panel of experts to interpret and evaluate; focuses discussions; avoids inappropriate behavior on the part of evaluators; draws picture of evaluators' estimate of the community's composite distribution; has ultimate responsibility for the project

The Level 2 and Level 3 approaches are being considered for this process based on available resources, and will be described in more detail below. The proposed implementation of the process for fire-induced circuit failure probability development is indicated in italics following the generic TI process description below.

Generic TI Process

The overall goal, regardless of the level, is to provide a representation of the informed scientific community's view of the important components and issues, and of (in this case) the probability of spurious actuations from fire-induced circuit failures under differing conditions of heat and cable construction.

The TI role varies with the level of the analysis. In a Level 2 analysis, the TI reviews the literature, contacts experts with interpretations or particular experience, and formulates a community distribution based on his own knowledge and information derived from the resource experts. In a Level 3 analysis, the TI brings together the resource experts and focuses their interactions to develop a community distribution. In these interactions the experts explain their hypotheses and defend their positions to other experts. Thus, the key difference between Levels 2 and 3 is the interaction among experts permitted in Level 3.

At both levels the TI remains the evaluator of these positions, and retains the responsibility for the success of the analysis, for the accuracy and completeness of the results, and for the process. The following generic tasks are suggested for a Level 2 or 3 analysis.

1. Identify and select project team and analysis level

   Levels 2 and 3: The Project Sponsor(s) select the Project Leaders and the TI. The Project Leaders and the TI jointly select the resource experts and the analysis level to be performed.

2. Identify and select peer reviewers

   Levels 2 and 3: The Project Leaders identify and select the peer reviewers. The peer reviewers should be able to provide meaningful guidance to the Project Leaders and TI on the process and substance of the project, which they should be able to endorse when the project is complete.

   The peer review would be either a late-stage peer review (conducted during the latter stages of the project, and involving the review of draft and final project documents), or a participatory peer review (the peer reviewers are active throughout the process). The peer review can also be a process review or a technical review. The advantage of the late-stage review is the increased likelihood of maintaining objectivity. The advantage of participatory peer review is the opportunity for necessary course corrections at the appropriate time, instead of after the fact when such corrections are more expensive. The authors of NUREG/CR-6372 recommend a participatory peer review for the TI process, especially for the process aspects.

3. Identify available information; design analyses and information retrieval methods

   Level 2 and 3: The TI identifies and assembles available and relevant information and design analyses and information retrieval methods. The TI recommends any process changes needed to carry out the particular analysis, and defines the procedures and methods to be used for the analysis. He also provides the assembled information or information retrieval methods to the resource experts.

4. Perform analyses, accumulate information relative to issue, and develop representation of community distribution.

   Level 2: The TI must understand the entire spectrum of pertinent information, including written literature, recent work, and other sources, through his own knowledge or through contact with other resource experts. The TI develops a community distribution of the range of uncertainty.

Level 3: The TI orchestrates interactions or workshops to focus the discussion on the issues of the most significance and to gain an awareness of the diversity of views. The TI develops a community distribution of the range of uncertainty.

5. Perform data diagnostics and respond to peer reviews

   Data diagnostics will most likely consist of sensitivity studies to identify the most significant issues and sources of uncertainty. These will be shared with the peer reviewers.

   The TI uses the peer reviewers to assure the full range of technical views has been identified. If participatory peer review is used, is used, on-going review would be used after Steps 3, 4, and 5, with appropriate responses. This includes interactions with the experts. If a late-stage peer review is used, the process would begin following preparation of the draft reports. Both types of peer review can be used if desired.

   The Project Leaders, in consultation with the TI, define the process for interactions among the experts and peer reviewers, and for submitting and addressing comments. The peer review comments are addressed to the Project Leaders. It is important to maintain the independence of the peer reviewers from the TI and resource experts.

6. Document process and results

   Good documentation is vital for assuring the scrutability of the process. The authors of NUREG/CR-6372 recommend a two-tiered approach. Tier 1 information consists of documentation that must be reported publicly, either in the main body of the report or the appendices. Tier 2 information is background material maintained by the analysis team in auditable form. The elements to be addressed in the Tier 1 documentation include

   Participant roles and responsibilities
   Comparisons with other studies
   Internal quality control and review
   Methodology
   Results
   External peer review
   Citations

Proposed Implementation of This Process

EPRI and NEI recommend a Level 2 analysis if EPRI is the only Project Sponsor. This offers the best use of available industry resources, since the number of experts used can be increased somewhat if the TI develops the community distribution and experts do not incur travel costs to the meeting required for a Level 3 analysis. If NRC can participate and

provide experts, EPRI and NEI recommend a Level 3 analysis. Participation of NRC with EPRI may be governed by the current Memorandum of Understanding between EPRI and the NRC Office of Research, but other methods to facilitate this joint regulatory and industry activity may be considered. More information on the Project Sponsors, Project Leaders, and TI is provided in the description of Step 1.

Step 1

The Project Sponsor(s) first select the Project Leaders. If the Project Sponsor is EPRI the Project Leaders should include EPRI and NEI representatives, and a Level 2 analysis is done (industry participation only). If the Project Sponsors are EPRI and NRC the Project Leaders should include EPRI, NEI, and NRC representatives, and a Level 3 analysis is done (industry and NRC participation). In either case, EPRI and NEI recommend that the Project Sponsor(s) and Leaders select a TI who is an independent expert with experience in both this process and the technical aspects of this type of analysis.

EPRI and NEI recommend that the Project Leaders work with the TI to identify the participating resource experts. These experts should reflect expertise in fire PSA analysis, circuit analysis, electrical engineering, and cable construction and failure modes. They should also reflect a balance of industry and independent views, as well as NRC views if they participate. If a Level 2 analysis is performed, 2 or 3 experts should be selected. If the Level 3 analysis is done, 4 to 5 experts should be selected.

Step 2

For the Level 2 analysis without NRC participation, EPRI and NEI recommend a late-stage technical peer review only, using one independent peer reviewer. A participatory review is not necessary for this simpler type of analysis because the TI (as opposed to collected resource experts in Level 3) is performing the integration of expert views. A technical rather than a process review is appropriate, again because of the relative simplicity of the process. The use of only one independent peer reviewer is further supported by the likelihood that NRC will perform a de facto peer review of both the process and the technical aspects when the process is finished.

For the Level 3 analysis with NRC participation, EPRI and NEI recommend that two peer reviewers be used in a participatory peer review. If possible, the peer reviewers should both be independent of the industry and NRC. Both the process and the technical aspects should be included in the peer review, though the focus should be on the technical aspects.

Step 3

The TI and the Project Leaders should jointly determine the documents and analyses to be reviewed by the resource experts. The information to be reviewed should include at least the following:

- *Results of current industry testing*
- *The NRC's letter report from Sandia dated May 8, 2000 (known in this proposal as "the Sandia report")*
- *Studies referenced in the Sandia report*
- *NUREG/CR-2258*
- *Other information known to the participants*

The TI will provide all relevant information to the selected resource experts. The TI should recommend any process changes deemed necessary to facilitate completion and meet the goals of the process, and develop instructions or procedures for the resource experts to use in performing the analysis. If a Level 3 analysis is performed, the procedures or instructions will reflect both individual analyses and a group process.

Step 4

For a Level 2 analysis, EPRI and NEI recommend that the experts and the TI independently review the information supplied to gain a full perspective of the likelihood of spurious actuations (and consequences of other circuit failure modes such as open circuits and shorts to ground) under defined conditions of fire and cable design and routing. Each expert will

- *Postulate a point estimate for the probability of spurious actuations for defined base cases (see the Sandia report)*
- *Define an uncertainty band around this point estimate, if possible*
- *Identify influence factors affecting each distribution and the likely degree of influence for each factor*

The TI will consult with each expert to gain the spectrum of probability distributions provided by the experts. Based on his own views and that of the experts, the TI will develop a community probability distribution for spurious actuations for each base case, and postulate the impact of the influence factors for each base case.

For a Level 3 analysis, the TI will convene the experts to explore the range of views and, if possible, achieve a consensus on a community probability distribution and influence factors for each base case.

Step 5

For either a Level 2 or a Level 3 analysis, the TI will perform sensitivity analyses on the community distributions to assess the impact of the influence factors, and will provide the results to the peer reviewers.

The Project Leaders, in consultation with the TI, will define the process for interactions among the experts and peer reviewers, and for submitting and addressing comments. The peer review comments are addressed to the Project Leader. It is important to maintain the independence of the peer reviewers from the TI and resource experts.

The TI will provide the same preliminary information information to the peer reviewers as to the experts prior to the analysis, regardless of which analysis level is performed. If a Level 2 analysis is done, the TI will provide the results of the community dstribution determination to the peer reviewer. If a Level 3 analysis is done, the TI will provide these results to the peer reviewers along with the results of analyses done by the individual resource experts

Step 6

The TI and the Project Leaders will provide documentation in the manner described earlier. Tier 1 documentation will include the results of both the expert analyses and TI community distribution development, as appropriate for the analysis level chosen.

Schedule and Milestones

EPRI and NEI propose the following schedule and milestones.

November 2000

17 *NRC decision on participation*
EPRI (and optionally, NRC) as Project Sponsor(s) select Project Leaders
EPRI (and optionally, NRC) select TI

27 *Project Sponsor(s) complete contractual arrangements with TI*
Project Leaders and TI select resource experts
Project Leaders select peer reviewers

December 2000

8 *Project Leaders and TI select information to be reviewed*
TI recommends any process changes
Project Leaders and TI agree on process

15 *Industry completes testing*
Project Sponsors complete contractual arrangements with resource experts and peer reviewers

TI schedules discussions with resource experts (Level 2 analysis) or meeting with experts (Level 3 analysis)

22 *TI provides procedures/instructions to resource experts*

January 2001

3 *TI provides information and documents to resource experts and peer reviewers*

12 *Resource experts complete analysis*

16-18 *TI solicits expert views (Level 2 analysis)*
TI convenes meeting of experts (Level 3 analysis)

26 *TI postulates community distributions (Level 2 or Level 3), provides results to Project Leaders*
Peer reviewers provide comments on process and expert analysis to Project Leaders

February 2001

9 *Peer reviewers provide comments on process and results to Project Leaders*

29 *TI and Project Leaders complete documentation*