**From:** <Zouhair.Elawar@aps.com>
**To:** <nrcrep@nrc.gov>
**Date:** Tue, Jun 20, 2006 7:59 PM
**Subject:** HRA_NUREG1842_Comments.pdf

**CC:** <EXL1@nrc.gov>, <jjulius@scientech.com>, <FRAHN@epri.com>, <JGrobbelaar@scientech.com>, <Gerald.Sowers@aps.com>

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Add = E. Lois (EXL1)

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**Subject:** HRA_NUREG1842_Comments.pdf
**Creation Date** Tue, Jun 20, 2006 7:58 PM
**From:** <Zouhair.Elawar@aps.com>

**Created By:** Zouhair.Elawar@aps.com

**Recipients**
nrc.gov
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EXL1 CC (Erasmia Lois)
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Junk Mail handling disabled by Administrator
Junk List is not enabled
Junk Mail using personal address books is not enabled
Block List is not enabled

June 19, 2006

Mr. Michael Lesar
Chief, Rules and Directives Branch
Office of Administration
Mail Stop T6-D59
U.S. Nuclear Regulatory Commission
Washington, DC, 20555-0001

**Subject: Comments on Draft NUREG-1842, "Evaluation of Human Reliability Analysis Methods Against Good Practices"**

Dear Mr. Lesar:

In response to the USNRC's request, the EPRI HRA Users Group has collected and collated a set of comments on draft NUREG-1842, "Evaluation of Human Reliability Analysis Against Good Practices". This set of comments represents a collectively compilation from the members of the EPRI HRA Users Group. The EPRI HRA Users Group consists of 28 organizations (20 of them utilities) representing 70 nuclear plants, consultants, and two vendors (Westinghouse and AREVA).

In general, the EPRI HRA Users Group is concerned about the following areas, which are reflected in specific comments (attached).

- The report is very negative towards time reliability correlations such as the EPRI HCR/ORE and THERP TRC.
- The report tries to compare methods to frameworks, and thus the results are mixed.
- Rather than provide comments on methods with respect to Good Practices, the real yardstick should be the ASME PRA Standard.
- The comments on the EPRI HRA Calculator® pertain to version 2 and now version 3 is in effect.

The development of this NUREG presented HRA practitioners with valuable information about the various HRA methods, it is an important step in providing a common understanding of the strengths and weaknesses of the different human reliability analysis methods used in risk-informed regulatory applications. The development of the NUREG is also in keeping with the EPRI HRA Users Group mission to ensure consistent, realistic HRA results and to develop a common industry approach to HRA to help ensure compliance with the ASME PRA Standard. These goals should improve the ease of review, both USNRC staff as

well as Peer Reviews. The EPRI HRA Users Group looks forward to continued cooperation in this area.

If there are any questions, please contact me via e-mail at Zouhair.Elawar@aps.com or via phone at (623) 393-5328. We are pleased to have this opportunity to provide comments to the USNRC.

Sincerely,

Dr. Zouhair Elawar, PE
Chairman, EPRI HRA Users Group

Elawar, Zouhair J (Z34646)

Digitally signed by Elawar, Zouhair J(Z34646)
DN: CN = Elawar, Zouhair J(Z34646)
Reason: Chairman, EPRI HRA Users Group
Date: 2006.06.20 16:56:28 -07'00'

Attachments – as stated

Distribution:
Dr. Frank Rahn, EPRI
Jeffrey A. Julius, Scientech

**Attachment**

**EPRI HRA Users Group**

**Comments on Draft NUREG-1842**

# Comments from EPRI HRA User's Group on DRAFT NUREG-1842
# June 2006

| Comment Index | Section in document | Comment |
|---|---|---|
| 1 | <Several> | Editorial comments combined in a separate table at the end. |
| 2 | Executive Summary | The description of the method does not give credit to the analyst. All parts of a PRA model need to be analyzed by practitioners who have been trained in the method. This includes developing the fault, analyzing data and HRA. So to state that the HRA methods could be used by an untrained analyst is not valid |
| 3 | Executive Summary | Again the shortcomings of the HRA Calculator do not take credit for the analyst being trained to use the software and in HRA techniques. |
| 4 | Executive Summary | The evaluation of ATHEANA is biased. The use of operator and plant experience is used in all methods. The use of the HRA Calculator encourages the documentation of all assumptions and information gathering. The ATHEANA method appears to be the only one that the reviewer has used and therefore has the most detail. |
| 7 | Section 3.5 | In main body little credit is given for the setup of the HRA Calculator and the step by step walk though of the analysis |
| 8 | Section 3.5 | Again little credit is given to the HRA Calculator ability to document each step of the analysis. The documentation from assumption to actual description of the individual steps can be inputted into the HRA Calculator. |
| 9 | Section 3.5 | The ease of using the Calculator and getting repeatable results should be stressed for the HRA Calculator. |
| 10 | Section 3.5 | It should be noted that since this document was produced, the Calculator has been updated to address dependencies between human failure events (HFE's). |
| 11 | Section 3.5 | There are plenty of input areas for documentation and therefore it is up to the analyst to make use of these areas. |
| 12 | Section 3.5 | EPRI provides training sessions for using the Calculator. The industry has used these training sessions to ensure that the people doing HRA are qualified. So the only people using the HRA Calculator should have training. So all comments concerning untrained analyst should not be applied to the HRA Calculator. |
| 13 | Section 3.5 | The Calculator was developed so that the analyst could document any assumptions, overrides, and comments that were needed. To prescribe what should go into each comment block is neither feasible nor expected. The text blocks were inserted so that the analyst would freely use them to document all pertinent information. |
| 14 | General comments | Most PRA models have already identified the necessary HFE's and the task now is to just improve the analysis and documentation. So stressing the identification and screening of HFE's should not have a high importance. |
| 15 | General comments | The HRA Calculator is a great improvement in the way that HRA's are performed. It would be more constructive for the NRC to submit improvement ideas since they are a member of the HRA Calculator owner's |

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| | | group instead of using a NUREG to criticize the software. |
| 16 | Section 2-3 p. 2-1 | In general NUREG-1842 has defined method as "an approach to HRA" This implies (and the document suggests) that every aspect of HRA from setting up the team and defining the scope of HRA, through the final review process is incorporated into a method. In reality there are very few methods that incorporate all these steps. However, there are a number of different "methods" for the quantification process. Within NUREG-1842 it would be useful to distinguish between the two types for clarity. One suggestion would be to define Framework, as a methodology approach that covers the entire process of HRA and method as technique used for a specific portion of HRA. A method can either be a stand-alone approach to any subsection of an HRA analysis or it can be part of the Framework. Frameworks for HRA would include the following:<br>o SHARP and SHARP1<br>o THERP<br>o ASEP<br>o ATHEANA<br>Examples of methods would include:<br>o THERP<br>o ASEP<br>o CBDT<br>o HCR/ORE<br>o SLIM/FLIM<br>Examples of a collection of methods would include:<br>o EPRI HRA Calculator<br>Using this approach there would be the THERP framework and the THERP method for quantification. Same is true for ASEP. Since SHARP does not have specific steps for quantification it would only be considered a framework and not discussed as a method. There can even be methods for screening process such as ASEP and THERP.<br>Now the review can compare methods that are intended to achieve the same goal. It does not seem logical to ask the same questions about SHARP and HCR/ORE when the over goal of each is not the same. It does seem logical to evaluate the HRA frameworks using the same parameters and the quantification methods on the same parameters. It is also confusing to list the HRA Calculator as a method and try to compare it to SHARP and THERP when it was developed from the approach in SHARP and applies the THERP method for quantification. |
| 17 | Section 2-3 | The proper name of the EPRI HRA Users Group software is the EPRI HRA Calculator® or the HRA Calculator®. The document refers to it as the HRA Calculator, EPRI HRA Calculator, and the Calculator. |

# Comments from EPRI HRA User's Group on DRAFT NUREG-1842
# June 2006

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| 18 | Section 2-3 | The framework for the HRA Calculator was developed from the SHARP1 Methodology. The user manual states, "The HRA Calculator® operates on a basic event basis and is based on EPRI's SHARP and SHARP1." If NUREG-1842 is defining the HRA Calculator as a method then SHARP and SHARP1 should also be listed as a method applied by the HRA Calculator. This needs to be added on Table E-1 as an underlying method. The HRA Calculator also allows the user to choose SPAR-H as quantification method. This should also be added to table E-1. |
| 19 | Executive Summary and Conclusions Table E-1 and 4-1 (Same table) | In Table E-1, and 4-1 under underlying data – THERP probabilities are used in the HRA Calculator but the table also needs to state that the median probabilities in THERP have been converted to means in the HRA Calculator. |
| 21 | Section 3.5 p. 3-84 (Paragraph 2) | Section 3.5.1 Paragraph 2 (p 3-84) – "The Calculator references SHARP1 for guidance on other aspects of the HRA process, but SHARP1 is not part of the software. Some limited guidance is provided in the draft guidance document" The HRA calculator was developed from the SHARP1 frame work Within the HRA Calculator, Stages 2 and 3 are done using the software. To be able to effectively use the software one must complete stage 1. The HRA Calculator asks for specific information that was obtained from Stage 1 such as: Action definition, qualitative screening (new in version 3.01), and representation – what specific tasks must the operator complete. Stage 4 –Internal review is facilitated using the software because now the HEPs can be updated electronically. Therefore, SHARP1 is part of the HRA Calculator Software! A better comment would be that the HRA Calculator uses the SHARP1 framework in the following ways.....<insert specifics> . The following differences are noted here: .....<insert specifics>. |
| 22 | Section 3.5 p. 3-84 (Paragraph 3) | "The analyst may choose either ASEP or THERP for quantifying pre-initiators events (although there appears to be preference to use ASEP for its simplicity and because it is likely to be sufficient for most case)" This statement should read "The analyst may choose either ASEP or THERP for quantifying pre-initiators events (while many early models use ASEP for its simplicity and because it is likely to be sufficient for most case, more of the recent HRA updates are using THERP to eliminate some of the conservatisms in ASEP.)" |
| 23 | Section 3.5 p. 3-85 (Paragraph 5) | "Although training is encouraged, it would be desirable to provide stronger emphasis on its use by appropriate experts only" Who is defined as an expert? People who have had training? NUREG 1842 needs to define who is considered an HRA expert. This same issue is raised again on page 3-86. |
| 24 | Section 3.5 p. 3-100 | This question and answer are both very direct and provide a clear concise review of the HRA Calculator. However, it gets lost in the rest of the body of the text. It would be more meaningful in a summary section at the beginning or end of the HRA Calculator section. |
| 25 | Section 3.5 | One of the major strengths of the HRA Calculator is the easy documentation feature. While not directly related |

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| | p. 3-103 | to the questioned on page 3-103 it would seem appropriate to add a discussion about how and what exactly is documented in the HRA Calculator. What is addressed in the discussion is outside the scope of the HRA Calculator and the comments give a misrepresentation of the documentation available within the software. Again, the HRA Calculator is a quantification method and the question being asked is for an HRA framework. |
| 26 | Section 3.5.1 | There are several places in Section 3.5.1 where there have been significant changes to the HRA Calculator since version 2.01 and some comments could be updated. The significant changes from Version 2 to Version 3 are summarized below.<br>• Screening HEP values can now be added within the HRA Calculator (pgs 3-90, 3-94 affected)<br>• Dependency analysis now included in the HRA Calculator (pgs. 3-91, 3-98, 3-103 affected)<br>• Procedure and location tables have been added (pg 3-87 affected)<br>• Updated report format (no direct correlation to the draft NUREG-1842)<br>• PSFs directly used for quantification in $P_{exe}$ (pgs. 3-91, 3-96, 3-101 affected)<br>• LER screening process (pgs 3-87, 3-88, 3-100 affected)<br>• SPAR-H Added as method (All of section 3.5, Executive summary tables, Conclusion tables affected) |
| 27 | Section 4-2<br>Table 4-2<br>p. 4-12 | An un-shaded box with the word YES needs to be defined in the key. It appears to be the same things as a shaded box. This table provides very little information for comparisons among methods, It would be more beneficial if instead of shading brief comments were placed in the matrix. Again, this matrix raises the question of why are all the "methods" being compared on the same parameters when the goals of each are different? A blank box is used to represent both weak discussion, not applicable and a simple no. These are not all the same.<br><br>In addition, under the HRA Calculator identify HFE the box is shaded representing covered generally well, however, the discussion section 3 page 3-87 about pre-initiator selection would suggest that the HRA Calculator is weak in this area. The discussion on page 3-92 about post-initiators would agree with the selection in the table. This box might want to be considered breaking into two parts, pre-initiators and post-initiators. |
| 29 | Section 4<br>Conclusion | In general the overall conclusions appear to favor ATHEANA. This is a little biased because the ATHEANA is both a framework and a quantification methodology and it is not logical to compare a framework to a quantification method. ATHEANA is the most recently developed framework and seems to be developed with the same set of parameters in mind as being evaluated in this NUREG. THERP and SHARP were not developed around parameters being evaluated. It is well understood that most methods are being used well outside of their original boundaries. |

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| 30 | General | The draft NUREG used the term "Lack of Accuracy" to describe the weaknesses in some established HRA methods. Lack of accuracy will always be present in any existing or future methods. Human performance varies widely between individuals as well as within the same person at different times and state of mind. The Lack of Accuracy term may lead reviewers to unreasonably believe a future method might achieve "accuracy" in predicting future human error probabilities (HEP). In order to reasonably compensate for the lack of accuracy in HEPs, PRA practitioners have a common practice of treating the various "Best Estimate" failure data (e.g. NUREG/CR 1278 data) as MEDIAN values. And then, convert that data to MEAN values (in a Log-Normal distribution) for use in their respective PRA models. When a typical error factor is 10, the resulting conversion multiplier is about 2.67. When this practice was presented in mid December 2005 to the ACRS PRA subcommittee, the subcommittee members showed an expression of over-conservatism when PRA models are not using simply the "best estimate" values in NUREG/CR 1278. |
| 31 | General | The draft NUREG identified dependency between human actions as weakness in some established HRA methods. Dependency between different HRAs is outside the scope of many HRA methods. That type of dependency is well accounted for by PRA practitioners and has been an important aspect of industry peer reviews. The dependency between human actions within an HRA and the level of dependency between operators executing the actions rely on established guidelines in existing methods (such as THERP, HRA Calculator, or SPAR-H). |
| 32 | General<br>THERP | **THERP Comment:** The use of TRC in THERP for diagnosis error was characterized as "simple, generic, and not appropriate for most regulatory applications". For several reasons, the use of TRC in THERP should be acceptable:<br>• The diagnosis error Tables in THERP apply to the control room crew as a whole. The diagnosis error conservatively takes no credit for diagnosis error recovery by the continuously present control room supervisor.<br>• In a prospective evaluation, an HRA practitioner must always assume that each control room operator is in a state of mind that makes him fit for duty<br>• The "best estimate" diagnosis errors presented in THERP tables are conservatively treated as median values. They are converted to mean values prior to application in PRA models. These conversion factors in a multiplier ranging from 1.66 to 4 or higher.<br>• Diagnosis errors of subsequent events are assigned higher error probabilities.<br>• PRA models routinely identify top 20 (or more) important HRAs. In the top 20 list, PRA practitioners do not accept diagnosis HRAs without written procedural support. This is also known as knowledge-based diagnosis not allowable to be credited in the top 20 most important HRAs.<br>• Written procedures have largely eliminated the need for true operator diagnosis. The response to |

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| | | almost every known initiating event or alarm is written down in emergency response procedures or severe accident management guideline (SAMG). Diagnosis errors in THERP Tables are conservative when applied to scenarios with written procedures. |
| 33 | Section 3.5 | The draft NUREG showed a concern the HRA-Calculator software may be erroneously used by personnel other than qualified HRA practitioners. Like numerous other qualified software, the use of HRA-Calculator is restricted to qualified personnel. Any mis-use would count as a serious departure from training program accreditation. |
| 34 | Section 3.5 | The draft NUREG indicated that insufficient guidance was devoted toward selecting the proper method within the HRA Calculator. The guideline document that was generated as part of the HRA-Calculator project does describe the various advantages of each available HRA method. That guideline is accessible to all users. HRA training clearly specify that one should not be shopping for the method that yields lowest results, instead, the user needs to describe in advance which method shall be used under which conditions. Furthermore, one important objective of the HRA-Calculator Users' Group is to converge to a common method. |
| 35 | Executive Summary p. xv Table E-1 | HCR/ORE limitations section states this method is not appropriate for most regulatory applications, until suitability of using the standard normal distribution and method to obtain relevant model parameters.<br><br>In general, the HCR/ORE is experiential-based, even more than many other methods and thus it should be appropriate. The issue of the applicability of the standard normal distribution will be addressed by this commenter in a follow-up to this comment.<br><br>Further, he Time PSF in SPAR-H has no documented experiential basis, and thus if this comment applies to HCR/ORE then the Time PSF portion of SPAR-H should also be judged as "not appropriate for most regulatory applications." |
| 36 | Executive Summary p. xv Table E-1 | CBDT limitations state no guidance for using this method under time-limited conditions. Please indicate that the EPRI HRA Guidance is being updated to address this issue. |
| 37 | Executive Summary p. xvii Table E-1 | EPRI HRA Calc - limitations state that there is not a strong emphasis on training, but the user group does provide many training classes for users, and advocates user qualification in accordance with the licensee's training program. |
| 38 | Executive Summary | EPRI HRA Calc - limitations state that the flexibility to make changes allows any result.. This is not specific to the EPRI HRA Calculator. |

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| | p. vxii<br>Table E-1 | |
| 39 | Executive Summary<br>p. vxii<br>Table E-1 | EPRI HRA Calc - limitations state that the approach has a lack of guidance for choosing what methods to use, however this is covered in training. |
| 40 | Executive Summary<br>p. xvii., Table E-1 | EPRI HRA Calc – table does not recognize that current version includes SPAR-H. |
| 41 | Section 2.1.3<br>p. 2-2, | Section 2.1.3, states that HCR/ORE and CBDT are the primary methods for post-initiator quantification used by the EPRI HRA Calc. The CBDT and THERP are the primary methods for post-initiator quantification. HCR/ORE are used for time-limited HFEs. |
| 42 | Section 3.1.2<br>p. 3-18 | THERP, statements seem to indicate this method does not incorporate all PSFs, rather just a few important ones. The EPRI HRA Calculator has the facility for any user to use any/all tables of THERP, but this requires some set-up work outside of the software. |
| 43 | Section 3.3.2<br>p. 3-57 | HCR/ORE for Pc. States method has a major limitation because it does not explicitly address potential for diagnosis errors and their causes/impacts. It should be noted in the EPRI TR 100259 that this method models the failure mode of failing to complete the action in the time available, given diagnosis success. The EPRI HRA Calculator approach recommends solving the CBDT method first to establish the diagnosis error, and then to quantify the HCR/ORE method for time-critical actions to see if the time-related failure mode dominates the diagnosis. |
| 44 | Section 3.3.2<br>p. 3-57 | HCR/ORE. NRC challenges HCR/ORE standard normal distribution fit to lognormal distribution. In general, the HCR/ORE is experiential-based, even more than many other methods and thus it should be appropriate. The issue of the applicability of the standard normal distribution will be addressed by this commenter in a follow-up to this comment. The HCR/ORE method is analogous to the Time-PSF in SPAR-H which does not have a lognormal distribution. |
| 45 | Section 3.3.2<br>p. 3-60 | HCR/ORE. States expert elicitation is a limitation due to potential to not obtain correct median response time. This data can be obtained by simulator measurement and/or operator interview per the ASME PRA Standard SR HR-G5. Consideration will be given to addressing this issue in the next update to the EPRI HRA Guidance. |
| 46 | Section 4.4<br>p. 4-4 | HCR/ORE limitations. States guidance for use of expert judgment to obtain T1/2 is not provided, and not appropriate for regulatory applications. This data can be obtained by simulator measurement and/or operator interview per the ASME PRA Standard SR HR-G5. Consideration will be given to addressing this issue in the next update to the EPRI HRA Guidance. |

# Comments from EPRI HRA User's Group on DRAFT NUREG-1842
# June 2006

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| 47 | Section 3.3.2<br>p. 3-64 | HCR/ORE. States that method is not appropriate for regulatory applications unless the lognormal distribution is validated and an adequate number of plant-specific simulator runs is used to determine TRC parameters. In general, the HCR/ORE is experiential-based, even more than many other methods and thus it should be appropriate. The issue of the applicability of the standard normal distribution will be addressed by this commenter in a follow-up to this comment. The HCR/ORE method is analogous to the Time-PSF in SPAR-H which does not have a lognormal distribution. |
| 48 | Section 3.4.2<br>p. 3-80 | CBDTM. States limitation that no guidance is provided if HFE is time-limited. ERPI HRA Calc user group training provides this guidance. |
| 49 | Section 3.5.1<br>p. 3-96 | EPRI HRA Calc. Only PSF stress level is used in Pe, other prompted PSF information not used to adjust the base HEP. This is fixed in v3.01. |
| 50 | Section 3.5.1<br>p. 3-98 | EPRI HRA Calc. A limitation is stated regarding global dependence. Dependency across and accident sequence is available in v3.01. |
| 51 | Section 3.5.1<br>p. 3-99 | EPRI HRA Calc. Reasonability check not performed. While this is not accomplished explicitly in Versions 2 or 3 of the software, the database approach has made it easy to conduct a query and create a table to facilitate the confirmation of reasonableness. This has been accomplished in recent HRA updates. |
| 52 | Section 3.5.1<br>p. 3-100 | EPRI HRA Calc. States that guidance does not address human factors experts and HRA expertise on the team. The User Group has championed and provided frequent, high quality training on for use of the Calculator and underlying theory. The issue of misuse, i.e., "plugs a number", is not a limitation of the calculator, but is an end user responsibility to ensure properly qualified personnel perform any PRA assessment. Considerations of recommending the user be qualified and that a team approach a la SHARP1 (section 2.4) be applied will be given during the next update of the EPRI HRA Guidance. |
| 53 | Section 3-101<br>p. 3-101 | EPRI HRA Calc. States that Sigma Decision Tree in HCR/ORE is not appropriate for most regulatory applications. This is recognized and will be accounted for in the next version of the software. |
| 54 | Section 4-2<br>p. 4-6 | EPRI HRA Calc. States we should not use the Sigma Decision Tree in conjunction with HCR/ORE method. This is recognized and will be accounted for in the next version of the software. |
| 55 | Section 4-2<br>p. 4-6 | EPRI HRA Calc. The EPRI HRA Users Group plans to provide written guidance on which methods to use for a particular HFE in future software and guidance updates. |
| 56 | General | Draft NUREG-1842 characterizes many of human reliability analysis (HRA) methods currently in use by the industry as "not appropriate for regulatory applications". The only comprehensive HRA method which did not receive this characterization was ATHEANA, which is a new HRA method developed by NRC contractors with limited use outside of NRC and its contractors. While all HRA methods have limitations and weaknesses, the NUREG is unnecessarily judgmental of the methods used in most industry PRAs. |

# Comments from EPRI HRA User's Group on DRAFT NUREG-1842
# June 2006

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| 57 | General | Draft NUREG-1842 reviewed 10 HRA methods and tools. However, these HRA methods and tools were developed for different purposes. These methods should not be reviewed and compared against each other since they are not independent alternatives for HRA modeling. |
| 58 | General | The review of HRA methods should be based on compliance with RG 1.200 and the ASME PRA Standard, not other acceptance criteria. |
| 59 | General | Draft NUREG-1842 overstates the importance of performance shaping factors in HRA methodologies such as HCR/ORE, where experience data is available to support the analysis. |
| 60 | General | Why not evaluate against ASME/RG 1.200 instead of the Good Practices? Also Addenda B is now out and applies. |
| 61 | General | Recommend adding a section on Applications (since industry users and NRC staff are dealing with applications now).<br>- Address global issues, such as if there is insufficient time available to complete the action then the HEP should be modeled as a guaranteed failure.<br>- Address non-proceduralized recovery actions as part of a Significance Determination Process.<br>- Probably will not be able to identify what methods are suitable for what applications, but may be easier to identify areas where the methods do not apply (e.g. HCR/ORE for very long system time windows) |

## Editorial Comments:

| Comment Index | Section linked to point in document | Comment |
|---|---|---|
| ED-1 | Executive Summary | Page 15 first paragraph, last sentence, hings should be things. |
| ED-2 | Executive Summary | [Blank Pages]<br>Page after flow chart is blank.<br>Page after acknowledgements is blank. |
| ED-3 | Executive Summary | [Flow chart comments]<br>1. The flow chart is incorrectly formatted<br>2. Need to add a step in HRA performance to interview operators and/or use an expert panel.<br>3. Under documentation need to add that the analysis for the amount of time available for performance of the actions in the HFE.<br>4. Under documentation need to add that any site procedure need to be stated.<br>5. Under documentation need to add that any assumptions made need to be stated.<br>6. Under documentation need to add that any recoveries credited need to be justified. |
| ED-4 | Section 4 Conclusion | Page 4-22 and 4-23 - The second and last bullets are very similar and could be combined into a single more concise point. |
| ED-5 | Section 3.5 EPRI HRA Calculator | Add sub-section numbers to section 3.5.2 (and every other section which has questions and answer format) and better table titles to Section 4 for easy reference. |

## Format/Report Layout Comments

| Comment Index | Section in Document | Comment |
|---|---|---|
| FO-1 | Section 2-3 | The proper name of the EPRI HRA Users Group software is the EPRI HRA Calculator® or the HRA Calculator®. The document refers to it as the HRA Calculator, EPRI HRA Calculator, and the Calculator. |
| FO-2 | Section 3.5<br>p. 3-100 | This question and answer are both very direct and provide a clear concise review of the HRA Calculator. However, it gets lost in the rest of the body of the text. It would be more meaningful in a summary section at the beginning or end of the HRA Calculator section. |
| FO-3 | Section 3.5<br>p. 3-103 | One of the major strengths of the HRA Calculator is the easy documentation feature. While not directly related to the questioned on page 3-103 it would seem appropriate to add a discussion about how and what exactly is documented in the HRA Calculator. What is addressed in the discussion is outside the scope of the HRA Calculator and the comments gives a misrepresentation of the documentation available within the software. Again, the HRA Calculator is a quantification method and the question being asked is for an HRA framework. |
| FO-4 | Section 4-2<br>Table 4-2<br>p. 4-12 | An un-shaded box with the word YES needs to be defined in the key. It appears to be the same things as a shaded box. This table provides very little information for comparisons among methods, It would be more beneficial if instead of shading brief comments were placed in the matrix. Again, this matrix raises the question of why are all the "methods" being compared on the same parameters when the goals of each are different? A blank box is used to represent both weak discussion, not applicable and a simple no. These are not all the same.<br><br>In addition, under the HRA Calculator identify HFE the box is shaded representing covered generally well, however, the discussion section 3 page 3-87 about pre-initiator selection would suggest that the HRA Calculator is weak in this area. The discussion on page 3-92 about post-initiators would agree with the selection in the table. This box might want to be considered breaking into two parts, pre-initiators and post-initiators. |