

Industry Priorities for Changes to Section 9 “Human Reliability Analysis” of the *Risk Assessment Standardization Project (RASP) Handbook Volume 1, Revision 2*

V Anderson - NEI

K Kohlhepp, J Grobbelaar, J Julius – Scintech

M Presley - EPRI

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Overview

- High level HRA comments
 - Repair vs. Recovery
 - Required Expertise
 - Recent Advances in HRA
 - Treatment of Dependencies
 - Minimum HEP
 - Uncertainty
- EPRI HRA User Group Dependency Committee

Repair vs. Recovery

- For internal events the handbook **appropriately differentiates between repair and recovery.**
- For shutdown scenarios there could be days available for repair type actions and these could be credited as recoveries.
 - Feasibility
 - Procedures
 - Planned organizational response strategies

Required Expertise

- Section 9 (general) invokes times when the analyst should consult an “HRA expert”
 - This could be generalized to say multi-disciplinary team
- Expert team could include
 - Thermal hydraulics experts
 - Experts in plant operations including plant response

Recent Advances in HRA

- The HRA guidance does not include references/discussions on recent HRA advances
 - Provide additional guidance on qualitative analysis
 - Halden Benchmarking studies (2011/2012)
 - IDHEAS
 - NUREG-1921 – Fire HRA guidelines
- SDP cases often involve conditions/situations where the HRA methods were not designed /benchmarked, such that the
 - qualitative discussion of staffing,
 - cues,
 - procedures
 - timingare important to establishing the degree of confidence in the HEP.

Treatment of Dependencies

- The RASP Handbook recognizes that *“Simply having two or more HFEs together in a sequence or cut set does not make them dependent”, which is good!* however, this is contradicted later in the document
 - *“An analyst should not use a minimum joint HEP of less 1E-06 for SDP analyses. Therefore, a SDP analysis always assumes some level of dependence between HFEs even if the specific reason for that dependence cannot be identified”.*
- Industry believes that minimum joint HEP of 1E-6 is too conservative if independence can be shown (See next slide)
 - Criteria for defining independence when assessing Joint HEPs should be included.
 - A minimum joint HEP could be used applied as a screening tool to make sure that multiple HFE scenarios don't get screened, and then rely on constructing a qualitative story to come up with a final judgment on whether the scenario warrants additional justification

Minimum HEP

- Section 9.3 is generally accepted by the industry, however, the discussion does not reflect conditions where this could be overly conservative.
- Any dependency floor applied is arbitrary, there is no technical basis to support the choice.
- A dependency floor can be useful for screening, however, using an absolute floor beyond that **distorts the overall risk profile**:
 - Application of a minimum joint HEP equates cutsets with 3-4 opportunities for operator recovery with those cutsets with 10-12 opportunities for recovery.
 - Effects calculation of component and operator action risk importances such that real drivers may be masked.
 - Does not help identify deficiencies or opportunities for improvement, because the cause is not known or unspecified.
- There is a general understanding that PRAs are less about the absolute value of risk, e.g., CDF, LERF; and more about the relative importance of the PRA constituents, which is why PRA should be “best estimate,” not overly conservative.
 - Uncertainty should be treated by sensitivity studies

Uncertainty

- Guidance currently lacks discussion on uncertainty
 - No guidance is provided to determine the impact of the assumed minimum HEPs, which are a source of uncertainty.
- Guidance should be included to assess the importance (i.e., perform sensitivity analysis) of the assumed HEP and/or dependency values including consideration of independence.
- EPRI 1026511 and NUREG 1855– Uncertainty in risk informed decision making

EPRI HRA User Group Dependency Committee

- HRA Dependency Committee
 - First formal meeting at Risk Technology workshop next week
 - NRC Research provides input to the committee
- Overall Goal of Committee
 - Provide guidance on minimum Joint HEPs
 - Provide guidance on the application of dependencies.
 - Determine if there is a need for future research.

Questions