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**Toward a Consensus Model
for Human Reliability
Analysis**

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Outline

- Staff Requirements Memorandum (SRM) on HRA model differences
 - Background
 - EPRI perspective
- Overview of the technical approach
- Summary of status

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Background

- Staff Requirements Memorandum (SRM) M061020 directed the ACRS to
 - “work with the staff and external stakeholders to evaluate the different human reliability models in an effort to propose a single model for the agency to use or guidance on which model(s) should be used in specific circumstances”*
- NRC/RES has taken lead to respond
 - Support from Sandia, Idaho, University of Maryland
 - Collaboration with EPRI
- Periodic interactions with ACRS via “quarterly” working meetings with PRA Subcommittee

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Background (continued)

Perceptions on intent of SRM-M061020

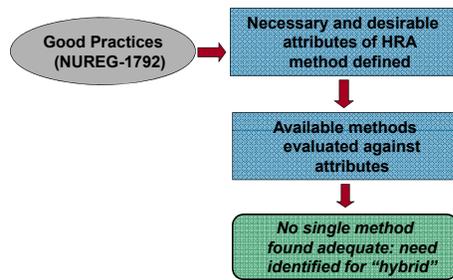
- A single consensus method is the most desirable
- Use of more than one method should be justified
 - Why more than one method?
 - Which method(s) should be used for which applications?
- Need for implementation guidance for each particular method and application
- Desirability for convergence of NRC and industry on HRA methods

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Background (continued)



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Why is EPRI participating?

Status of EPRI Research and Activities:

- Basic HRA methods developed by EPRI in late 1980s/early 1990s still in wide use within nuclear industry
 - SHARP1 framework for HRA (including guidance for qualitative analysis)
 - Complementary methods for representation and quantification of human failure events (HCR/ORE time-based correlation and cause-based decision trees)
- Methods codified in HRA Calculator®
 - Facilitates HRA and promotes consistency among analysts
 - Used extensively in US, and by some others

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Why is EPRI participating?

Status of EPRI Research and Activities (continued)

- Methods are generally well-understood by users
- Methods and tools are being used effectively for risk management and risk-informed applications

But...

- There is recognition that the methods
 - Are aging, without significant review or update for 18+ years
 - Included elements that were meant to be examined further over time

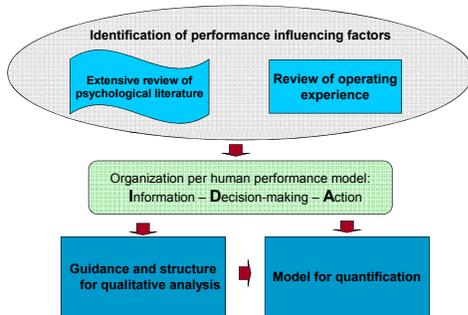
Opportunity to leverage resources for improvements in HRA

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Elements of the approach



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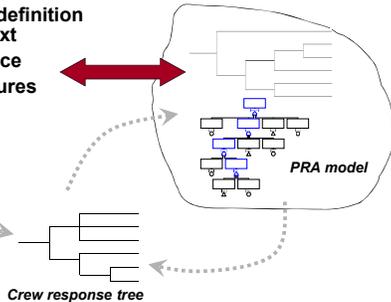
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Overview of Qualitative Analysis

• Scenario definition and context

- Sequence
- Procedures
- Timing
- Cues
- Etc.



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Quantitative Analysis

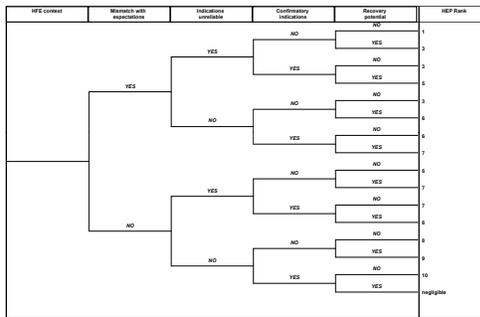
- EPRI's cause-based decision trees provide conceptual framework
- Qualitative influences represented in decision trees
 - Proximate causes of failure linked to performance-influencing factors (PIFs)
 - Impact of context and PIFs assembled logically to address **Crew Failure Modes**
- Each decision tree addresses one crew failure mode
- End states quantified
 - Using expert judgment for the present
 - Framework for incorporating data in the future

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Example Decision Tree: Information Dismissed



Summary

Expectations for the hybrid model: method that

- Enables achieving consistency and repeatability in results
- Is practical to implement
- Provides insights into important sources of human failure
- Produces quantitative results for human failure events that appear reasonable
 - From one HFE to another
 - Relative to (available) operating experience
- Does not require major restructuring of current PRA models in the near- to mid-term

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