An Initiative Aimed at Collecting and Exchanging Data For Human Reliability Analysis

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Outline

• Motivation
• Observations based on a review of activities and trends
• A proposed way forward
Motivation

- One reason for the extensive reliance on expert judgement in Human Reliability Analysis, with its advantages and drawbacks, is the lack of data.
- Data on human performance in complex, technical domains such as nuclear power plants would provide an improved basis for expert judgement, e.g. traceable evidence supporting the conclusions.
WGRisk Task on HRA Data

Working Group on Risk Assessment (WGRisk) of the Nuclear Energy Agency Committee on the Safety of Nuclear Installations (CSNI)

In 2002, a WGRisk Task Group was set up to examine the following questions:

– what kinds of data are needed?
– what are the potential sources?
– what actions can be taken?
– what are the challenges and how can they be addressed?
– what are the factors for success?
Data needs (kind of data)

- Primary scope is the **Level 1 PRA** for nuclear power plants (other presentations suggest: accident management/Level 2, fire), **full-power** as well as **shutdown (LPSD) operation** (issue of large time windows or extended time scales)

- Pre-initiator errors – errors contributing to latent system failures or post-initiator actions – actions in the response to initiating events?
  - **Methodologically**, certain types or aspects post-initiator actions, in particular decision-making, situation assessment, and errors of commission,
  - In terms of **risk significance**, post-initiator actions are and are expected to remain important contributors (note: relative importance even as absolute risk is reduced)
Data needs (for what)

- data needed to support HRA analysis and PSA applications
  - challenges associated with specific scenarios
  - effects and mechanisms to account for in analysis (e.g. MERMOS stories)

- data to support the improvement and development of HRA methods
  - especially but not limited to new methods that include errors of commission within their scope,
  - as well as improved guidance (e.g. assessment of dependencies)
Potential or candidate sources

- **operational experience**: the systems for operational experience feedback and reporting mandated by regulatory authorities
- plant full-scope **training simulators** (training, qualification, but also special-purpose sessions)
- research and **other simulators**
- **controlled studies** (factor studies, experiments on psychological effects/subject performance)
- HMI validation and verification (**V&V**) studies
# Operational experience vs. simulator data

<table>
<thead>
<tr>
<th>Operational experience</th>
<th>Simulators</th>
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<tr>
<td>by volume, relates mainly to latent system failures</td>
<td>primarily used for training</td>
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<td>efforts within and outside the plant and utility organization</td>
<td>utilities are using increasingly challenging scenarios</td>
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<td>outside: organizational, national, Owners’ Groups, IAEA/NEA, WANO</td>
<td>direct feedback to crews, improvements to training (e.g. content and priorities) and to procedures (e.g. revise ambiguous steps)</td>
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<td>modifications probably needed to allow human performance issues to be addressed</td>
<td>sole (?) source of data on performance in accidents, but limited mostly (today) to scenarios initiated during full-power operation</td>
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<td>large inertia (expertise and training)</td>
<td>resource-intensive</td>
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<td>efforts to “mine” this data (e.g. INL/NRC’s HERA)</td>
<td>know-how concentrated in a handful of programs of simulator studies for HRA purposes</td>
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<td>research simulators (for complex domains, e.g. Hammlab in Halden)</td>
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Proposed strategies

• support increased HRA data collection, in plant simulators in particular, sharing methods and know-how
  – flatten the steep learning curve
  – increase use and acceptance of justifications based on data (common approaches, “methodology”)

• establish an HRA Data Project (along the lines of ICDE, OECD-Fire, etc) to complete the exchange framework and carry out a pilot effort
Next steps

- workshop on the use of simulators and operational experience for HRA purposes in member countries
  - share the methodologies and practices applied in these efforts, results and experience
  - take steps to identify and form a core group of organizations to...

- establish an NEA HRA Data project, in which the core participants will develop and operationalize the data exchange framework and apply the framework in a pilot effort
A proposed HRA Data Project

- data exchange framework, common framework based on best features used in existing efforts
- procedural aspects to be based on current NEA data projects (e.g. ICDE)
- draw generic insights from the collected data relating to specific scenarios or human performance issues
- identify and prioritize those areas of human performance in most need of additional data

Some success factors

- depth of experience and on-going programs in some member countries (many with a long history)
- interest in getting increased benefit from simulation facilities that have proven their usefulness in the context of training
- potential source of “consensus” or accepted data to be used as evidence to support HRA estimates