Overview of Licensed Operator Simulator Training Data and Use

Lawrence Criscione¹, Song-Hua Shen¹, Rodney Nowell², Richard Egli¹, Y. James Chang¹, Anthony Koonce³

¹U.S. Nuclear Regulatory Commission
²STP Nuclear Operating Company
³Idaho National Laboratory

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Outline

• Introduction
• Overview of Simulator Training
• Considerations of simulator data fidelity for estimating human error probabilities in human reliability analysis (HRA)
• Conclusions
Introduction

• Risk-significant real nuclear power events are
  – Rare: limited data
  – Unique: response of a specific crew

• Simulator data is a good supplemental data source for HRA, in the US (104 reactors):
  – Generate ~ 10,000 simulator scenarios annually
  – Any scenario is exercised by multiple crews
  – Performed by the licensed operators

• Simulator data fidelity would affect applicability of simulator data for HRA
Overview of Simulator Training

• Types of Simulator Scenarios
  – Annual Exams and Exam practice
  – Periodic exams and training
  – Instructional training

• Periodic training for a dual unit station
  – ~ 5 training weeks a year
  – ~13 crews per training week
  – Usually 4 scenarios per training week
  – Usually around 4 malfunctions per scenario
  – Usually one or two critical tasks per malfunction
# An Example Malfunction

**Malfunction:** Loss of Emergency Cooling Water (ECW) 1A

<table>
<thead>
<tr>
<th>Task: Lead Performer</th>
<th>Expected Response</th>
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<tbody>
<tr>
<td>1. Crew</td>
<td>Recognize loss of emergency water (EW) flow to A train</td>
</tr>
<tr>
<td>2. Crew</td>
<td>Secure ECW pump 1A</td>
</tr>
<tr>
<td>3. Crew</td>
<td>Manually trip Diesel Generator (DG) prior to the DG trips automatically</td>
</tr>
<tr>
<td>4. Crew</td>
<td>Ensure the charging cooling pump 1A is in service</td>
</tr>
<tr>
<td>5. Crew</td>
<td>Verified natural circulation</td>
</tr>
<tr>
<td>6. Shift Manager</td>
<td>Determines need to cooldown</td>
</tr>
<tr>
<td>7. Shift Manager</td>
<td>Declare an Alert HA1/EAL2 due to damage to EW structure or notify ED that escalation is appropriate</td>
</tr>
</tbody>
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Considerations of Simulator Data Fidelity for HRA

- Command Presence
- Sensitivity to Cues
- Stress
  - Performance Pressure
  - Environmental
  - Emotional Distraction
- Success Criteria
- Other considerations
  - Simulator
  - Scenario
  - Training
  - Staffing
Conclusions

• Simulator data are good for estimating human error probabilities in HRA
  – Data amount and results sampling
  – Similarity in work place and people to real events

• Fidelity issues are likely manageable
  – Require careful data screening