




USNRC Research Activities to Support FLEX Implementation

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Regulatory Information Conference
March 13-15, 2018



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United States Nuclear Regulatory Commission
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Uses of FLEX Equipment

- Beyond Design Basis Accidents
- Plant Flexibility



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Challenge Using Current Methods for FLEX



- Limitations of current methods
 - Mostly designed for and based on data for control room actions
- HRA is needed for various scenarios and environments
 - Actions performed outside the control room
 - Low Power/Shutdown Actions
 - Level 2/3 Probabilistic Risk Analysis (PRA) actions



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NRC's HRA Needs for Crediting FLEX



- Support risk assessments
 - Significance Determination Process, Notices of Enforcement Discretion, licensing, incident investigation
- Update SPAR models
 - Using FLEX to support Level 1/2/3 PRAs
- User friendly
 - In order to support quick-turnaround assessments



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Plan to Address Challenges in Crediting FLEX



- Ultimate goal - Develop a user-friendly Human Reliability Analysis (HRA) approach for FLEX actions
- 1) Data Evaluation
 - Use current plant field work data to generate surrogates for similar FLEX decisions/actions
 - Need volunteer plants to provide data
- 2) Expert Elicitation
 - Expert elicitation to look at common FLEX decisions/actions
- 3) Develop Advanced SPAR-H Capability
 - Use IDHEAS-ECA as basis for developing a user-friendly HRA method



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Data Sources



- Surrogate industry data – i.e. firefighting, military, etc.
- Nuclear industry FLEX actions
- Nuclear industry field work data
- NRC's Scenario Authoring Characterization and Debriefing Application (SACADA) database – expanding to capture Job Performance Measures

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Expert Elicitation



Used to

- Identify important FLEX actions
- Identify unique performance shaping factors
- Evaluate the contribution of the performance shaping factors on the total Human Error Probability (HEP)
- Quantify HEPs of FLEX
 - Plant flexibility
 - Beyond design basis scenarios

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IDHEAS - ECA



- Supports HRA in Event and Condition Assessment
- Qualitative Analysis
 - Identify boundary conditions under the specific event and condition.
 - Major tools are Crew Response Trees and Human Fault Trees
- Quantitative Analysis
 - HEP includes Cognition Error Probability (HEPc) and Time Uncertainty Error Probability (HEPu).
 - HEPc includes Information Detection, Diagnosis, Decision, and Execution Errors.
 - HEPu is the probability of the human action failed due to the Uncertainty of the Time Required to perform the specific action.

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SPAR Model Updates



- HRA improvements are used in conjunction with NRC SPAR models
- PWR Pilot Model
 - Created
 - Modeling process and challenges - documented.
- BWR pilot model
 - In process
- Additional models are expected to be created as resources allow.

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Path Forward



- Develop and document NRC approach
 - Supported by the Office of Nuclear Regulatory Research
 - To be used in NRC's risk-informed decision making processes
- Engage industry on their approach
 - Communicate any concerns
 - Continue to hold public meetings to discuss concerns (as necessary)

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Schedule



- Data Analysis - Ongoing
- Expert Elicitation – Summer 2018
- IDHEAS-ECA – Summer 2018
- SPAR Updates - Ongoing

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Questions?

If you have further questions, please email:

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