JENSEN HUGHES

Advancing the Science of Safety

INTEGRATING RISK AND ENGINEERING SKILLS FOR 10 CFR 50.69 SYSTEM CATEGORIZATION

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AGENDA

OVERVIEW OF STEPS AND RESOURCES FOR CATEGORIZATION

- System Functions
- Component Mapping
- Active PRA Categorization
- Defense-in-Depth
- External Hazards
- Shutdown Safety Assessment
- Passive Evaluation
- Conclusions

TEAM INTEGRATION MEANS SUCCESS

- The Exelon integrated categorization team use a consistent approach in procedures and processes and shares information about needs and objectives
  - Clear roles and responsibilities
    - Right person for each job
    - Tasks can be done in parallel to decrease overall duration
  - Effective use of procedures and processes
    - Changes can be identified and made quickly
  - Shares information about needs and objectives
    - Avoids overlapping work
  - Easy to get latest project status and reports to management
  - Problems are visible almost immediately
  - Accountability is increased

DEVELOP SYSTEM FUNCTIONS

- Develop list of functions performed by the system
  - Systems Engineer (Leads Development)
  - PRA Model Owner
  - Operations Representative
- All system functions must be identified
  - Maintenance Rule Functions
  - PRA Modeled Functions,
  - Many more..
- Cross-checking by team ensured that all functions were properly identified
  - Team members connect directly with one another

COMPONENT TO FUNCTION MAPPING

- Involves determining which SSCS are required to perform each of the designated system functions
- Integration of the team was beneficial in that several engineers performed this task to save time and verified each other's work

Component ID	Component Description	F1	F2	F3	F4	F5	F6
SSC A	Description A	+	+	+	+	+	
SSC B	Description B	+	+	+	+	+	+
SSC C	Description C		+	+	+		+
SSC D	Description D	+	+			+	
SSC E	Description E				+	+	+
SSC F	Description F				+		+
SSC G	Description G					+	

ACTIVE PRA CATEGORIZATION

- All of the PRA model tasks defined in NEI 00-04 must be performed by qualified PRA engineers
  - PRA Basic Event to Component Mapping
  - Risk Importance Measures Evaluations
  - Integrated Model Analysis
  - Preliminary Results Examination
  - System Specific and Cumulative Impact Sensitivity Analyses
- At Exelon the PRA Model Owners were the ideal choice for this task.
- Integrated team insights used to help confirm risk categorization of functions appropriate
  - Subdividing of functions

DEFENSE-IN-DEPTH

- Two Main Parts: Core Damage and Containment Integrity
  - Requires involvement by PRA engineers and systems engineers
  - May need engineer familiar with plant safety analysis to provide input
- For modeled functions it is most efficient for the PRA engineer to perform the defense-in-depth assessments
- For non-modeled functions it is most efficient for the systems engineers (non-PRA engineer) to perform the defense-in-depth assessments
- Defense-in-Depth grid developed by both PRA and engineering team members ensuring its accuracy

EXTERNAL HAZARDS

- Most efficient to perform this evaluation up-front in the process
  - PRA engineer evaluate modeled external hazards
  - Engineers with systems and design background evaluate non-modeled hazards. Examples:
    - Extreme Winds or Tornados
    - External Flooding
    - Seismic Margin Assessment (SMA)
      - » Necessary to confirm SMA component list matches current as-built as-operated plant
      - » Multiple engineering resources to review plant change records
- Useful input for system selection if performed up-front

SHUTDOWN SAFETY ASSESSMENT

- Involves reviewing shutdown PRA or shutdown safety model
  - Best to also perform up-front in the process
  - Useful input for system selection if performed up-front
- Important to coordinate this assessment with PRA and non-PRA engineers (operations or systems engineers)
  - Ops / work control staff may be useful in interpreting how the shutdown safety process is implemented
  - Coordination necessary to help identify “primary shutdown safety system” (i.e., primary and first alternative methods to satisfy key safety functions)

PASSIVE EVALUATION

- Risk-informed in-service inspection (RI-ISI) individual is ideal for 50.69 passive evaluations
  - Traditional ISI programs identify inspections based on deterministic criteria (e.g. stress analyses, structural discontinuities, random selection)
  - RI-ISI uses operating experience and risk insights to target the pipe segments that present the greatest risk, including both likelihood and consequence of failure.
- PRA engineer is a good alternative to conduct this passive evaluation if RI-ISI individual is unavailable

CONCLUSION

SETTING UP A SUCCESSFUL INTEGRATED TEAM

- Identify needed disciplines and skills
- Setup organizational structure
- Train team together
- Develop and review procedures and processes as a team
- Hold routine meetings to facilitate communication and resolve issues collaboratively

QUESTIONS?

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