FRAMEWORK FOR RISK-INFORMED PERFORMANCE-BASED ALTERNATIVE TO 10CFR Part 50

Preliminary Comments

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Topics

- Progress and Testing
- Fundamental Quantitative Safety Principles compared to QHO's and F-C Function
- LBE Definition
- SSC Significance
- External Event Treatment
- Protective Strategies, Design Strategies and Defense-in-Depth
- Summary

Progress and Testing - Comments

- April Draft Provides Considerable, Well-Developed Preliminary Technical Bases
- July Draft Provides a Limited Scope Example for LBE and Safety Classification
- Example is Reasonable- except NNS SSCs are not Considered
- Detailed Example, which Considers Stakeholder Input, is Needed
- Definitions Need to be Unambiguous
- Preliminary, Technical Comments are Provided for Consideration in Future Development

Fundamental Quantitative Safety Principles Compared to QHOs and F-C Function

- Structure of RI, PB, TN Framework includes
  - Safety / Security / Preparedness Expectations
  - Defense-in-Depth Expectations
  - Protective Strategies
  - Design Objectives
- Safety is Addressed in this Presentation
  - F-C and QHOs Compared to CCDF and QHOs is Focus for this Topic in Today's Presentation
  - Deterministic Measures will be Addressed in Future Comments

Safety - Summary of Framework

- Anchored in Safety Goals
- Provides for Enhanced Margins of Safety
- Framework Uses QHOs, F-C Approach and Deterministic Practices
- Continues the Practice of Ensuring that the Allowable Consequences of Events are Matched to their Frequency
- Sequences of the PRA Populate the F-C Curve
- Results Must Lie Below the Curve

QHO and F-C Curve Use Summary of Framework

Comments

- F-C Function is Applied on a Sequence-specific Basis
- F-C Function is Not a "Risk Curve"
- Bases for F-C Function (Form and Values) is not Clear – Primarily Frequency Values
- Meeting QHO's Provides Incomplete Assurance of Design Acceptability

F-C Function - Comments

Considerations

- Aggregation of Sequences could Define Risk Profile, but the Use of Aggregation in the Draft is Unclear
- Fundamental Quantitative Safety Principles (CCDF) Should be Considered
  - Would provide criteria in the form of a risk profile
  - Would address issues associated with "Rare Events" and definition of an event/event sequence
  - Would address full spectrum of consequences versus QHO focus on total individual risk
- Consider CCDF as Decision Criteria with F-C Function as a Design Aid or Develop F-C Function and Process on the Basis of a CCDF?

Sample Quantitative Fundamental Safety Principles

Sample, Approximate Fundamental Design Principles (FDPs) (Based on Operating Experience and CDF and LERF goals)	
Consequence Level at EAB (rem)	**Frequency of incurring Consequence Level or higher does not exceed this Value (per yr.)**
0.001	>1
0.05	0.01
2.5	1E-3 to 1E-4
25	1E-4 to 1E-5
300	1E-5 to 1E-6
750	1E-5 to1E-6
1000	1E-5 to 1E-6

LBE Definition - Comments

- Identification and Grouping/Aggregating Should be Clarified
  - Treat Sequences Individually?
  - Group?
  - Definition/Partitioning of IEs? Event Sequence?
- Consequence Determination Should be Clarified
  - Deterministic?
  - Probabilistic?
- Lower Frequency values (1E-7 to 1E-8) appear to be too low. CCDF should be final criteria?

SSC Significance – Comments

- Needs Clarification and Comprehensive Example
- Appears that any SSC Needed to Meet F-C Function Would be Characterized as Safety Significant
  - This is more restrictive than current practices or RTNSS
  - SSCs which would typically be characterized as NNS should be Considered
  - Treatment for SS SSCs will need to be addressed
- Treatment of Initiating Events, Other than Managing Frequency, is Not Addressed
  - IEs due to failures in NNS systems could be important
  - As Special Treatment would presumably not be applied to these systems, a similar approach for "NNS" SSCs available to mitigate IEs should be considered

External Events - Comments

- Calculated Uncertainty is High
- Should consider Approaches Used in ALWR Certification
  - Screening
  - PRA-based seismic margins
  - Deterministic
- Relevant Insights can be Obtained

Protection Strategies (PS), Design Strategies and Defense-in-Depth (DID)-Comments

- Discussion on these Topics is “Interdependent”
  - Physical protection (PS) and consideration of intentional as well as inadvertent events (DID) have overlap
  - Stable Operation (PS) and accident prevention and mitigation (DID) have overlap
- Consider Tabulating and Grouping
- Sample on Next Slide

Sample Alternative

Alternative DID Elements & Design Principles
PS1: Physical protection (workers and public)
PS4: Barrier integrity (adequate barriers for workers and public- physical and chemical)
PS2: Stable operation (limit frequency of events that can upset plant stability and challenge safety functions)
DID2/PS5: Accident prevention and mitigation capability (Includes Protective Actions - emergency procedures, accident management and emergency preparedness)
DID3: Ensuring key safety functions (KSFs) are not dependent upon a single element of design, construction, maintenance or operation
DID4: Consideration of uncertainties in equipment and human performance
DID5: Alternative capability to prevent unacceptable releases
DID6: Siting considerations

Summary

- Impressive Draft Document
- Test with Detailed Example
- Consider Fundamental Quantitative Safety Principles (e.g., in the form of an CCDF)
- LBE and SSC Categorization Clarifications
- External Event Assessment Alternatives
- Consider “Grouping” PS’s, DSs and DID
- THANKS!