NRC Public Workshop

Overview of ASME General Comments on ANPR to Make 10 CFR 50 Requirements Risk-Informed and Performance-Based

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SETTING THE STANDARD
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Topics

- Background on Preparation of ASME Comment Letter – August 25, 2006
- ASME Introductory Comments
- ASME General Comments
- Review of Selected Subject Area Comments
- Summary
- Supplementary Discussion

Background on Preparation of ASME Comment Letter – August 25, 2006

- Represent initial ASME comments developed by ASME Board Risk Management Task Group and shared with Nuclear Risk Management Coordinating Committee
- Comments primarily based on April 2006 version of the working draft report on technology neutral framework
- Detailed comments to be provided by Dec. 29, 2006 with help of ASME Committee on Nuclear Risk Management
- Will revise initial ASME general comments during final submittal, as required, based on these NRC Public Workshop discussions
- Preparation of comments is a volunteer effort

ASME Introductory Comments

- U.S. NRC should move forward with developing a new risk-informed performance-based Part 53 as an alternative to 10 CFR Part 50 for licensing future nuclear power plants
- Current regulatory process and deterministic codes and standards design rules have provided an adequate level of safety; however –
  - Reliability of component can vary
  - Development of risk-informed, performance-based regulatory process coupled with risk-informed / probabilistic design methods will provide greater consistency in meeting target levels of reliability dependent on specific consequences of failure

ASME General Comments

ASME General Comments

1. NRC should maintain high priority on supporting licensing and certifications for next generation advanced light water reactors (LWRs)
2. NRC should allow use of 10 CFR 50.69 risk-informed regulation and related codes & standards to be applied for next generation advanced LWRs
   - ASME still developing Code actions to support 10 CFR 50.69
3. Proposed 10 CFR Part 53 should be focused on early Gen IV designs such as high temperature gas-cooled reactors
4. A phased approach to develop a new 10 CFR Part 53 should be considered; integrate with licensing and certification activities responsive to industry needs

ASME General Comments

5. In planning efforts, there are limited experienced nuclear industry human resources available to support new Part 53 –
   - licensing, certification, and construction of new LWRs
   - development of Gen IV designs
   - continued support of current reactors
6. New Part 53 should address development of detailed design processes that integrate the concept of an evolving PRA and risk-informed/probabilistic design methods with traditional deterministic design approaches
7. For new Part 53, broad changes to ASME and other nuclear codes and standards will be needed (e.g., ASME Boiler Code)
8. ASME has an initiative to move toward use of performance-based codes and standards

Review of Selected Subject Area Comments

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- ***Integration of Safety, Security, and Emergency Preparedness*** – New reactor designs need to address results and insights from safety risk analysis, security risk evaluations, and emergency preparedness planning; Integration of safety risk and security risk, at this time, would not be beneficial
- ***Level of Safety*** – Quantitative Health Objectives are an appropriate basis to develop risk objectives to use for design requirements for new reactors
- ***Integrated Risk*** – Overall risk to the public for multiple reactors at a given site cannot be ignored if there are significant events that could cause simultaneous accidents; Including existing plants would essentially require backfit of a full scope PRA
- ***Containment Functional Performance Standards*** – Performance standards should address the containment "system" not just the containment structure
- ***Single Failure Criterion*** – Consideration should be given to risk-inform the single failure criteria approach

Summary

Summary

- ASME looks forward to continuing to work with NRC on development of a Risk-Informed Regulatory Structure for Future Reactors as well as other issues to address NRC needs
- ASME has a number of related initiatives underway in both Nuclear Codes and Standards Actions as well as supporting research activities
- ASME would like to expand collaborative efforts underway with other Standards Development Organizations, industry groups, and government agencies to support new reactor needs
- Relevant global cooperative initiatives are underway and can be built upon to address future new reactor needs

Supplementary Discussion – PRA Standards Needs

1. Integration of ASME RA-S PRA Standard for Internal Events with ANS Internal Fire, Low Power/Shutdown, and External Event PRA standards requirements consistent with NRC Plan for PRA quality expectations and requirements for Level 1
2. Continue to build integrated PRA Standards for Levels 2 and 3 to support current light water reactors (LWRs)
3. Extend PRA Standards for current LWRs to address Advanced Reactor Designs – e.g.,
   - ABWR
   - AP-1000
   - EPR
4. New PRA Standards for Gen IV Reactor Designs

Supplementary Discussion – PRA Standards Needs

- PRA is integrated from the beginning of the design
- Licensing of new reactors should continue as PRA Standards are under development
- Key initiatives can be coordinated with Nuclear Risk Management Coordinating Committee (NRMCC) –
  - Comprised of leaders from ASME, ANS, NRC, NEI, DOE, IEEE, EPRI, Owners Groups
  - Develop overall structure and plan for all needed PRA Standards

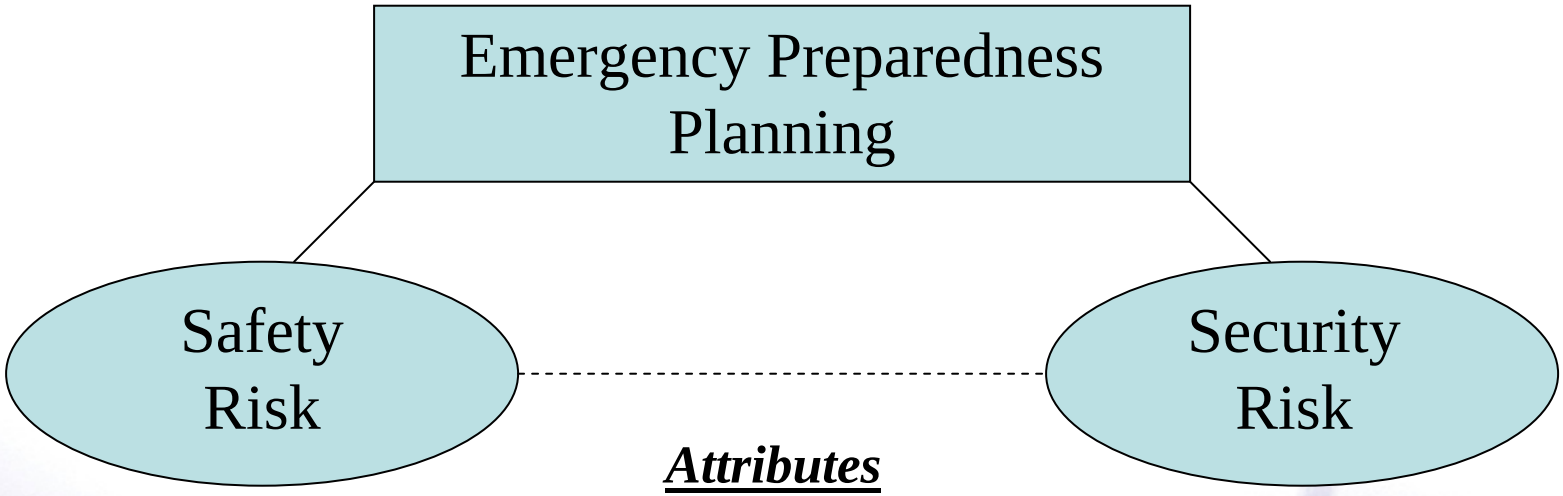
Supplementary Discussion – Risk-Informed Design Example

- Need for Gen IV - Nuclear Graphite Core Components Code
- Key Differences in Properties/Behavior from Steel
  - Non-linear materials behavior
  - Yield stress is not definable
  - Large scatter of strength data
  - Strength increases with increasing temperature
  - Fast neutron flux changes all material properties and induces dimensional change and creep

Supplementary Discussion – Risk-Informed Design Example

- Main Processes in Probabilistic Design –
  - Establish loads / load combinations & probability of occurrences
  - Characterization of material strength distribution
  - Prediction of stress state in parts for load cases
  - Application of probabilistic failure criterion
  - Comparison of probability of failure to required reliability
- ASME Research Project underway for application of load & resistance factor design (LRFD) methods for nuclear plant piping
- Effort underway by ASME Board on Nuclear Codes & Standards to determine how to incorporate these methods into ASME Section III

Supplementary Discussion – Interdependency of Safety, Security, and Emergency Preparedness



Attributes

No ←	Safeguards Required	→ Yes
Based on Experience ←	Definition of Initiating Events	→ Dynamic Situation
CDF/LERF or Equivalent ←	Risk Metric	→ Multiple
Established Practices ←	Stage of Development	→ Emerging