

Development of a Quality Standard for Level 3 Probabilistic Risk Assessment

International MACCS User's Group

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DISCLAIMER

- Presentation reflects perspective of the author as a member of the working group

Outline

- Background
- Development Process
- Content and Structure
- Current Status and Path Forward

Background

- Standards Developing Organizations:
 - American Nuclear Society (ANS) Standards Board
 - American Society of Mechanical Engineers (ASME) Board on Nuclear Codes and Standards (BNCS)
- Nuclear Risk Management Coordinating Committee (NRMCC)
- ASME/ANS Joint Committee on Nuclear Risk Management (JCNRM)

Probabilistic Risk Assessment:

Levels and Standards

- Level 1: Identification and quantification of the sequences of events leading to the onset of core damage.
 - Standard initially issued in 2002, updated in 2013
- Level 2: Evaluation of containment/confinement response to severe accident challenges and quantification of the mechanisms, amounts, and probabilities of subsequent radioactive material releases to the environment.
 - Standard issued for trial use in 2014
- Level 3: Estimation of the consequences of the release to the environment from radioactive materials
 - Under development; publication pending
- Other standards have been developed or are in process to address other topical areas such as non-LWR facilities, low power and shutdown operating modes, etc.

Development Process

- Draft developed by working group under the direction of JCNRM
- Working group comprised of individuals with expertise in aspects of Level 3 PRA
 - Chair: Keith Woodard, ABS Consulting (ret.)
 - Vice Chair: Grant Teagarden, JENSEN HUGHES
- Draft standard to be processed and approved for trial use and pilot application (TUPA) by JCNRM
- Following trial use and pilot application, draft standard may be approved, revised, or withdrawn

Scope and Purpose

- Written to apply to nuclear facilities generally, not only commercial power reactors
- Standard is intended to be independent of the application
- Includes process for determining the capability of a Level 3 analysis to support various applications
- Focus is on what to do, not how to do
- Supports formal peer review of analysis

Structure and Content

- Technical Elements
- High Level Requirements and Supporting Requirements
- Capability Categories

Technical Elements

- Radionuclide Release Characterization
- Protective Action Parameters and Other Site Data
- Meteorological Data
- Atmospheric Transport and Dispersion
- Dosimetry
- Health Effects
- Economic Factors
- Consequence Quantification and Reporting
- Risk Estimation

High Level and Supporting Requirements

- High Level Requirements (HLR)
 - Several high level requirements for each technical element
 - Set forth the minimum requirements to assess the technical adequacy of the analysis, independent of an application
 - Defined in general terms and present the top-level logic for the derivation of more detailed SRs
 - Address both the content and documentation of the analysis
- Supporting Requirements (SR)
 - Multiple supporting requirements for each HLR
 - Specify what should be included in the analysis to meet the high level requirement for a given technical element

Capability Categories

- Supports determination of whether a particular analysis can support a given application
- Based on:
 - degree of site-specificity: generic vs site or release specific models and data
 - degree of realism: departures from realism can have moderate to negligible impacts on conclusions or insights
- Currently range from Category I to Category III
- NOT based on the level of conservatism

Status

- Draft of standard used to support peer review of NRC Level 3 PRA offsite consequence analysis in Fall 2015, and lessons learned were incorporated into both the analysis and the draft standard
- Draft standard submitted to JCNRM for approval
- Planned for publication by ASME/ANS in 2016
- Trial use and pilot application is encouraged and can support evaluation of:
 - Format and content of standard
 - Peer review process
 - Application process

Summary

- A draft quality standard for the performance of probabilistic consequence analyses (Level 3 PRA) has been developed and should shortly be available for trial use and pilot application
- Standard supports analytical quality throughout the the development, documentation, and review of analyses