



U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

**Revision of Nuclear Criticality Safety
Guidance: Chapter 5 of NUREG-1520**

**FCIX 2014
June 10-11, 2014**

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Chapter 5, “Nuclear Criticality Safety”

- Guidance to staff on how to conduct NCS review of:
 - License Application (NCS Program)
 - Integrated Safety Analysis (Applied to NCS)
- Provides *one acceptable way to meet regulations*
- Applies to new license applications & amendments
- Areas of review
- Acceptance criteria
 - Organization & administration
 - Management measures
 - Technical practices
- Evaluation Findings

Motivation(s) for Revision

- Streamline to reduce redundancy & improve readability
- Restructure to improve logical flow
- Incorporate relevant guidance (ISGs)
- Add to glossary for NCS-specific terms
- Incorporate licensing lessons learned
- Relax unnecessary prescriptiveness
- Increase flexibility in regard to standards

Streamlining & Restructuring

- Removed redundant and ambiguous acceptance criteria
- Removed references to meeting “intent”
- Replaced bullets with labeled paragraphs (as in Rev. 0) to facilitate referencing in RAIs & SERs
- Breaking up long sections (e.g., parameters section)
- Discussion of standards moved back to front of chapter
- Separate sections for programmatic and ISA reviews to reduce confusion

Content Enhancements

- Inclusion of ISG-10 on subcritical margin as an appendix (as previously done for ISG-01 and ISG-03)
- Example NCS evaluation added as an appendix
- Added criteria for acceptance reviews, new applications, and license amendments
- Added guidance for reviewing emergency plans

Additions to Glossary of Terms

- NCS-specific terms added to glossary:
 - Normal and credible abnormal conditions
 - Safety margin vs. subcritical margin
 - Validation terms (area of applicability, benchmark, bias)
 - Subcritical limit, safety limit, operating limit
 - Safe mass, critical mass, favorable geometry
 - Controls and controlled parameters
- Some terms have different meaning for NCS vs. other safety disciplines/ISA (management measures, unlikely)

Lessons Learned

- Clarify double contingency principle vs. protection (address single vs. dual-parameter control)
- Clarify what constitutes margin of subcriticality for safety
- Example needed for demonstrating subcriticality under normal & abnormal conditions
- Some acceptance criteria found unnecessarily prescriptive
- Body of Chapter 5 significantly revised; no revision to ISGs

Removing Prescriptiveness

- Expectation to submit summaries of changes to validation reports (removed due to industry feedback)
- Fraction critical limits for mass & geometry removed
- Functionality of criticality alarm system in seismic event revised consistent with ANS-8.3
- Criteria for compensatory measures during alarm outage added (to allow flexibility)

Goal is maintaining a *reasonable* degree of conservatism while increasing regulatory flexibility

Use of ANSI/ANS-8 Standards

- Removed references to specific standard versions/dates
- Latest endorsed version (Reg Guide 3.71) should be used
- Permits use of alternative versions and standards to those in RG-3.71 (e.g., ISO) with justification
- Reduced repetition of specific standard provisions in favor of general acceptance criteria to follow the standard in whole

Goal is to enhance flexibility, keep guidance more current, and avoid emphasizing some standard provisions over others