

Industry Views on DG-1301, Appendix A

Public Meeting to Discuss Draft Guidance on
Mitigation Strategies for New Reactors
July 1, 2015 • Rockville, MD

Background

- Current COL holders received Order EA 12-049 or a License Condition to follow Order
- DC Applicant asked what design requirements would be applicable
 - Understood should plan to meet the Order
 - RAIs were aligned with this philosophy
- **No expectation for additional requirements for new reactors**

NRC Regulatory Actions

- In SECY-15-0065, U.S. NRC is codifying Fukushima requirements into new rule 10 CFR 50.155, *Mitigation of Beyond-Design-Basis Events (MBDBE)*, that will accomplish five objectives:
 - Make requirements of post-Fukushima orders (i.e., EA-12-049 and EA-12-051) generically applicable to all plants
 - Include provisions for Severe Accident Management Guidelines (SAMGs) as a part of integrated response capability
 - Include requirements for increased emergency response capability for multi-unit events
 - **Provide requirements for New Reactor designs**
 - Address petitions for rulemaking submitted in aftermath of March 2011 Fukushima Dai-ichi event
- **Key changes for New Reactors are addressed in DG-1301, App. A**

Proposed New Reactor Requirements

- Who: Applicants for new nuclear power plant designs, specifically designers of key safety functions (e.g., DC & COL applicants)
- What: “include design features in the plant design sufficient to enhance coping durations and minimize reliance on human actions to maintain or restore key safety functions during an ELAP concurrent with either a loss of normal access to the ultimate heat sink or, for passive designs, a loss of normal access to the normal heat sink.”
- Why: “approach is consistent with the Policy Statement on the Regulation of Advanced Reactors (73 FR 60612; October 14, 2008), in which the Commission encouraged vendors to include certain features into the plant design; and the most effective opportunity to do so is during the design of those SSCs.”

DG-1301 Key Questions for New Reactors

- Are the proposed safety enhancements for New Reactors needed?
- Are the proposed safety enhancements for New Reactors appropriate?
- Are the proposed safety enhancements for New Reactors cost beneficial?

Regulatory Need for Safety Enhancements

- NRC promulgated 10 CFR 50.54(hh) that requires licensees provide mitigative strategies and response procedures for potential or actual aircraft attacks → Benefits of 10 CFR 50.54(hh) rule were evaluated in State of the Art Reactor Consequence Analysis (SOARCA), and were shown to prevent core damage for most severe accident sequences
- NRC is proposing 10 CFR 50.155(b) to codify requirements of EA-12-049 Order → EA-12-049 provides an additional layer of defense-in-depth for mitigation of Extended Loss of AC Power (ELAP) event sequences - ACRS comments during May 6, 2015 NRC-ACRS meeting

Regulatory Need for Safety Enhancements

- NRC is proposing 10 CFR 50.155(d) for New Reactors to supplement requirements of EA-12-049 Order → NRC staff regulatory analysis concluded that “given the already low risk associated with new reactors, a large absolute safety benefit from an averted-dose perspective is unlikely.”
- Duplicative regulatory requirements and those that provide marginal safety improvements should be avoided

Appropriateness of Safety Enhancements

- DG-1301 Uses Time-Based Criteria to Define Phases
 - Phase 1A – Event mitigation for at least 8 hours with no supplemental AC source; no resupply of consumables; use of installed equipment only
 - Phase 1B - Event mitigation for at least 24 hours with supplemental AC source (as needed); no resupply of consumables; use of installed equipment only
 - Phase 2 - Event mitigation for at least 72 hours (extended beyond Phase 1B) with resupply of consumables from on-site sources only; and use of installed and portable on-site equipment only

Appropriateness of Safety Enhancements

- Concerns with Time-Based Criteria
 - Use of prescriptive time-based criteria is inconsistent with Commission direction in 10 CFR 50.54(hh) and Order EA-12-049 → Rule and DG-1301 guidance should rely on performance-based definitions of phases
 - Conformance with DG-1301 guidance can increase design complexity (e.g., AC-independent means to pump borated water into core in lower operating modes) → provides little to no safety improvement
 - Increased design complexity is inconsistent with Advanced Reactor Policy → requires simple, less complex designs

Appropriateness of Safety Enhancements

- DG-1301 Minimizes Operator Actions: To the extent practical, minimize number of operator actions of all types; in all modes; and inside and outside of Control Room
- Concerns with Minimizing Operator Actions
 - Minimizing operator actions is inconsistent with Commission direction in 10 CFR 50.54(hh) → Rule and DG-1301 guidance should rely on reduced (not minimized) operator actions, consistent with past Commission direction
 - Minimizing operator actions will not make the plants more robust against BDBEEs → ACRS comments during May 6, 2015 NRC-ACRS meeting
 - Operator actions can be minimized, but this could require significant increase in the degree of plant automation → Increased automation will increase I&C design complexity and can result in unintended consequences
 - Increased design complexity is inconsistent with Advanced Reactor Policy → requires simple, less complex designs

Appropriateness of Safety Enhancements

- DG-1301, Appendix A is ambiguous in several areas, e.g.,
 - what is meant by Beyond-Design-Basis Events?
 - what criteria will be used for NRC evaluation?
- BDB example: the latest flooding/seismic hazard will be used for design basis of new reactors
 - In accordance with Standard Review Plan (same as 50.54(f) letter today) → BDB flooding/seismic for current plants = DB flooding/seismic for new plants
 - What is BDB for a new reactor? → ACRS comments during May 6, 2015 NRC-ACRS meeting

Cost/Benefit of Safety Enhancements

- Regulatory Analysis for Alternative 2d: Include paragraph 50.155(d) in the proposed rule
- Concerns with Cost/Benefit Analysis - **NRC estimated total industry implementation cost to be \$1.16M (undiscounted) + qualitative benefits**
 - Industry costs are highly dependent upon the scope of changes (if any) needed to comply with the new rule which are reactor dependent. Notwithstanding this point, total industry costs are significantly underestimated → **New Reactor vendors should provide updated estimates**
 - Rule intended to increase regulatory predictability and transparency → **Rule accomplishes the opposite for vendors currently undergoing design certification**
 - Consistent with the Commission vote on SECY 14-0087 and the subsequent SRM, “the staff should continue to strive to improve its methods for quantitative analysis.”
- **NRC cost/benefit conclusions are based on unrealistically low industry implementation costs and significant credit for qualitative benefits**

Summary

- In 10 CFR 50.155(d), NRC has proposed that New Reactors include “design features in the plant design sufficient to enhance coping durations and minimize reliance on human actions to maintain or restore key safety functions during an ELAP concurrent with either a loss of normal access to the ultimate heat sink or, for passive designs, a loss of normal access to the normal heat sink.”
- From a safety perspective, NRC has proposed requirements that are duplicative and provide marginal safety benefits.
- From a regulatory appropriateness perspective, NRC has proposed requirements that do not holistically address the Advanced Reactor Policy Statement (i.e., regulatory basis for 10 CFR 50.155(d))
- From a cost/benefit perspective, NRC has used budgetary estimates that significantly underestimate industry costs and take significant credit for qualitative benefits.

Industry View

- 10 CFR 50.155(d) is unnecessary
- Consequently, DG-1301, Appendix A is unnecessary