DG-1145: Combined License Applications for Nuclear Power Plants (LWR Edition)

Office of Nuclear Reactor Regulation
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Section C.II.1, Probabilistic Risk Assessment (PRA)

Regulatory Overview

- DG-1145: Combined License Application
  - ➢Part I: FSAR format & content
  - ➢Part II: Application supplemental information
  - ➢Part III: Application information if reference Certified Design and/or Early Site Permit

Section C.II.1, PRA

- Proposed 10 CFR 52 (71 FR 12782)
  - Subpart B – Design Certification
    - 52.47(a): Application – Contents of FSAR
    - 52.47(b)(1): Application include **design-specific PRA**
  - Subpart C – Combined Licenses
    - 52.79: Application – Contents of FSAR
    - 52.80(a): Application include **plant-specific PRA**

Section C.II.1, PRA

- DG-1145: PRA
  - **II.1 – Overall PRA for COL application**
  - I.19 – PRA information included in FSAR
  - III.1 & III.2 – portions of PRA addressed by Certified Design and/or Early Site Permit

Section C.II.1, PRA

C.II.1.1 *REGULATORY BASIS*

- 10 CFR 52.47 requires application contain design-specific PRA
- Proposed 10 CFR 50.80(a) requires plant-specific PRA
- COL application without certified design needs to provide information equivalent to that needed to support certified design reviews
- COL application with a certified design builds off certified design reviews with focus on site-specific information, design and operational changes/level of detail information, and resolution of COL issues

Section C.II.1, PRA

C.II.1.2 *PURPOSE & OBJECTIVES*

- COL PRA submittal needs to support NRC uses:
  - Identify and address potential design and operational vulnerabilities
  - Compare plant risk to Commission goals for core damage frequency (CDF), large release frequency (LRF), and containment performance goal (CPG)
  - Determine design (including site characteristics) represents reduction in risk over existing plants
  - Identify risk-informed safety insights, e.g.,
    - Understanding of design robustness
    - Understanding of risk significance of human errors

Section C.II.1, PRA

C.II.1.2 *PURPOSE & OBJECTIVES* (continued)

- COL PRA submittal needs to support NRC uses
  - ➢ Identify/Support design and operational requirements and programs, e.g.,
    - ITAACs (Inspection, Tests, Analyses, and Acceptance Criteria)
    - D-RAP (design reliability assurance program)
    - COL and interface requirements (e.g., COL Action Items)
    - TS (technical specifications)
    - Human Factors
    - Maintenance Rule
  - ➢ Support RTNSS (regulatory treatment of non-safety systems) process
  - ➢ Assess balance of preventive and mitigative features

Section C.II.1, PRA

C.II.1.3 *SCOPE*

- Risk evaluation needs to be comprehensive (address internal + external initiators + all plant operating modes) to enable NRC to conclude that objectives (C.II.1.2) are met
- Risk evaluation may include both PRA and alternative approaches for addressing contributors to risk, e.g.,
  - ➢ Risk-based seismic margins analysis versus seismic PRA

Section C.II.1, PRA

C.II.1.3 *SCOPE* (continued)

- Risk evaluation scope, level of detail, and technical adequacy may need to be expanded to support other risk-informed applications, e.g.,
  - NFPA-805
  - 10 CFR 50.69
- All 4 certified designs have addressed full scope:
  - Internal and external initiators
  - All operating modes
  - Addressing
    - core damage
    - containment performance
    - offsite consequences

Section C.II.1, PRA

C.II.1.4 *LEVEL OF DETAIL*

- Applicant must justify appropriateness of the risk evaluation approach, methods, data, and level of detail such that NRC can conclude objectives (C.II.1.2) are met
  - Need to realistically reflect actual plant design, planned construction, anticipated operational practices and relevant operational experience
  - Need to be sufficient to gain risk insights and use such insights, in conjunction with assumptions made in PRA, to identify vulnerabilities and identify/support requirements and programs important to design and plant operation

Section C.II.1, PRA

C.II.1.5 *TECHNICAL ADEQUACY*

- Quality of applicant's methodologies, processes, analyses, and personnel associated with risk evaluation need to be sufficient for NRC to conclude objectives (C.II.1.2) are met
  - Comply with provisions of nuclear plant quality assurance (10 CFR 50 Appendix B)
  - Meet ASME and ANS Standards as endorsed by RG 1.200 and RG 1.174 pertaining to quality and technical adequacy
  - Justify alternative measures or scope areas for which there is no Standard
  - Special emphasis on novel and passive features

Section C.II.1, PRA

C.II.1.6 *RISK INSIGHTS*

- Applicant needs to provide risk insights and use them in integrated fashion to enable NRC to conclude objectives (C.II.1.2) are met
  - Areas where certain design features are most effective in reducing risk (including comparison to current plants)
  - Major contributors to risk (initiators, sequences, systems, and components)
  - Major contributors to maintaining the "built-in" plant safety (including importance at system, train, and component level)
  - Major contributors to the uncertainties in risk evaluation
  - Risk evaluation sensitivities to data (e.g., frequencies of events, component failure probabilities, equipment unavailabilities), assumptions, lack of modeling detail, and previously raised issues

Section C.II.1, PRA

C.II.1.7 *FORMAT & CONTENT*

- PRA documentation submitted should be sufficient for NRC to conclude objectives (C.II.1.2) are met
  - Risk evaluation process including provisions to ensure technical adequacy
  - Modeling aspects (initiating events, simplified drawings/diagrams, fault and event trees, success criteria, data, important assumptions/ calculations)
  - Results (minimal cut sets and importance, sensitivity, and uncertainty analyses)
- Appendix B to C.II.1 provides standard format
- Applicant does not need to provide all plant-specific, site-specific PRA information, but it must be maintained and available for NRC review

Section C.II.1, PRA

C.II.1.8 *PRA MAINTENANCE & UPGRADE*

- PRA maintenance program based on RG 1.200 configuration control guide should be developed and described

Section C.II.1, PRA

Public Questions & Comments