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Public Meeting to Discuss 10 CFR 50.71(h)(1) Requirements and Proposed ALWR PRA Standard Applicability

April 16, 2014

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Agenda

TIME	TOPIC
9:00am-9:10am	Opening Remarks & Introductions
9:10am-9:30am	50.71(h)(1) Requirements and Proposed ALWR Standard Applicability
9:30am-9:45am	Timing of New Standards and NRC Endorsement
9:45am-10:15am	Definition of "As Built" as It Relates to "freezing point" for State of Design
10:15am-10:30am	Definition of "As Built" as It Relates to Use in the PRA Walkdown License Conditions
10:30am-10:45am	Break
10:45am-11:55am	Draft ALWR Standard / ISG
11:55am-12:00pm	Conclusion
12:00pm	Adjourn

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10 CFR 50.71(h)(1) Requirements and Proposed ALWR PRA Standard Applicability

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Meeting Objectives

- Communicate NRC perspective on applicability of the proposed ALWR PRA standard
- Provide the current proposed schedule of ASME/ANS PRA standards and planned NRC endorsement
- Discuss the PRA walk-down license conditions used to confirm PRA assumptions
- Discuss draft ISG for ALWR applicants

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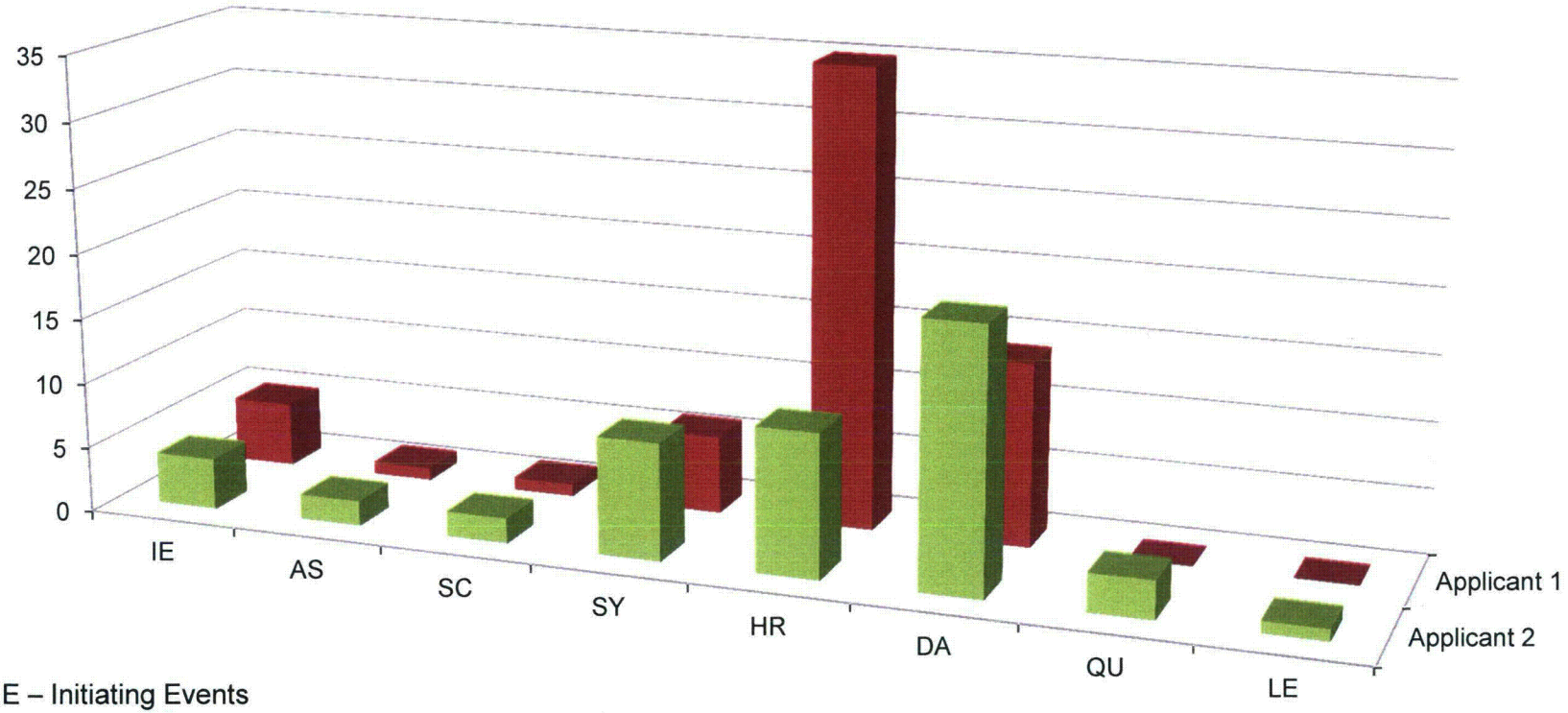
Supporting Requirements Evaluation Variations



IE – Initiating Events
AS – Accident Sequence Analysis
SC – Success Criteria
SY – Systems Analysis
HR – Human Reliability Analysis
DA – Data Analysis
QU – Quantification
LE – LERF Analysis

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Proposed ALWR PRA Standard Applicability

- What is the regulatory perspective?
  - Design certification application reviews
  - Combined license application reviews
  - Industry standard development
- Why issue interim staff guidance?
  - Communication of NRC expectations
  - Interim staff guidance will be incorporated into next revision of RG 1.200

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10 CFR 50.71(h)(1) Requirements

- 10 CFR 50.71(h)(1):

  "No later than the scheduled date for initial loading of fuel, each holder of a combined license under subpart C of 10 CFR part 52 shall develop a level 1 and a level 2 probabilistic risk assessment (PRA). The PRA must cover those initiating events and modes for which NRC-endorsed consensus standards on PRA exist one year prior to the scheduled date for initial loading of fuel."

- What are NRC expectations for the PRA technical adequacy at fuel load?

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Schedule of PRA Standards and NRC Endorsement

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Outline

- History of past PRA standard development
- Relationship of RG 1.200 to regulatory activities
- ASME/ANS Schedule of future standards
- Future standard development/endorsement
- Milestones and schedule

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History of PRA Standards and NRC Endorsement

Standard	Standard Published	RG 1.200	NRC Date Published
ASME RA-S-2002	April 2002	DG 1122	Nov 2002
ASME RA-Sa-2003	Dec 2003	RG 1.200, Rev 0	Feb 2004
ASME RA-Sb-2005	Dec 2005	DG-1161 RG 1.200 Rev 1	Sep 2006 Jan 2007
ASME RA-Sc-2007, Addendum C	July 2007	NRC reviewed and endorsed this standard when it reviewed and endorsed ASME/ANS RA-S-2008	
ANS 58.21 External Hazards for Operating Reactors	2004	DG-1138	Aug 2004
Revision 1 – ANS 58.21	March 2007	Revision 1 of this standard was reviewed and endorsed in ASME/ANS RA-S-2008	
ANS 58.22 Low Power /Shutdown for Operating Reactors	These standards are being issued as part of the joint ASME/ANS standard which is the standard the NRC will review and endorse.		
ANS 58.23 Internal Fire			
ASME/ANS RA-S-2008	April 2008	DG-1200	June 2008
ASME/ANS RA-Sa-2009	Feb 2009	RG 1.200, Rev 2	March 2009
ASME/ANS RA-Sb-2013	CY 2013	NRC does not plan to review and endorse, plans to review and endorse the new edition, which addresses NRC issues	

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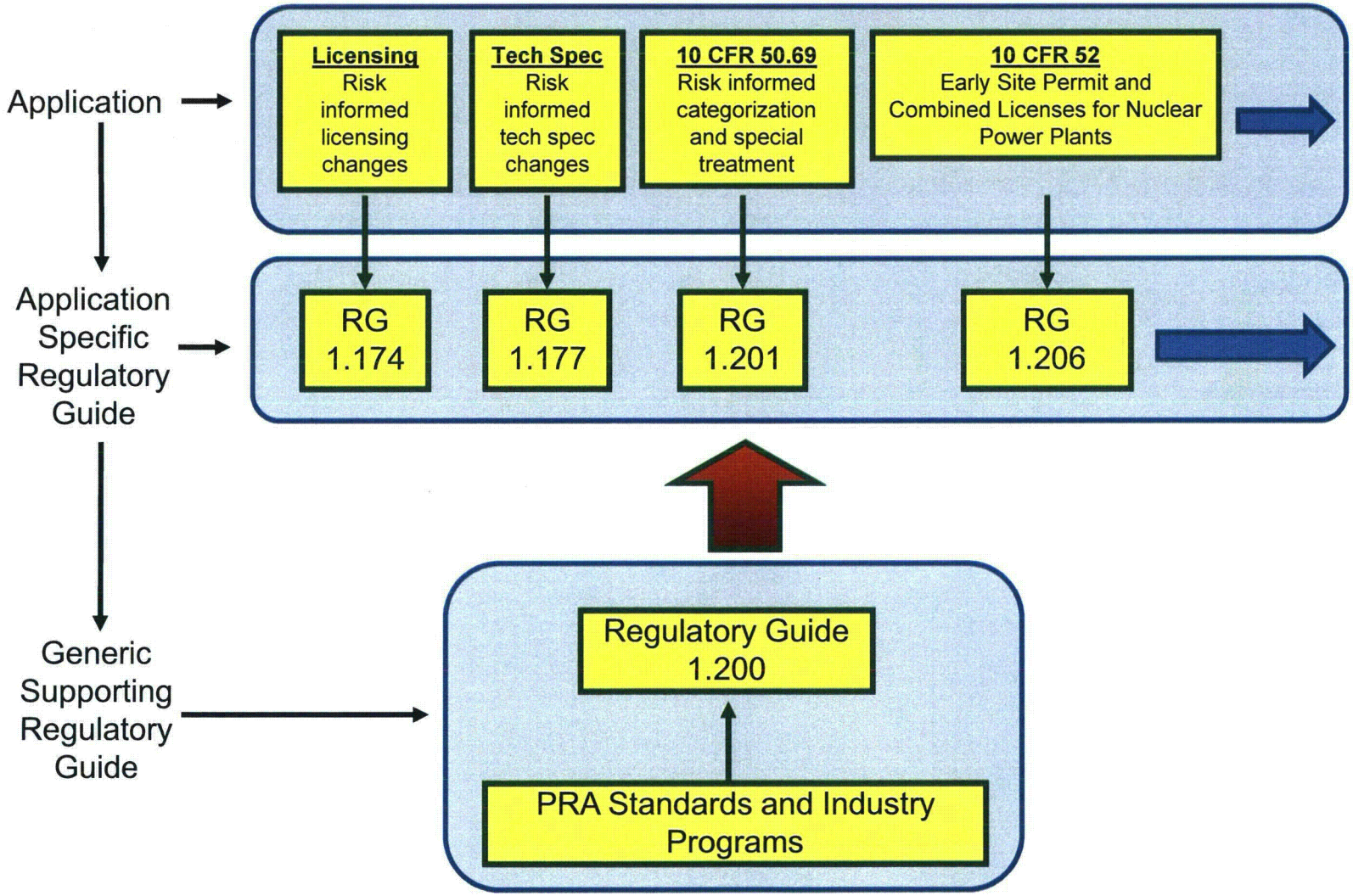
Relationship of RG 1.200 to Regulatory Activities



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Proposed ASME/ANS Schedule

Trial Use Standard	Publication Date
• Next Edition	Sept-2016
• ALWR	Jan-2015
• Level 2 PRA	Nov-2014
• Level 3 PRA	Dec-2014
• LP/SD PRA	Nov-2014
• NLWR	Dec-2013
• SFP PRA	Cancelled

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Proposed NRC Endorsement Schedule

Trial Use Standard	Publication Date	NRC Endorsement Date
• Next Edition	Sept-2016	→ To be determined
• ALWR	Jan-2015	} Endorse in Revision 3 to RG 1.200, one year after publication of Trial Use Standard (tentative date of Dec 2015)
• Level 2 PRA	Nov-2014	
• Level 3 PRA	Dec-2014	
• LP/SD PRA	Nov-2014	
• NLWR	Dec-2013	→ NRC does not plan to review and endorse

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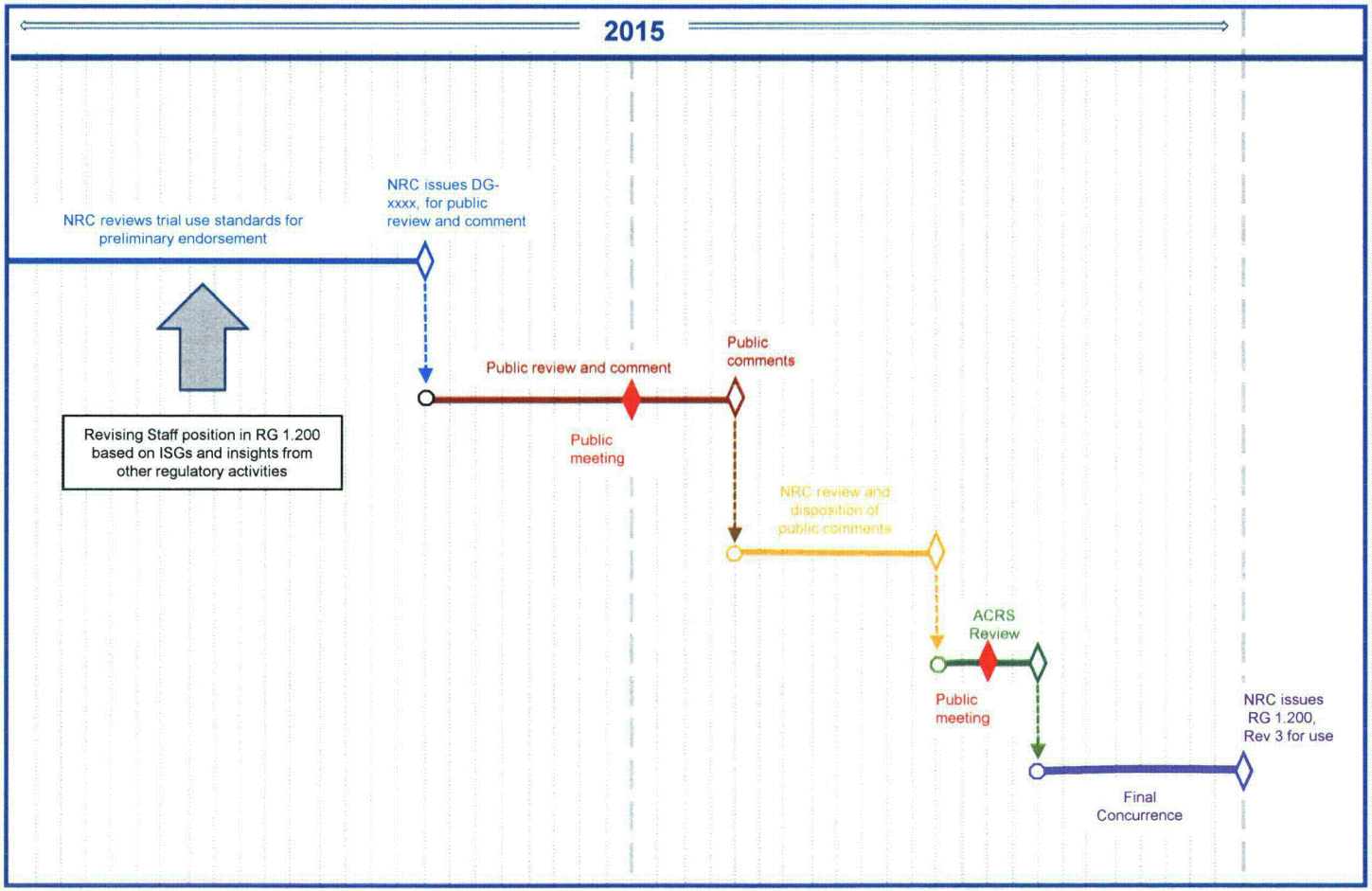
Milestones and Schedule



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PRA Walkdown License Conditions

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Walkdown License Conditions

License Conditions

Site- and Unit-Specific Conditions

Before initial fuel load:

- Seismic Margin Analysis
- Probabilistic Risk Assessment
- Internal Fire and Internal Flood Analysis

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Draft ALWR Standard/ISG

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Purpose of ISG

- Provide Staff Position on Technical Adequacy of Probabilistic Risk Assessment (PRA) needed by Part 52 Advanced Light Water Reactor (ALWR) Applicants During the Pre-Operational Phase
  - Design Certification (DC) Application: 10 CFR 52.47(a)(27)
  - Combined License (COL) Application: 10 CFR 52.79(a)(46)
- Also address use of PRA Standard for:
  - PRA required by Fuel Load: 10 CFR 50.71(h)(1)
  - Voluntary risk-informed applications

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Expectations Discussed in ISG

- Scope and Capability of Pre-Operational PRA
- PRA Configuration Control
- Peer Reviews
- Operational Guidance/Practices
- Large Release Frequency
- Specific Technical Challenges
- PRA Standard Supporting Requirements

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Scope and Capability of Pre-Operational PRA

- Standard Review Plan 19.0
  - Pre-operational phase PRAs that meet the applicable SRs for Capability Category I and meet high-level requirements, as defined in PRA Standard and endorsed by RG 1.200, should generally be acceptable for DC and COL applications
  - Exceptions:
    - Some SRs do not contain an action to achieve CC I, which may be acceptable or may need to address CC II
    - Parts 7 and 8 of PRA Standard, in which SRs do not define CC I level, need to use the CC I of parallel SRs of Part 9
    - PRA-based seismic margins analysis approach for DC impacts use of Part 5 and should follow ISG DC/COL-ISG-020
    - Part 10 (seismic margins analysis) of PRA Standard not endorsed.

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Scope and Capability of Pre-Operational PRA

- PRA Required by Fuel Load PRA
  - 10 CFR 50.71(h)(1) and Statement of Considerations
    - Level I and II PRA
    - Cover modes of operation and initiating events for which NRC-endorsed consensus standard in effect 1 year prior to fuel load
  - Directly address PRA Standard (Parts 1-9) as endorsed by RG 1.200 (i.e., do not use ISG)
- Voluntary Risk-Informed Applications
  - Most require to address CC II and would require additional application-specific considerations (e.g., delayed implementation, license conditions, reducing application scope)
  - Directly address PRA Standard (Parts 1-9) as endorsed by RG 1.200 (i.e., do not use ISG)

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PRA Configuration Control

- Section 1-5 of PRA Standard addresses PRA configuration control program, which includes
  - Process to monitor PRA inputs and collecting new information
  - Process to maintain and upgrade PRA to be consistent with as-built, as-operated plant
  - Process to ensure cumulative impact of pending changes is considered when applying PRA
  - Process to maintain configuration control of computer codes supporting the PRA
- For DC and COL application stages, PRA configuration control is for "as-to-be-built" and "as-to-be-operated" plant based on design, operational, procedural information and guidance available for that stage
  - PRA required by Fuel Load more directly addresses "as-built" plant using actual plant information, such as equipment layout and procedures, but is still "as-to-be-operated" regarding operations experience and data
- PRA configuration control program should include guidance on addressing when the PRA needs to be updated and/or upgraded, consistent with 10 CFR 50.71(h) and the endorsed PRA Standard
  - Include guidance for conditions that can wait until next scheduled PRA maintenance and conditions requiring immediate update/upgrade

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Peer Reviews

- SRP 19.0 states DC PRA is not required to have a peer review (or independent assessment or self assessment)
  - If one is performed the review results should be examined and address deviations and deficiencies
  - If one is not performed, the applicant should justify the adequacy of the PRA scope, detail, and technical acceptability
- Guidance on peer reviews requiring team to have collective knowledge of plant design and operation, while also being independent, may not be possible for DC and COL applications
  - Recognize that peer review team will not have specific knowledge of all aspects of design in detail, but should have familiarity with the general design and operating philosophy based on design and operating guidance available for that stage
  - Peer review documentation should identify limitations associated with the review that would impact risk-informed applications due to the status of the site, design, operational, and maintenance information and data

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Addressing Operational Guidance/Practices

- PRA Standard developed for currently operating reactors with many decades of operating experience
  - Many SRs refer directly to using plant-specific guidance (e.g., plant-specific procedures, operating practices, technical specifications, etc.)
  - ALWRs at DC and COL application stages do not plant-specific guidance
  - The applicant will use general design and operational guidance and general industry practices
  - The intent of these SRs is met by using the available information appropriate for that stage
- Where the use of general design and guidance information and general industry practice is used, there are inherent assumptions and increased uncertainty in the PRA
  - DC/COL applicant should document the limitations and impacts on applications and document the sources of uncertainty and assumptions resulting from the use of general operational information
- For the PRA required by Fuel Load, plant-specific guidance will be established and COL Holder can review and update PRA, as appropriate

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Addressing Large Release Frequency

- PRA Standard developed for currently operating reactors
  - Risk metrics considered in the standard are CDF and LERF
- ALWRs in the pre-operational phase use CDF and large release frequency (LRF) metric.
  - Approach and factors considered in calculating the LRF are essentially the same as used for calculating LERF
  - Staff expects PRAs for the pre-operational phase to use the LERF SRs in assessing and reviewing technical acceptability of LRF approach.

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Specific Technical Challenges

- DC applications do not have site-specific information
- PRA Standard events/hazards screening criteria can be orders of magnitude above the total plant risk
- Specific layouts and capability of equipment not fully known
- No plant-specific operating experience and data
- No plant-specific operating guidance
- No operations staff (or plant-specific trainers) with plant-specific experience to support Interviews, reviews, or assessments
- Walkdowns cannot be performed
- Increased uncertainties due to the pre-operational phase information

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Addressing Specific PRA Standard Supporting Requirements (SRs)

- SR-by-SR evaluation performed, resulting in 6 possible outcomes for each SR
  - Can Meet
  - Cannot Meet
  - Not Applicable
  - Replace
  - Enhance
  - New

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Summary of SR-by-SR Evaluation Grouped by Technical Challenges

Technical Issue

Site-Specific Features and Characteristics

Supporting Requirements

Cannot Meet for DC:

- SHA-B2, SHA-B3,SHA-C1, SHA-C3, SHA-C4, SHA-D1, SHA-D3, SHA-D4, SHA-E1, SHA-E2, SHA-F2, SHA-G1, SHA-H, SHA-I, SFR-C1, EXT-A1

Not Applicable for DC:

- SFR-C2, SFR-C4, SFR-C6

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Summary of SR-by-SR Evaluation Grouped by Technical Challenges

Technical Issue

Screening Events/Hazards for Analysis

Supporting Requirements

Not Applicable for DC:

- EXT-B2, EXT-B4

Replace for DC and COL:

- IE-C6, EXT-C1

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Summary of SR-by-SR Evaluation Grouped by Technical Challenges

Technical Issue

Plant-Specific Layouts and Capabilities

Supporting Requirements

Cannot Meet for DC and COL:

- CS-A2, CS-A3, CS-A4, CS-A5, CS-A6, CS-A7, CS-A8, CS-A9, CS-B1

Not Applicable for DC and COL:

- FSS-F1, FSS-F2, FSS-F3

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Summary of SR-by-SR Evaluation Grouped by Technical Challenges

Technical Issue

Plant-Specific Operating Experience and Data

Supporting Requirements

Cannot Meet for DC and COL:

- SY-A19, SY-A20, DA-C2, DA-C3, DA-C4, DA-C5,
- DA-C6, DA-C14, ES-B1

Not Applicable for DC and COL:

- IE-A3, IE-A4, IE-A7, IE-C2, IE-C4, DA-C10, DA-C11, DA-C16, DA-D8, ING-A6, PRM-B2

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Summary of SR-by-SR Evaluation Grouped by Technical Challenges

Technical Issue

Plant-Specific Guidance (e.g., Procedure, Operating Practices, Technical Specifications, etc.)

Supporting Requirements

Can Meet for DC and COL:

- IE-C3, IE-C11, IE-C14, AS-A5, SC-A6, SY-A2, SY-A3, SY-B12, SY-B15, HR-A1, HR-A2, HR-A3, HR-D4, HR-D5, HR-E1, HR-E2, HR-2, HR-G4, HR-G6, HR-H2, QU-D2, LE-D6, IFSN-A3, IFSN-A14, IFSN-A-16, ES-A1, HRA-A2, HRA-B3, WPR-A11, XFPR-A11, XPR-A11

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Summary of SR-by-SR Evaluation Grouped by Technical Challenges

Technical Issue

Interviews

Supporting Requirements

Can Meet for DC and COL:

- SY-A2, SY-A4

Cannot Meet for DC and COL:

- HR-E3, HRA-A4, SF-A5

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Summary of SR-by-SR Evaluation Grouped by Technical Challenges

Technical Issue

Walkdowns

Supporting Requirements

Cannot Meet for DC:

- EXT-D1

Cannot Meet for DC and COL:

- IFPP-A5, IFSO-A6, IFSN-A17, IFQU-A11, PP-B7, FSS-D10, FSS-D11, SFR-D1, SFR-E1, SFR-E2, SFR-E4, SFR-E5, SPR-B11, EXT-D2, WFR-A1, XFFR-A1, XFR-A2

Not Applicable for DC and COL:

- SFR-E3

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Summary of SR-by-SR Evaluation Grouped by Technical Challenges

Technical Issue

Treatment of Uncertainties

Supporting Requirements

Enhance DC and COL:

- IE-D1, IE-D3, AS-C1, AS-C3, SC-C1, SC-C3, SY-C1, SY-C3, HR-I1, HR-I3, DA-E1, DA-E3, QU-F1, QU-F4, LE-G1, LE-G4, IFPP-B1, IFPP-B3, IFSO-B1, IFSO-B3, IFSN-B1, IFSN-B3, IFEV-B1, IFEV-B3, IFQU-B1, IFQU-B3, PP-C1, PP-C3, ES-D1, CS-C1, CS-C2, CS-C3, CS-C4, QLS-B2, PRM-C1, FSS-H9, ING-B1, ING-B3, ING-B5, QNS-D1, QNS-D2, CF-B1, HRA-E1, SF-B1, FQ-F1, SHA-J1, SHA-J3, SFR-G1, SFR-G3, SPR-F1, SPR-F3, EXT-E1, EXT-E3, WHA-B1, WHA-B3, WFR-B1, WFR-B3, WPR-C1, WPR-C3, XFHA-B1, XFHA-B3, XFFR-B1, XFFR-B3, XFPR-C1, XFPR-C3, XHA-B1, XHA-B3, XFR-B1, XFR-B3, XPR-C1, XPR-C3

New for DC and COL:

- PP-C5, ES-D2, CS-D5, QLS-B4, PRM-C2, FSS-H11, QNS-D3, CF-B2, HRA-E2, SF-B2, FQ-F3, UNC-B1, UNC-B2

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PRA Standard Considerations

- Stages in Pre-Operations
  - DC Application: Design without site information
  - COL Application: Design with site information
  - PRA required by Fuel Load: Plant constructed without plant-specific operating experience
- Seismic Approach
  - US approach for DC/COL Applications is to perform PRA-Based Seismic Margins consistent with DC/COL-ISG-020 (ML100491233)
  - US Approach for PRA required by Fuel Load is to address Part 5 directly
  - Need to evaluated Part 5 and 10 SRs if Seismic PRA or Margins Approaches might be used for designs with/without site information

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Acronyms

- ACRS- Advisory Committee on Reactor Safeguards
- ALWR- advanced light-water reactor
- ANS- American Nuclear Society
- ASME- formerly American Society of Mechanical Engineers
- CC- capability category
- CDF- core damage frequency
- COL- combined license
- DC- design certification
- DG- draft guide
- ISG- interim staff guidance
- LERF- large early release frequency
- LP/SD- low power / shutdown
- LRF- large release frequency
- NLWR- non-light-water reactor
- PRA- probabilistic risk assessment
- SFP- spent fuel pool
- SR- supporting requirement
- SRP- standard review plan