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Status of NRC Endorsement of the Advanced Non-LWR PRA Standard and NEI 20-09

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July 22, 2020

Objectives

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- Provide an update on the advanced non-LWR (ANLWR) PRA standard review/endorsement
- Provide an update on the NRC schedule for endorsement
- Discuss plans for review and endorsement of NEI's guidance on peer review (NEI-20-09)
- Discuss observations from initial review of NEI-20-09
- Discuss the scope of the Regulatory Guide and seek feedback from public.

Status of Endorsement of ANLWR PRA Standard

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- Staff has developed an endorsement plan, "Review and Endorsement of ASME/ANS Advanced NON-LWR PRA Standard Action Plan" (ML20104C132).
  - Task 1 - Supporting development of the standard
  - **Task 2 - Preparation for review of the ANLWR PRA standard and NEI's peer review guidance**
  - **Task 3 - Staff review and endorsement**
  - Task 4 - Development of schedule for staff review and endorsement*
  - Task 5 - Identification of resources*
  - Task 6 - Development of communication plan

    * These tasks have been completed

- Staff completed initial review and submitted ballot comments to the JCNRM on May 22, 2020.
- Staff is preparing to provide feedback on the recirculation ballot.

Status of Endorsement of ANLWR PRA Standard

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- NRC is preparing to endorse the ANLWR PRA standard. Some of the ongoing activities include:
  - Comparing the ANLWR PRA standard to other PRA standards
  - Finalizing the scope of regulatory activities
- Staff will endorse the ANLWR PRA standard with the development of a new regulatory guide (RG), similar to RG 1.200.

Schedule for Endorsement and Public Engagement

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- Recirculation ballot feedback- Mid-August 2020
- Draft RG- September 2021
- Public review and comment- September through November 2021
- Final RG- November 2022
- Public meetings
  - Public meeting: July 22, 2020
  - Approximately every 3-6 months thereafter

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NRC Staff's Observations on NEI 20-09, Rev. 0, "Performance of PRA Peer Reviews Using the ASME/ANS Advanced Non-LWR PRA Standard"

Hanh Phan, NRR

July 22, 2020

Staff's Observations on NEI 20-09

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- NRC staff received NEI 20-09, "Performance of PRA Peer Reviews Using the ASME/ANS Advanced Non-LWR Standard" on June 01, 2020 (ML20155K685)
- Staff to review and endorse concurrently with the non-LWR PRA standard (by 2021).
- Additional information/clarification on the following areas is needed for the staff to obtain a better understanding of NEI 20-09 guidance.

1. Non-LWR PRA Life Cycle Stages

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a) Are there any differences in the review process, requirements, materials, finding disposition, etc., among the peer reviews conducted for the PRAs performed during design stage, COL stage, construction stage, initial fuel load, and operation?

b) Is NEI 20-09 applicable to the peer reviews conducted for the mobile reactor PRAs?

c) Should there be any differences between the peer reviews conducted for the existing LWR PRAs (NEI 17-07) and for the non-LWR PRAs on operating plants (e.g., after the first four-year upgrade)?

d) The non-LWR PRA standard includes requirements for PRAs performed before and after initial fuel loading. The capability category (CC) assignment for the same PRA may change significantly from one stage to another. Any specific guidance on this aspect?

e) If the PRA being used for a design certification application or risk-informed application does not have a specific site, should a review of the proxy site information be included?

1. Non-LWR PRA Life Cycle Stages (Con't)

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e) The discussion in Sections 2.1 and 6.4 concerning the potential non-applicability of certain SRs during various plant life cycle stages appears to be inconsistent with the discussion in Section 1.3 of the non-LWR PRA standard, which states:

> "In addition, some PRA requirements that are appropriate for an operating plant or a plant already constructed may not be achievable or appropriate for a PRA on a plant in various design and licensing stages…"

The language used in NEI 20-09 appears to potentially give a false impression that users and peer reviewers may arbitrarily set aside certain supporting requirements (SRs) due to lack of design or operating details, rather than documenting assumptions and proceeding with the analysis as specified in the non-LWR PRA standard.

2. Technical terms used in the guidance

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Several terms in NEI 20-09, i.e., self assessment, independent review, independent assessment, PRA upgrade, etc., are not defined in the same context as they are described in the Standard Review Plan and some other staff guidance. The staff recognizes that these terms are used consistently between NEI 20-09 and NEI 17-07, Rev. 2, which is endorsed in DG-1362.

3. Follow-on Peer Review

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a) It is not clear whether a follow-on peer review or a full-scope peer review or a focused-scope peer review will be performed for the plant-specific COL applicant's PRAs that reference a design-specific PRA and COL holder's PRAs that are updated to reflect the site-specific design information and/or design changes/departures.

b) Would the follow-on or focused-scope peer review be needed/conducted for a PRA on a certified design, which is subject to the restrictions of 10 CFR 52.63(a)(1) concerning the finality of standard design certification?

4. Radiological Consequence Peer Review

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a) Is there any specific guidance on the radiological consequence reviews in addition to the sub-bullet on Page 12 (e.g., physical properties of the fuel, negative temperature coefficient of reactivity, inherently safe capacity, computer software/code)?

b) Section 4.4, “Attributes of Review Team,” should consider additional expertise for radiological consequence reviews, such as:

- meteorological data
- exposure assessment (e.g., exposure factors, shielding)
- modeling of radiation effects to human health
- modeling of emergency response measures
- economic impact modeling.

5. Attributes of Review Team

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a) Should the following attributes be included?
   - knowledge/familiarity with the non-LWR designs, configurations, procedures, performance data, in which the plants are not yet built/operated.
   - knowledge/familiar with the LMP and other risk-informed application(s) for which the PRA is to be used.

b) It is not clear why the experience expectation for the peer review team lead is reduced from 10+ years (NEI 17-07) to 5+ years (NEI 20-09).

c) It is not clear why the last sentence of the first paragraph in Section 4.1 "avoiding a perception of a conflict of interest remains important," has been removed from NEI 17-07.

d) It is not clear why the following sentences in Section 4.4 have been removed from NEI 17-07:
   - Expert in all phases of the type of PRA being reviewed.
   - A minimal team size for a full-scope peer review is five members.

6. Relative Timing of the Reviews

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It is unclear whether all reviews (including follow-on peer review, focused-scope review, in-depth review, and newly developed method review) will be performed and completed prior to the submittal of an application.

7. Figure 1-1, Peer Review Process

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a) The language in the second box should be modified to fit non-LWR PRAs.

b) It is not clear what needs to be done after the last box.

c) It is not clear why the following sub-bullets under Item 7 in Section 5.2 have been removed from NEI 17-07:

- Sub-bullet d - Examine results of any sensitivity run(s) performed during the review
- Sub-bullet e - Examine the PRA maintenance and upgrade process
- Sub-bullet f - Review newly developed method.

8. Seismic PRA Peer Review

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a) The following statement on Page 12, “Reviewer(s) focusing on the seismic fragility work should have successfully completed the SQUG Walkdown Screening and Seismic Evaluation Training Course or have demonstrated equivalent experience or training in seismic walkdowns,” may not be applicable to a PRA performed prior to construction.

b) Should other requirements in EFRI Seismic PRA Implementation Guide, e.g., “The peer review team shall have the combined experience in the areas of systems engineering, seismic hazard, seismic capability engineering, and SPRAs” be included?

c) Seismic margin assessment is not considered for new reactors as listed on Page A-12.

9. Appendix A: Preparation Material

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Information to be sent by the host user to the peer review team should include:

- Procedure(s) used to assess design changes for PRA impact, including documentation that implements the procedure,
- List of design changes up until the peer review but not incorporated into the models yet,
- List of key sources of uncertainty and key assumptions that drive the PRA models and results,
- Etc.

10. Practical Implementation Aspects

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a) Section 3.1 states that "To start the PRA peer review process, the host user should request and schedule a peer review through the appropriate responsible organizing entity (e.g. Owners Group, independent vendor, industry consortium, etc.)," For certain non-LWR designs, an appropriate responsible organizing entity may not have been established. Will NEI serve as a clearinghouse in this situation?

b) For PRAs where a site has not been selected (e.g., PRAs in support of DC, SDA, and ML applications), the non-LWR PRA standard requires the use of bounding sites. These bounding sites will be used to establish appropriate external hazards and the information needed to develop offsite consequence estimates (e.g., meteorology and demographic information). Is there any industry effort to define bounding sites for non-LWRs?

11. Other Minor Clarifications

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a) If a normal plant walkdown cannot be conducted, should other methods (e.g., tabletop walkdowns, computerized simulations) be necessary?

b) There are no CCIII in the non-LWR PRA standard as cited in Section 8.10.

c) Define and add “SQUG - Seismic Qualification Users Group” to the document.

d) For PRAs on plants performed prior to construction, the terms “as-designed, as-to-be-built, and as-to-be operated” should be used.

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Scope of the Staff's Efforts to Endorse the ANLWR PRA Standard

Marty Stutzke, NRR

July 22, 2020

Scope of the Staff's Efforts to Endorse the ANLWR PRA Standard and NEI 20-09

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- Staff's current efforts are focused on endorsing the ANLWR PRA Standard and NEI 20-09 to support ANLWR licensing under Part 50 or Part 52, including LMP implementation.
- Considerations:
  - Attributes of PRA acceptability:
    - Scope
    - Level of detail
    - Compliance with regulatory positions (includes endorsement of industry consensus standards and guidance, with possible clarifications or qualifications)
    - Plant representation
  - Regulations and rulemaking
  - Scope of the ANLWR PRA Standard and NEI 20-09
- No plans to revise risk-informed regulatory guides (e.g., RG 1.174) to address ANLWRs at this time.

PRA-Related Regulations (1 of 2)

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Applicability	Requirement	Regulation
DC/SDA/ML Applicants	Provide a description of the design-specific PRA and its results.	• DC - 10 CFR 52.47(a)(27) • SDA - 10 CFR 52.137(a)(25) • ML - 10 CFR 52.157(c)(31)
COL Applicants	Provide a description of the plant-specific PRA and its results.	10 CFR 52.79(a)(46)
	If the COL application references a DC/SDA/ML, then use the PRA information for the DC/SDA/ML and update it to account for site-specific design information and any design changes or departures.	• DC - 10 CFR 52.79(d)(1) • SDA - 10 CFR 52.79(c)(1) • ML - 10 CFR 52.79(e)(1)

PRA-Related Regulations (2 of 2)

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Applicability	Requirement	Regulation
COL Holders	No later than the scheduled date for initial loading of fuel, develop a level 1 and a level 2 PRA that covers 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	10 CFR 50.71(h)(1)
	Maintain and upgrade the PRA required by paragraph (h)(1) of this section. Must cover initiating events and modes of operation contained in NRC-endorsed consensus standards on PRA in effect one year prior to each required upgrade. The PRA must be upgraded every four years until the permanent cessation of operations under §52.110(a)	10 CFR 50.71(h)(2)
	No later than the date on which the licensee submits an application for a renewed license, upgrade the PRA required by paragraph (h)(1) of this section to cover all modes and all initiating events.	10 CFR 50.71(h)(3)

Licensing and PRA Acceptability

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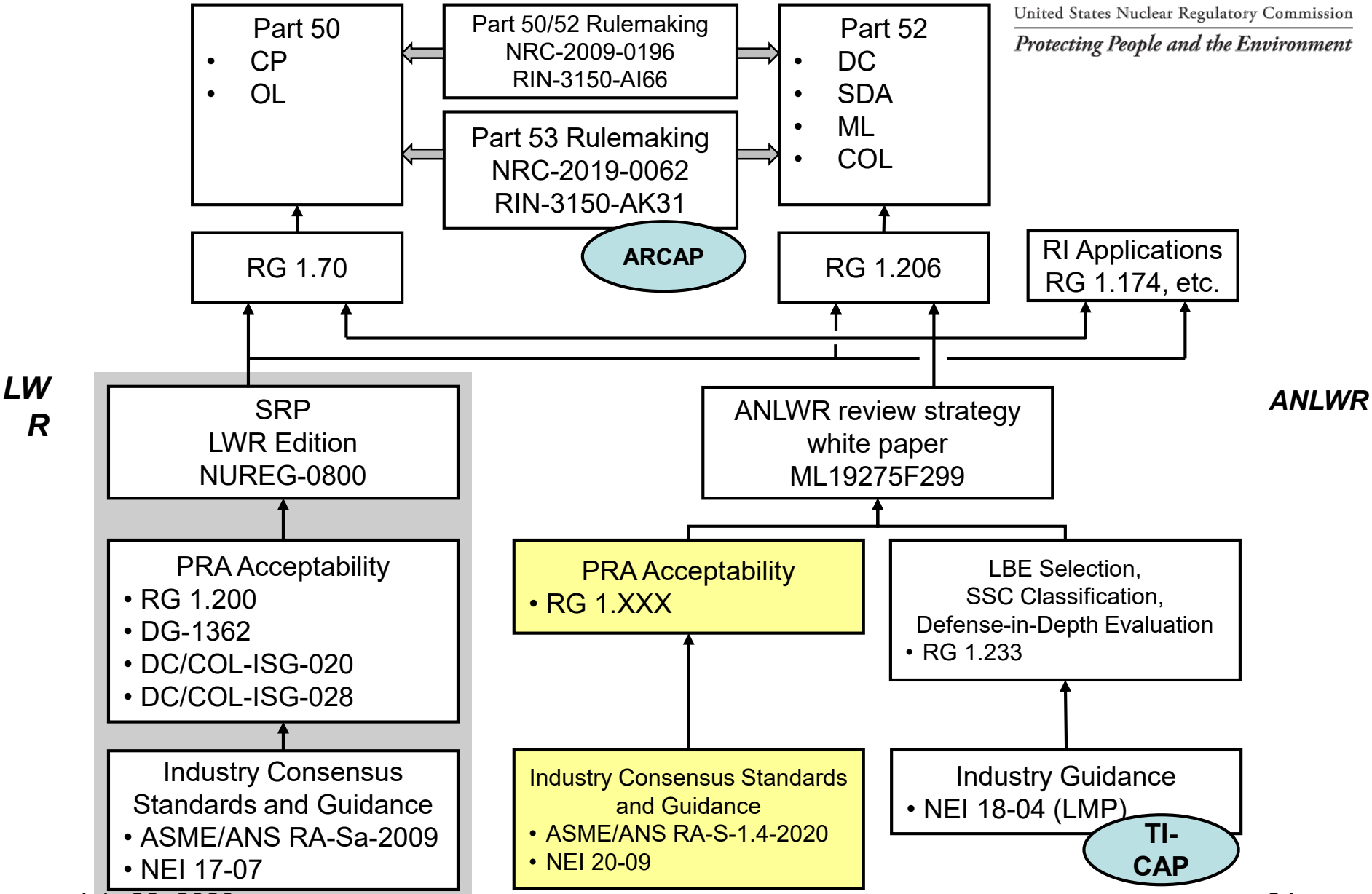

Rulemaking

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- Rulemaking to align Parts 50 and 52:
  - NRC-2009-0196, RIN 3150-AI66
  - SECY-19-0084
  - Final rule anticipated by June 2024
  - Part 52 COL PRA ≈ Part 50 construction permit (CP) PRA
  - Part 52 fuel-load PRA ≈ Part 50 operating license (OL) PRA
- The Nuclear Energy Innovation and Modernization Act (NEIMA) requires the NRC to develop a technology-inclusive, risk-informed, performance-based licensing approach by 2027 (Part 53 Rulemaking)
  - NRC-2019-0062, RIN 3150-AK31
  - SECY-20-0032
  - Anticipate schedule acceleration to 2024

Observations

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- The ANLWR PRA Standard addresses:
  - All radiological sources
  - All internal and external hazards
  - All plant operating states (POS)
  - All lifecycle phases (design, construction, operations).
- Update of the DC/SDA/ML PRA to support COL applications appears to be a PRA "upgrade," according to the ANLWR PRA Standard:
  - Site-specific external hazard analyses
  - Site-specific consequence analyses
- 10 CFR 50.71(h):
  - Phrase "level 1 and level 2 PRA" does not match the ANLWR PRA Standard (which addresses the development of a Level 3 PRA).
  - The fuel-load PRA required by 10 CFR 50.71(h)(1) appears to be an "upgrade" of the COL PRA.
  - The first periodic update required by 10 CFR 50.71(h)(2) appears to be an "upgrade" of the fuel-load PRA.

PRA Evolution

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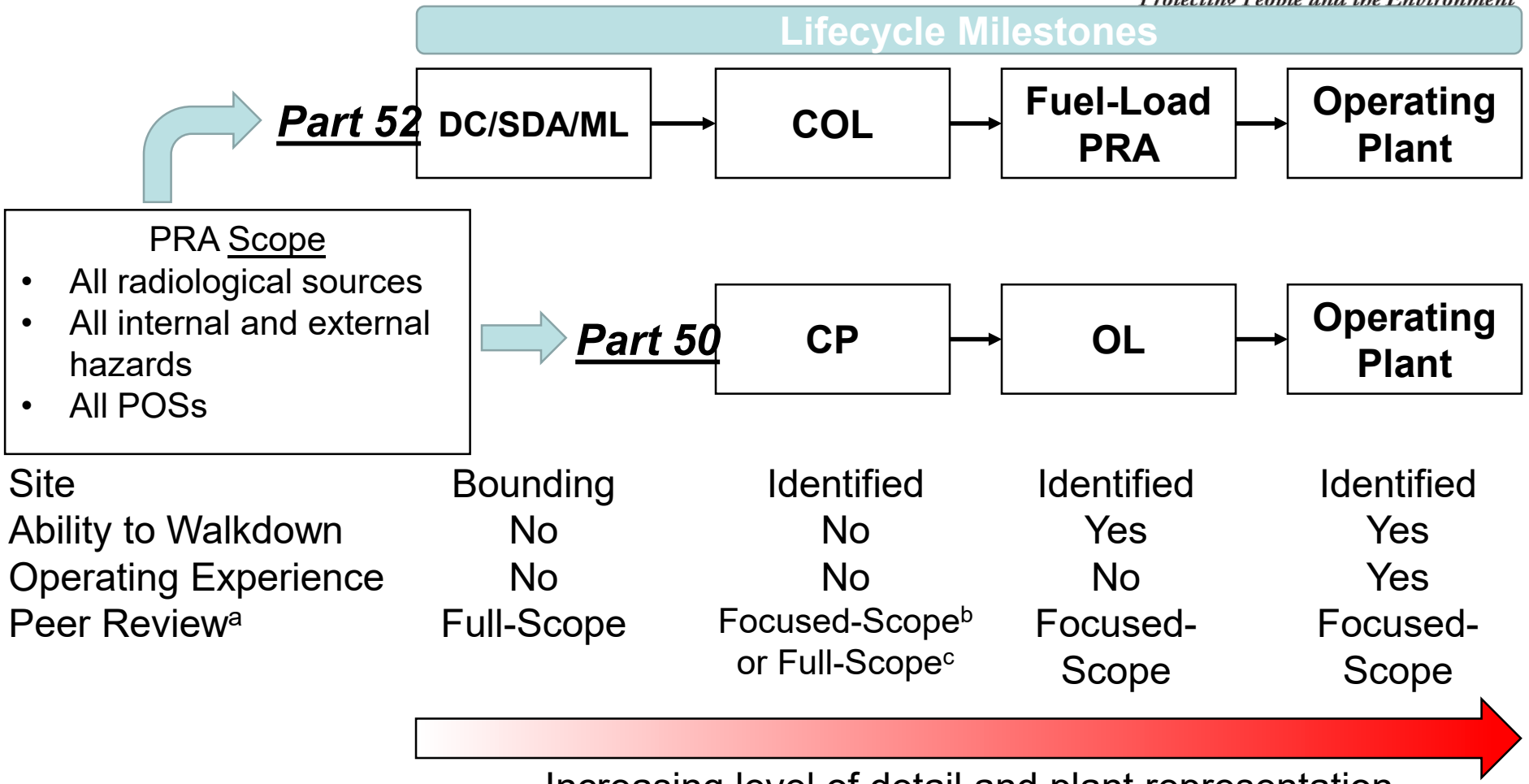

[a]Helps ensure compliance with regulatory position
[b]If COL references DC/SDA/ML
[c]Custom COL or CP

Acronyms

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ANLWR- advanced non-light water reactor
ANS- American Nuclear Society
ARCAP - Advanced Reactor Content of Application Project
ASME-American Society of Mechanical Engineers
CC – capability category
COL- combined license
DC- design certification
JCNRM- Joint Committee on Nuclear Risk Management
LMP- Licensing modernization project
LWR- light water reactor
NEI- Nuclear Energy Institute
NPP- nuclear power plant
RG- regulatory guide
RIPB- risk-informed performance-based
SR - supporting requirement
SSC- structure, system, and component
TICAP – Technology Inclusive Content of Application Project