NLWR PRA Acceptability Public Meeting

March 30, 2021

Background

- NRC staff issued draft White Paper in January 2021- Demonstrating the Acceptability of Probabilistic Risk Assessment Results Used to Support Advanced Non-Light Water Reactor Plant Licensing – ML21015A434
- NEI provided feedback at February 23, 2021 public meeting – ML21055A732

Items for Regulatory Guide Section B, "Discussion"

- Interface with the Parts 50/52 alignment rulemaking
  - Docket NRC-2009-0196; RIN-3150-AI66
  - Use of assumptions in lieu of detailed design information for CP PRA
  - Timing of OL PRA (after plant construction is essentially complete)
- Interface with the Part 53 rulemaking
  - NRC-2019-0062; RIN-3150-AK31
- Interface with the graded PRA initiative:
  - Develop regulatory position by early May
  - Incorporate into ARCAP or develop a stand-alone RG
- Use of intermediate risk metrics (CDF, LRF, LERF) for NLWRs
- Interface with the graded SAMDA analysis initiative for microreactors

Response to NEI Comments Provided During 2/23/2021 Public Meeting (1 of 15)

NEI Comment	Staff Response
Slide 3, 3rd bullet Stated document purpose should reflect that the existing commission policy and rules related to PRA are specific to power reactors and are not applicable to non-power reactors.	Will clarify that the draft white paper and the trial-use RG apply to commercial power reactors.
Slide 3, 4th bullet References to SAMDAs should be eliminated due to lack of applicability of SAMDAs for advanced technologies.	10 CFR Part 51 applies to advanced reactors, including NLWRs. The staff is exploring ways to screen out SAMDAs for microreactors without going through the entire process as described in NEI 05-01A.
Slide 3, 5th bullet References to Level 3 PRA should be eliminated. This term is not appropriate for an ANLWR design.	The staff proposes the new term and initialism "Comprehensive Probabilistic Radiological Risk Assessment (CPRRA)" in lieu of "Level 3 PRA."

Response to NEI Comments Provided During 2/23/2021 Public Meeting (2 of 15)

NEI Comment	Staff Response
Slide 3, 6th bullet Expectations for relative risk significance criteria should be removed.	• PRA may be developed using either relative or absolute risk significance criteria. • PRA developer has flexibility in selecting which risk target(s) to use when determining absolute risk significance. • It is anticipated that NLWRs will have very low risks. • The staff is concerned that only a few PRA items will be reported as absolute risk significant. Such a result provides limited insight into (1) what PRA items actually control the risk and (2) how to tailor the staff's review process. • NEI 18-04, Rev. 1, p. 29: "Hence, it is appropriate to evaluate risk significance not only on a relative basis but also on an absolute basis."

Response to NEI Comments Provided During 2/23/2021 Public Meeting (3 of 15)

NEI Comment	Staff Response
Slide 4, 1st bullet No clear basis for expectation of PRA at Construction Permit stage • Detail is not available at this time • No safety finding is made at this stage, PRA is not needed	• Refer to the Part 50/52 alignment rulemaking (Docket NRC-2009-0196; RIN-3150-AI66). • Will provide discussion (i.e., "links") to related ongoing regulatory activities in Section B of the trial-use RG on NLWR PRA acceptability.
Slide 4, 2nd bullet Screening criteria from the standard should be endorsed as well.	The staff intends to endorse the screening criteria. Note that the staff may include clarifications, qualifications, exceptions, or additions in any proposed endorsement.

Response to NEI Comments Provided During 2/23/2021 Public Meeting (4 of 15)

NEI Comment	Staff Response
Slide 4, 3rd bullet Expectations for timing and scope of peer reviews • Several listed stages will not have PRAs suitable for peer review • Scope should be according to PRA availability and changes, not by design	• The draft staff white paper reflects the staff's current interpretation of the NLWR PRA standard's requirements. ➢ The discussion of peer reviews is aligned with licensing submittals. • NLWR applications must demonstrate the acceptability of their PRAs. ➢ The trial-use RG on NLWR PRA acceptability will provide one (but not the only) acceptable approach. • How will the staff determine the acceptability of a PRA that is "not suitable for peer review"?

Response to NEI Comments Provided During 2/23/2021 Public Meeting (5 of 15)

NEI Comment	Staff Response
Slide 5, 1st bullet Discussion of white paper revealed need for additional dialogue in several key areas outside the scope of the paper itself • What PRA means for various technologies • Use of a fully deterministic basis • Use of PRA without use of the ANLWR PRA Standard • Need for durable, visible guidance from NRC	• Agreed. This discussion needs to be coordinated with the Part 53 rulemaking and the Part 50/52 alignment rulemaking. • Will provide discussion (i.e., "links") to related ongoing regulatory activities in Section B of the trial-use RG on NLWR PRA acceptability.
Slide 5, 2nd bullet Common understanding critical to providing context of white paper	Agreed.

Response to NEI Comments Provided During 2/23/2021 Public Meeting (6 of 15)

NEI Comment	Staff Response
Slide 6, 1st bullet Page 7: "For ANLWR applications that are based on the LMP guidance, the PRA is used to select licensing basis events, classify systems, structures and components (SSCs), and to inform the defense-in-depth evaluation." • "is" should be "may be" as this need not be required	• The only purpose of NEI 18-04 is to provide an acceptable way of selecting licensing basis events, classifying SSCs, and evaluating defense-in-depth. • The staff agrees that NEI 18-04 is not the only acceptable way for doing so.

Response to NEI Comments Provided During 2/23/2021 Public Meeting (7 of 15)

NEI Comment	Staff Response
Slide 6, 2nd bullet Page 8: Plant representation and PRA configuration control • The listed definition doesn't address PRA configuration control. Suggest eliminating.	Will clarify as follows (adapted from RG 1.200, Rev. 3): "Plant representation and PRA configuration control: Plant representation is defined in terms of how closely the PRA represents the plant as it is designed, built, and operated. In general, PRA results used to support an application must be derived from a PRA model that represents the as-designed (as-to-be-built), as-built (as-to-be-operated), and as-operated plant to the extent needed to support the application. Consequently, the PRA is maintained and upgraded, where necessary, to ensure it represents the as-designed (as-to-be-built), as-built (as-to-be-operated), and as-operated plant."

Response to NEI Comments Provided During 2/23/2021 Public Meeting (8 of 15)

NEI Comment	Staff Response
Slide 7, 1st bullet Page 8: "The NRC staff expects that a PRA that supports implementation of the LMP guidance or other voluntary risk-informed applications (such as implementation of 10 CFR 50.69 for applicants that do not use the LMP guidance), will have an increased level of detail and plant representation." • Some ANLWRs will have a simplified safety case so additional detail (relative to LWRs) may not be necessary. This sentence should be eliminated.	Will clarify as follows: The NRC staff expects that a NLWR PRA that supports implementation of the LMP guidance or other voluntary risk-informed applications (such as implementation of 10 CFR 50.69 for applicants that do not use the LMP guidance), will have an increased level of detail and plant representation as compared to a NLWR PRA that does not support implementation of the LMP guidance or other voluntary risk-informed applications."

Response to NEI Comments Provided During 2/23/2021 Public Meeting (9 of 15)

NEI Comment	Staff Response
Slide 8, 1st bullet Page 10: Discussion on CDF and LERF • The ANLWR PRA standard is not organized around CDF and LERF. • These references are not appropriate for this white paper/regulatory guidance. • The PRA owner may define and use core damage, but not all will. • Risk integration and risk significance criteria require quantification of event sequence consequences	• The staff understands that the NLWR PRA standard provides requirements for developing a CPRRA. • The draft staff white paper discusses the difficulties involved in adapting intermediate risk metrics used for LWRs to NLWRs. This discussion should be of interest to NLWR applicants who are contemplating the development of a PRA that is less than a CPRRA. • Will provide further discussion in Section B of the trial-use RG on NLWR PRA acceptability.

Response to NEI Comments Provided During 2/23/2021 Public Meeting (10 of 15)

NEI Comment	Staff Response
Slide 8, 2nd bullet Page 10: Discussion on LRF • LRF and LERF are intentionally not used in the standard and should not be used here. • Existing definitions of LRF and LERF are qualitative and difficult to apply to NLWRs	• See response to Slide 8, 1st bullet. • Interestingly, SRM-SECY-89-102 (ML12251A496) states that "…the Large Release Guideline relates to all current as well as future designs." This SRM specifically mentions LWRs, LMRs, and HGTRs.
Slide 9, 1st bullet Page 11: Discussion on fire LPSD POSs • There is insufficient technological advancement to support development of supporting requirements on this in the standard. It is unclear what the purpose of this discussion is	• Consistent with the discussion provided in SRP Chapter 19.0, Final Rev. 3 (December 2015), pp. 19.0-23 and 19.0-24, the staff expects NLWR PRAs to address internal fires that may occur during LPSD. • Recent LWR DCs (e.g., APR1400 and NuScale) have assessed LPSD internal fires. • The use of bounding, conservative, and screening analyses may be appropriate. • The NRC is considering the need to initiate research into LPSD fire PRA.

Response to NEI Comments Provided During 2/23/2021 Public Meeting (11 of 15)

NEI Comment	Staff Response
Slide 9, 2nd bullet Discussion on bounding site • An application should only need to provide enough siting information to demonstrate that the site is bound by the bounding site analyses performed.	The staff interprets the NLWR PRA standard as requiring the use of site-specific information (e.g., external hazards, meteorology) once the site has been selected. For example, see the table provided in Section 3.3.2.
Slide 10, 1st bullet Page 12: Risk metrics that support the evaluation of SAMDAs, such as population dose risk (person-rem per plant-year) and offsite economic risk ($ per plant-year). • SAMDAs are likely not in the scope for many ANLWRs and this is not an appropriate expectation	10 CFR Part 51 applies to advanced reactors, including NLWRs. The staff is exploring ways to screen out SAMDAs for microreactors without going through the entire process as described in NEI 05-01A.

Response to NEI Comments Provided During 2/23/2021 Public Meeting (12 of 15)

NEI Comment	Staff Response
Slide 10, 2nd bullet Page 13: Commercial operations stage: The plant accrues operating experience; the PRA reflects the as-built, as-operated plant including plant-specific operating experience. • It is unclear what is meant by this. Is there an expectation that the PRA will be resubmitted?	Revisions to the PRA should be reflected in periodic FSAR revisions, as required by 10 CFR 50.71(h)(2) for COL holders. The Part 50/52 alignment rulemaking will add a similar requirement for OL holders.

Response to NEI Comments Provided During 2/23/2021 Public Meeting (13 of 15)

NEI Comment	Staff Response
Slide 11, 1st bullet Page 13: "OL application stage: The plant has been constructed and is ready to begin pre-operational testing; the PRA generally represents the as-built and as-to-be-operated plant but does not reflect plant-specific operating experience." • The plant has not necessarily been constructed at the OL stage. The OL cannot be issued until the plant is largely constructed. ○ A defined time prior to fuel load could be a better expectation. • In this sentence, "as-built" should be "as-to-be-built"	• Will coordinate with the Part 50/52 alignment rulemaking. • Will provide discussion (i.e., "links") to related ongoing regulatory activities in Section B of the trial-use RG on NLWR PRA acceptability.

Response to NEI Comments Provided During 2/23/2021 Public Meeting (14 of 15)

NEI Comment	Staff Response
Slide 12, 1st bullet Page 16: "Type 5 SRs become applicable when plant-specific operating experience is first incorporated into the PRA; Type 4 SRs become not applicable" • Unclear on what the regulatory standing of this is	10 CFR 50.71(h)(2) requires COL holders to maintain and upgrade the PRA every four years. The Part 50/52 alignment rulemaking will add a similar requirement for OL holders.
Slide 12, 2nd bullet Page 17: Discussion on use of relative and absolute criteria. • Standard gives flexibility for use of either criteria; requiring both types of criteria was never considered in the standard's development or use	See response to Slide 3, 6th bullet.

Response to NEI Comments Provided During 2/23/2021 Public Meeting (15 of 15)

NEI Comment	Staff Response
Slide 13, 1st bullet Page 18: Reference to Appendix B • PRA is not subject to Appendix B	Agreed, as stated in the draft staff white paper. The staff expectations for PRA quality control have been stated in RG 1.174 since its initial issuance in 1998.
Slide 13, 2nd bullet Page 20: "The industry-led technology-inclusive content of application project (TI-CAP) is developing proposed content for specific portions of the safety analysis report (SAR) that would be used to support an advanced reactor application. The TI-CAP portion of the SAR will be informed by the guidance found in the LMP guidance (NEI 18-04)." Change "would" to "could" –TI-CAP should not be required to be used by applicants for advanced reactor licenses	Agreed. The staff is pointing out that TI-CAP is expected to provide an acceptable approach for documenting PRA results, should an applicant decide to use it.