UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

September 23, 2015

Mr. Mark A. Satorius
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: INTERIM STAFF GUIDANCE: DC/COL-ISG-028, "ASSESSING THE TECHNICAL ADEQUACY OF THE ADVANCED LIGHT-WATER REACTOR PROBABILISTIC RISK ASSESSMENT FOR THE DESIGN CERTIFICATION APPLICATION AND COMBINED LICENSE APPLICATION"

Dear Mr. Satorius:

During the 627th meeting of the Advisory Committee on Reactor Safeguards, September 9-12, 2015, we met with representatives of the NRC staff to review interim staff guidance (ISG) for assessing the technical adequacy of a probabilistic risk assessment (PRA) prepared for a design certification (DC) application and combined license (COL) application for an advanced light-water reactor. Our Reliability and PRA Subcommittee reviewed the original ISG draft during a meeting on September 15, 2014, and a draft revised in response to comments on August 21, 2015. We also had the benefit of the documents referenced.

RECOMMENDATIONS

1. The staff should issue the ISG after considering our Recommendations 2 and 3.

2. The staff should develop revised guidance that endorses PRA conformance with ASME/ANS Capability Category II requirements to the greatest extent achievable at the DC and COL stages of the licensing reviews.

3. The staff should expand the revised guidance to include seismic PRA in the endorsement of Capability Category II. For the COL, any seismic analysis should be site-specific.

BACKGROUND

For new reactor applications, 10 CFR 52.47(a)(27) requires DC applicants to provide a description of the design-specific PRA and its results; 10 CFR 52.79(a)(46) requires COL applicants to provide a description of the plant-specific PRA and its results.

Typically, the process for endorsing standards related to the technical adequacy of PRAs is defined in Regulatory Guide 1.200, which currently endorses ASME/ANS PRA Standard RA-Sa-2009, with a number of qualifications and clarifications. However, Regulatory Guide 1.200, the PRA Standard, and other PRA-related guidance documents were developed for currently operating nuclear power plants that have decades of operating experience. Some supporting requirements in the PRA Standard are not applicable or cannot be achieved for a new reactor application, while other supporting requirements need clarification as to how they can be achieved.

The staff developed DC/COL-ISG-028 to provide consistent consideration of the PRA Standard in assessing the technical adequacy of a PRA for 10 CFR Part 52 DC and COL applications.

DISCUSSION

We were briefed on each section of the PRA Standard, its high-level requirements and supporting requirements, and its technical bases. The briefing included the following general topics: scope and capability of the PRA, PRA configuration control, peer reviews and self-assessments, operational guidance and practices, and large release frequency. Technical challenges in applying the PRA Standard to new reactors include the lack of site-specific features and characteristics, plant-specific layouts and capabilities, plant-specific operating experience and data, operator interviews, and walkdowns.

In developing the ISG, the staff envisioned that individual supporting requirements from the PRA Standard could be apportioned unambiguously to one of six categories, which indicate how existing requirements apply to new reactors. For example, if the existing requirement matches perfectly, then an assignment of “Can Meet” is appropriate. “Cannot Meet” can arise when the requirement demands operational data that will not be available for new reactors. The six categories and the percentage of supporting requirements that the staff associated with each are:

- Can Meet (75%)
- Cannot Meet (5%)
- Not Applicable (6%)
- Replace (1%)
- Enhance (11%)
- New (2%)

From this tally, it appears that most of the PRA Standard supporting requirements apply directly and a few fit into the other categories. However, in practice, the assignments are not “unambiguous”, and the ISG warns users to review the clarifications and comments carefully for each specific supporting requirement. It would improve clarity to remove the categorization from the ISG to avoid confusion for users who might be tempted to overlook comments when a requirement has been labeled “Cannot Meet” or “Not Applicable” or even “Can Meet,” all of which may include exceptions or special instructions.

In general, the guidance is thorough and will be helpful for reviewers. There is one area where we were disappointed. Because of previous discussions with the staff and as a result of our earlier letter reports and staff responses, we had hoped that this ISG would be the place where the staff would suggest that applicants should develop DC and COL PRAs to meet Capability Category II from the PRA Standard, as recommended in Regulatory Guide 1.200, with use of Capability Category I restricted to exceptions justified by the applicant.

PRA Capability Category

According to Section 19.0 of NUREG-0800:

> PRAs that meet the applicable supporting requirements for Capability Category I and meet the high-level requirements as defined in the ASME PRA Standard (ASME/ANS RA-S-2008) and addenda ASME/ANS RA-Sa–2009) should generally be acceptable for DC and COL applications.

This guidance is often cited as a primary reason why PRA models developed for DC and COL applications are very simplified in both scope and level of detail. This has led to broad variations of technical quality among PRAs developed for completed design certifications and for designs that are currently in the certification review process.

The staff should consider revised guidance that endorses PRA conformance with Capability Category II requirements to the greatest extent achievable at the DC and COL stages of the licensing process. Staff reviewers should assess the adequacy of the PRA and justifications for why specific elements of Capability Category II cannot be achieved at each stage.

It has been claimed that the staff's experience has shown that conformance with Capability Category I from the PRA Standard has resulted in PRAs which are sufficient to meet the Commission's objectives for use of PRA in the design of new and advanced reactors. We have found no Commission guidance that Capability Category I provides sufficient quality for design certification PRAs. Acceptance of Capability Category I appears to stem from earlier interim staff guidance.

We disagree that Capability Category I is sufficient. We have observed that DC applicants are using their PRAs to inform the selection of design options that reduce risk. Our own spot checks have found areas where potentially significant components and failure modes have been omitted from PRAs that meet Capability Category I. This experience demonstrates that it is time to shift the endorsement to Capability Category II, which will give more confidence in the technical quality and results of the design certification PRAs. We acknowledge that there will be some site-specific and, perhaps, design-specific areas where full achievement of Capability Category II will not be possible at the DC and COL stages. Those instances should be justified and identified for enhancement as the applicable design information and operating experience become available. Use of Capability Category II at the DC stage will also reduce the burden on COL holders to find such omissions and correct them when their plant-specific, full-scope PRAs are developed prior to fuel load.

In addition, in the staff requirements memorandum for SECY 93-087, the Commission approved the staff's request to accept a PRA-based seismic margins study. Now, more than two decades later, with the experience of a number of Part 52 design certifications, the time has come to endorse a Capability Category II seismic PRA, at least for the COL, except in areas where the applicant can demonstrate that Category II criteria cannot be met. Even if the endorsement continues to require only a seismic margins study, the COL version should be made as fully site-specific as possible following the guidance in the PRA Standard for a seismic margins study.

The staff has acknowledged its opportunity for further improvements in the technical adequacy of PRAs required for new reactors. This ISG presents a timely vehicle for implementing such improvements.

Sincerely,

/RA/

John W. Stetkar
Chairman

REFERENCES

1. U.S Nuclear Regulatory Commission, Interim Staff Guidance DC/COL-ISG-028, "Assessing the Technical Adequacy of the Advanced Light-Water Reactor Probabilistic Risk Assessment for the Design Certification Application and Combined License Application," August 2015 (ML15188A282).

2. Nuclear Energy Institute letter, Industry Comments on Draft ISG-028, January 23, 2015 (ML15027A333).

3. U.S Nuclear Regulatory Commission, Response to NEI Comments, January 23, 2015, August 5, 2015 (ML15188A291).

4. ACRS letter, "Standard Review Plan Chapter 19 and Section 17.4," July 16, 2014 (ML14196A119)

5. ACRS letter, "Standard Review Plan Chapter 19 and Section 17.4," November 13, 2014 (ML14314A653).

6. U.S Nuclear Regulatory Commission, Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2, March 2009 (ML090410014).

7. ASME/ANS RA-Sa-2009, Addenda to ASME/ANS RA-S–2008, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," May 2012

8. U.S Nuclear Regulatory Commission, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 19.0, "Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors," Draft Revision 3, September 2012 (ML12132A481).

9. U.S Nuclear Regulatory Commission, Memorandum to J. Taylor, Executive Director for Operations, “SECY-93-087 – Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Design,” From Office of Secretary, July 21, 1993.

8. U.S Nuclear Regulatory Commission, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 19.0, "Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors," Draft Revision 3, September 2012 (ML12132A481).

9. U.S Nuclear Regulatory Commission, Memorandum to J. Taylor, Executive Director for Operations, “SECY-93-087 – Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Design,” From Office of Secretary, July 21, 1993.

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