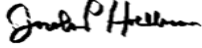




UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

September 13, 2023

MEMORANDUM TO: Steven T. Lynch, Chief  
Advanced Reactor Policy Branch  
Division of Advanced Reactors and Non-Power  
Production and Utilization Facilities  
Office of Nuclear Reactor Regulation

FROM: Jordan P. Hoellman, Project Manager  Signed by Hoellman, Jordan  
Advanced Reactor Policy Branch on 09/13/23  
Division of Advanced Reactors and Non-Power  
Production and Utilization Facilities  
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF APRIL 4, 2023, WORKSHOP ON  
INSTRUMENTATION AND CONTROLS LICENSING  
FRAMEWORK FOR ADVANCED REACTORS

On April 4, 2023, the U.S. Nuclear Regulatory Commission (NRC) staff held an Information Meeting with Question and Answer public meeting with representatives from industry, including the Nuclear Energy Institute (NEI), the national laboratories, and members of the public to discuss the instrumentation and controls (I&C) licensing framework for advanced reactors. The NRC staff has posted the meeting notice is available in the NRC's Agencywide Documents Access and Management System (ADAMS) at Accession No. ML23089A077 and the presentation is available at ADAMS Accession No. ML23094A056. Enclosure 1 lists the meeting attendees who participated.

The NRC staff introduced the rationale for hosting these workshops as part of the NRC's efforts to streamline reviews of future license applications and to ensure common understanding amongst the NRC staff, potential applicants, and the public, and provided a summary of the previous workshops held on February 23, 2023, and March 16, 2023 (ML23082A319). As a follow-up to those workshops, industry prepared a specific question related to how the categorization of non-safety-related special treatment (NSRST) structures, systems, and components (SSCs), as endorsed in Regulatory Guide (RG) 1.233, "Guidance for a Technology-Inclusive, Risk-Informed and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light Water Reactors" (ML20091L698), compares to previously used categorizations for non-safety-related SSCs that perform safety significant functions.

Enclosure:  
List of Attendees

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301-415-5481

The industry question is reproduced below with a summary of the NRC staff's response. The NRC staff provided an open forum for discussion on the question and for various industry and public views to be presented and discussed.

Question 1: How does the NSRST categorization compare to previously used categorizations such as Regulatory Treatment of Non-Safety Systems (RTNSS) and Risk-Informed Safety Class 2 (RISC-2) which also describe supplemental requirements for non-safety-related SSCs that perform safety significant functions?

The NRC staff responded, noting the following high-level comparisons:

- NSRST is a classification category under the Licensing Modernization Project (LMP) methodology, endorsed in RG 1.233, and has its own definition. The NSRST SSC special treatment provisions can be informed by the existing guidance (as discussed in NEI 18-04, Revision 1, "Risk-Informed Performance-Based Technology Inclusive Guidance for Non-Light Water Reactor Licensing Basis Development" (ML19241A336), Section 4) including those associated with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.69 (RISC-2) and RTNSS.
- All three categories are similar in terms of providing appropriate special treatment capabilities and reliabilities for the functions identified as significant (e.g., risk-significant or defense-in-depth (DID) adequacy)
- NSRST is more similar to RISC-2 than RTNSS. For example, RTNSS is heavily light-water reactor (LWR)-specific and the use of deterministic analysis are used instead of probabilistic risk analysis (PRA) insights.

The NRC staff provided a summary of the three categorizations:

- NSRST is a classification category under the integrated, risk-informed and performance-based approach under the LMP methodology for non-light-water reactors (non-LWRs). The NSRST SSCs are identified as either:
  - *Non-safety-related SSCs relied on to perform risk-significant functions. Risk-significant SSCs are those that perform functions that prevent or mitigate any licensing basis event (LBE) from exceeding the frequency-consequence (F-C) Target or make significant contributions to the cumulative risk metrics selected for evaluating the total risk from all analyzed LBEs, or*
  - *Non-safety-related SSCs relied on to perform functions requiring special treatment for DID adequacy.*

The NRC staff discussed that special treatment for SSCs (i.e., those requirements that provide increased assurance beyond normal industrial practices) is evaluated and developed on a case-by-case basis and in the context of the SSC functions in the prevention and mitigation of applicable LBEs. This is determined by design and confirmed via an Integrated Decision-Making Process that is part of the LMP methodology. Given the more defined role of the PRA in the LMP process, (1) special treatments for SSCs, (2) the related performance monitoring, and (3) the feedback mechanisms into PRA and licensing basis document updates, may be better defined for

NSRST SSCs than it is under the existing NRC programs and guidance. The NRC staff noted that these matters are currently under discussion as part of developing guidance in areas such as the Advanced Reactor Content of Application Project (ARCAP) and the Technology-Inclusive Risk-Informed Change Evaluation (TIRICE) effort.

- The RTNSS process applies broadly to those non-safety related SSCs that perform risk significant functions and is more for passive LWRs as discussed in NUREG-0800, Chapter 19, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition – Severe Accidents,” Section 19.3, “Regulatory Treatment of Non-Safety Systems (RTNSS) for Passive Advanced Light Water Reactors.” The RTNSS process uses the following five criteria to determine those SSC functions:
  - A. SSC functions relied on to meet beyond design basis deterministic NRC performance requirements such as those set forth in 10 CFR 50.62 for mitigating Anticipated Transients Without Scram (ATWS) and in 10 CFR 50.63 for Station Blackout (SBO).
  - B. SSC functions relied on to ensure long-term safety (the period beginning 72 hours after a design basis event and lasting the following 4 days) and to address seismic events.
  - C. SSC functions relied on under power-operating and shutdown conditions to meet the Commission goals of a core damage frequency (CDF) of less than  $1 \times 10^{-4}$  each reactor year and a large release frequency (LRF) of less than  $1 \times 10^{-6}$  each reactor year.
  - D. SSC functions needed to meet the containment performance goal, including containment bypass, during severe accidents.
  - E. SSC functions relied on to prevent significant adverse systems interactions between passive safety systems and active non-safety SSCs.
- RISC-2 is a classification category among RISC 1-4 under 10 CFR 50.69 and means non-safety-related SSCs that perform safety significant functions. It is based on the existing safety-related definition in 10 CFR 50.2. RG 1.201, “Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance” (ML061090627), provides guidance on the process for the categorization and applies more specifically to LWRs.

NEI introduced the discussion of alternate frameworks, noting that some advanced reactor vendors are planning on using alternate frameworks from the LMP methodology that align more with international guidance and standards. The presentations, from General Atomics (GA) and General Electric-Hitachi (GE-H), provided specific examples of how they were developing the safety strategy for their respective designs. GA and GE-H noted that, while not following the LMP methodology, the concepts described in the Design Review Guide (DRG): Instrumentation and Controls for Non-Light-Water Reactors (Non-LWR) Reviews (ML21011A140) (e.g., use of international standards, integrated I&C architecture and system development process, safety analysis report format) align well with their safety strategies and that they planned to use the DRG to inform their respective applications.

The questions industry posed in the presentation material was discussed at a high level, with the NRC staff noting that the use of the LMP concepts in safety strategies that differ from the LMP methodology would need to be discussed in applicant-specific meetings. The NRC staff reiterated that no regulatory decisions would be made in these workshops.

The meeting ended before the NRC staff and industry could have a full discussion on some of the industry questions and before the NRC staff's detailed questions on alternate frameworks could be addressed. The NRC staff did not present on perspectives on design basis accident analysis described in the LMP at this workshop. The NRC staff and industry agreed to continue these discussions in the next workshop. The NRC staff discussed additional plans for future workshops to engage on specific areas. The NRC staff is planning for its next public workshop to continue discussions on specific areas, including the use of alternative international I&C safety standards.

SUBJECT: SUMMARY OF APRIL 4, 2023, WORKSHOP ON INSTRUMENTATION AND CONTROLS LICENSING FRAMEWORK FOR ADVANCED REACTORS  
DATED: SEPTEMBER 13, 2023

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CCheung, NRR

GOberson, NRR

MHayes, NRR

**ADAMS Accession No.: ML23226A141**

**NRC-001**

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|--------|------------------|------------------|------------------|
| OFFICE | NRR/DANU/UARP/PM | NRR/DANU/UARP/BC | NRR/DANU/UARP/PM |
| NAME   | JHoellman        | SLynch           | JHoellman        |
| DATE   | 8/14/2023        | 9/13/2023        | 9/13/2023        |

**OFFICIAL RECORD COPY**

**PUBLIC MEETING  
U.S. NUCLEAR REGULATORY COMMISSION  
Tuesday, April 4, 2023  
1:00 p.m. – 3:00 p.m. EDT**

| <b>List of Attendees* (remote)</b>        |
|---|
| Jordan Hoellman                           |
| Beth Reed                                 |
| James O'Driscoll                          |
| Michael Waters                            |
| Alan Campbell (NEI)                       |
| Lon Andrew Dawson                         |
| Tony Jackson                              |
| Steven Lynch                              |
| Ryan David Brownfield                     |
| Mark Burzynski (GE Power Portfolio)       |
| Scott Bussey                              |
| Norbert Carte                             |
| Jana Bergman                              |
| Ian Jung                                  |
| Joseph Ashcraft                           |
| Mohammad Alavi (GA)                       |
| Alan Smith                                |
| William Catullo (Paragon Energy Services) |
| Scott Tonsfeldt                           |
| Dan                                       |
| Samir Darbali                             |
| Hash Hashemian                            |
| Wesley Steh                               |
| Ossy Font                                 |
| Steven Alferink                           |
| Dennis Allen Petrarca                     |
| Amy Cabbage                               |
| Steve Kincaid (Kairos Power)              |
| Eric Thornsbery                           |
| Amanda J Spalding                         |

| <b>List of Attendees* (remote)</b>           |
|--|
| Eternity Perry                               |
| Matthew J. Marzano                           |
| Patrick Essner                               |
| Doug Eskins                                  |
| Gilberto Blas Rodriguez                      |
| Dinesh Taneja                                |
| Nathan DeKett (GE Power Portfolio)           |
| Jeffrey L Arndt                              |
| Donald H. Behnke                             |
| William Reckley                              |
| Erin Wisler                                  |
| Christopher Phillips                         |
| Joseph Sebrosky                              |
| Charlyne Smith (Breakthrough Institute)      |
| Richard Brian Vilim                          |
| Shelby Small (GE Power Portfolio)            |
| Leigh Lloveras (Breakthrough Institute)      |
| Paul J. Hunton                               |
| Nicholas Goss                                |
| Stephen Kimura                               |
| Skip Butler (GE Power Portfolio)             |
| Stacia Van Linden                            |
| Viola A.                                     |
| Ryan Marcum                                  |
| Jared Hunt                                   |
| Hangbok Choi                                 |
| Rossnyev Alvarado                            |
| Jason Paige                                  |
| Sushil Birla                                 |
| Steven Pope                                  |
| Philip John                                  |
| Mary H Miller                                |
| Francis J Mascitelli (Constellation Nuclear) |
| Christina Antonescu                          |

| <b>List of Attendees* (remote)</b> |
|------------------------------------|
| Daniel L Watson                    |
| Jason Hearne                       |
| Ted Quinn                          |
| William T Ryan                     |
| Charlotte Geiger                   |
| Anders Gilbertson                  |
| Scott Zinkham (GE Power Portfolio) |
| Timothy Kosler                     |

\* Attendance list based on Microsoft Teams Participant list. List does not include 4 individuals that connected via phone.