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Sent: Tuesday, September 20, 2022 9:45 AM
To: Diaz-Quiroz, Jesus G. (GE Power Portfolio); GEH-BWRX-300DocsPEM Resource
Cc: Wadkins, George (GE Power); Rebecca Patton; Brian Wittick; Shanlai Lu; Angelo Stubbs; Ryan Nolan; Stewart Bailey; Mike Franovich; Marie Pohida; Michael Dudek; Jordan Glisan; Shilp Vasavada; Anne-Marie Grady
Subject: Pre-Application Page Turn Observations Concerning the Draft GEH BWRX-300 LTR NEDC-33934P, "Safety Strategy" 08/03/2022
Attachments: GEH BWRX-300 Safety Strategy LTR Readiness Assessment Observation 08032022.docx

Jesús,

U.S. Nuclear Regulatory Commission (NRC) staff participated in a non-public pre-application readiness assessment ("Page Turn") on August 3, 2022, of the GE-Hitachi Nuclear Energy Americas, LLC (GEH) proposed Licensing Topical Report (LTR) NEDC-33934P, "Safety Strategy," for its small modular reactor (SMR) design BWRX-300, prior to its planned submittal in late August 2022.

The staff concluded from its "Page Turn," observation that, a "White Paper," submission of the "Safety Strategy" methodology used by GEH for the BWRX-300 design is more appropriate, because the NRC staff could not make safety conclusions on a design process methodology but only on the final design. The subsequent feedback from the staff can be used to develop and submit specific licensing topics that implement the "Safety Strategy," with a corresponding regulatory evaluation that shows how NRC Regulations would be met in a final design proposed for licensing.

Subsequently following further discussions with GEH regarding the staff draft LTR Observations, GEH has decided to submit a "White Paper," on its Safety Strategy methodology later this year in November with another LTR Pre-Submittal meeting planned for December before its LTR is submitted for NRC review in January 2023.

The NRC staff noted that the GEH, "Safety Strategy," design methodology approach includes principles of defense-in-depth (DID) concepts for design of safety systems consistent with International Atomic Energy Agency (IAEA) Specific Safety Requirements SSR-2/1, "Safety of Nuclear Power Plants: Design." In the public pre-application meeting held on June 29, 2022, it was stated that the staff could not make any evaluations or endorsements of IAEA guidance or rules.

The "Page Turn," is an approved method of engagement under the NRC's official pre-application readiness assessment which is not part of the NRC's official LTR acceptance review process. This "Page Turn" engagement objective was to help the NRC staff and GEH to determine the readiness of the draft GEH LTR on BWRX-300, Safety Strategy, and to identify any major issues or information gaps between the draft application and the technical content required to be included in the application submitted to the NRC. Therefore, the observations from the "Page Turn" engagement do not predetermine whether the application will be docketed.

The “Page Turn” engagement staff observations are summarized in the attached “PRE-APPLICATION READINESS ASSESSMENT OBSERVATIONS OF GE-HITACHI LICENSING TOPICAL REPORT NEDC-33934P, “BWRX-300 SAFETY STRATEGY.”

No regulatory decisions were made during or as part of the staff observations from this pre-application activity and engagement with GEH.

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PRE-APPLICATION READINESS ASSESSMENT OBSERVATIONS OF GE-HITACHI LICENSING TOPICAL REPORT NEDC-33934P, “BWRX-300 SAFETY STRATEGY”

Docket No. 99900003

LOCATION

This “Page Turn,” engagement was held at the North Bethesda Marriot across from the NRC HQ, on August 3, 2022, from 9:00am till 4:00pm.

PURPOSE

GEH requested that the staff perform a pre-application “Page Turn,” engagement activity for the draft GEH licensing topical report (LTR) NEDC-33934P, “Safety Strategy,” for the BWRX-300 small modular reactor (SMR) before the application is submitted for a formal NRC review.

The “Page Turn” engagement allows the NRC staff to:

- identify information gaps between the draft application and the technical content required in the application submitted to the NRC,
- identify major technical or policy issues that may adversely impact the docketing or technical review of the application, and
- become familiar with the application, particularly in areas where GEH is proposing new concepts or novel design features.

The observations from the “Page Turn,” will inform GEH in finalizing the application and assist the NRC staff in planning resources in preparation for the formal application.

SCOPE OF THE PREAPPLICATION ENGAGEMENT

The “Page Turn” covered only the draft GEH BWRX-300, “Safety Strategy,” LTR.

INFORMATION AND GUIDANCE NECESSARY FOR THE PREAPPLICATION ENGAGEMENT

GEH provided the staff with copies of the draft LTR for review in the conference room as well as access to the draft LTR in a temporary electronic reading room (eRR) that was available for staff during the “Page Turn,” meeting. Some staff were in attendance in the conference room while other staff attended remotely. GEH opened the page turn engagement with an introduction at 9:00am. The staff Project Manager reviewed the “Page Turn,” rules and guidance with the staff from the NRC-NRR Office Instruction LIC-116, Revision 0, “Preapplication Readiness Assessment,” (Agencywide Documents Access and Management System Accession No. [ML20104B698](#)) and as outlined in the staff draft pre-application engagement White Paper, “DRAFT Pre-application Engagement to Optimize Advanced Reactors Application Reviews.” ([ML21145A106](#))

specifically, the staff focused its review on the LTR adherence to applicable NRC regulations and review guidance.

PRE-APPLICATION ENGAGEMENT TEAM

The NRC staff “Page Turn” engagement team included the Division of New and Renewed Licenses (DNRL) project staff as well as Office of Nuclear Reactor Regulation (NRR) technical staff covering expected technical aspects of the LTR and that are anticipated to be the principal reviewers for the LTR. NRR staff representing the Division of Engineering and External Hazards, Division of Safety Systems that includes the lead reviewer and the Division of Risk Assessment.

PRE-APPLICATION ENGAGEMENT, “PAGE TURN,” OBSERVATIONS

GEH in its draft LTR requested that the NRC approve a GEH design process methodology for establishing its final BWRX-300 design that utilizes principles of DID for the design of safety systems consistent with IAEA Specific Safety Requirements SSR-2/1.

The GEH “Safety Strategy,” design process methodology, appears from the staff’s observation to be a method to refine the final design by iterative design steps that feed back into a risk-informed design model. This GEH design process method, as described in the draft LTR, is based in part on safety concepts and principles derived from IAEA guidance or rules.

GEH has stated in pre-application public meetings that after implementation of its final design and submitting it for approval under Title 10 of the *Code of Federal Regulations* (CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities,” or Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” the BWRX-300 would expect to meet all the applicable NRC regulations and guidance. Specifically, as it relates to determining required safety functions; identifying design and analysis requirements; and classification of nuclear power plant systems, structures, and components (SSCs). These regulations include Appendix A, “General Design Criteria for Nuclear Power Plants,” to Title 10 of the Code of Federal Regulations (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities,” (GDCs) and 10 CFR 50.55a, “Codes and Standard,” as well as applicable NRC guidance from NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition” (SRP) and NRC regulatory guide 1.26, “Quality Group Classifications and Standards for Water, Steam, and Radioactive-Waste-Containing Components of Nuclear Power Plants.

GEH indicated during the public pre-application meeting held on June 29, 2022, that no exemptions to NRC regulations were expected in a future license application for the BWRX-300 regarding safety system classifications and requirements and that justification would be provided for any alternative to NRC guidance. The staff emphasized with GEH during that public meeting that the LTR should explicitly state any deviations from regulations or expected alternatives to guidance in its submittal for staff review. That staff also made a point in the public meeting that the staff could not make any evaluations or endorsements of IAEA guidance or rules. In addition, the staff noted that the IAEA guidance refers to several ASME codes and revisions which have not been endorsed or incorporated by NRC regulations. However, in the draft LTR the staff found that the structure of the LTR was built on IAEA guidance without an associated link to how the process for the final design for safety system classifications and requirements of SSCs would meet the applicable NRC regulations, guidance as well as Commission Policy on passive advanced reactors.

The staff found that the LTR section on Regulatory Evaluation was not completed or available to the staff in time for the “Page Turn,” and therefore the staff could not gain any insight regarding how the BWRX-300 final design will meet all the current NRC regulations and guidance specifically regarding NRC SRP Chapter 15, “Transient and Accident Analysis” and NRC SRP Chapter 19.3, “Regulatory Treatment of Non-Safety Systems for Passive Advanced Light Water Reactors.” In addition, the draft LTR did not specify how the BWRX-300, “Safety Strategy,” design

process methodology ties directly to the Commission Policy regarding Safety Goals and Regulation of Advanced Reactors.

PRE-APPLICATION ENGAGEMENT, “PAGE TURN,” OBSERVATIONS CONCLUSIONS

Observation 1:

The staff concluded that based on the above “Page Turn” observations that a submission of the underlying “Safety Strategy” methodology used by GEH for the BWRX-300 design as a “White Paper,” for feedback from the staff is more appropriate since the staff cannot make any specific safety findings related to the GEH design process methodology as outlined in its draft LTR on GEH’s “Safety Strategy.” The staff’s feedback on such “White Paper,” can then be used by GEH to develop and submit LTRs on specific topics that implement the design methodology. If GEH chose to submit a “White Paper,” the staff could provide limited scope interaction and feedback on the submitted “White Paper,” and both GEH and NRC could then consider the feasibility to pursue further official regulatory review. This observation conclusion is based on:

- The need for a clearly defined scope of the “Safety Strategy” regarding development of a final design and corresponding regulatory evaluation which shows how the, BWRX-300. “Safety Strategy,” meets NRC Regulations. Such a scope is necessary for the staff to make its corresponding regulatory finding(s).
- The “Safety Strategy,” draft LTR has very broad applicability, potentially beyond the safety system classifications of SSCs as intended. In addition, the LTR included significant gaps of detailed information between the draft application and the technical content required in the application specifically related to details regarding how the BWRX-300, “Safety Strategy,” design process methodology would lead to a plant design that would meet the applicable NRC regulations and guidance.

Observation 2:

It was unclear to the staff how the “Safety Strategy” methodology is consistent with Commission Policy Statements and Staff Requirements Memoranda (SRM), pertaining to advanced reactors, particularly on passive advanced reactors. For example, it is unclear to the staff how the “Safety Strategy” methodology is consistent with the Regulatory Treatment of Non-Safety Systems (RTNSS) as discussed in NUREG 0800 Standard Review Plan Chapter 19.3 which is based on the following Commission guidance:

- SECY-94-084, “Policy and Technical Issues Associated with the Regulatory Treatment of Nonsafety Systems in Passive Plant Designs,” dated March 28, 1994 (ML003708068) and associated Staff Requirements Memorandum (SRM), June 30, 1994 (ML003708098).
- SECY-95-132, “Policy and Technical Issues Associated with the Regulatory Treatment of Nonsafety Systems (RTNSS) in Passive Plant Designs,” dated May 22, 1995 (ML003708005), and associated SRM, June 28, 1995 (ML003708019).
- SECY-96-128, “Policy and Key Technical Issues Pertaining to the Westinghouse AP600 Standardized Passive Reactor Design,” June 12, 1996 (ML003708224), and associated SRM, January 15, 1997 (ML003755486).

Observation 3:

It was also not clear to the staff how the BWRX-300, "Safety Strategy," defense layers based on IAEA concepts corresponded to the applicable NRC requirements related to safety system classifications and requirements of SSCs that are required to mitigate the consequence of anticipatory events (AOOS) or accidents (DBAs) as defined in the NRC GDCs or guidance from SRP Chapter 15. Specifically, the description and purpose of Defense Layer (DL 5) in the "Safety Strategy" methodology is unclear as to how this relates to safety system classifications and requirements.

Conclusion:

As a result of our observations, GEH may consider the alternate approach to submit a "White Paper," on the BWRX-300, "Safety Strategy," design methodology and based on subsequent staff feedback, GEH could provide LTR(s) on specific final design topics that would implement the, BWRX-300, "Safety Strategy," design process methodology.