

U.S. NUCLEAR REGULATORY COMMISSION SUMMARY OF THE AUGUST 23, 2023,
OBSERVATION PREAPPLICATION PUBLIC MEETING
WITH SMR, LLC (A HOLTEC INTERNATIONAL COMPANY)
TO DISCUSS THE SMR-160 DESIGN DIGITAL INSTRUMENTATION AND CONTROL
ARCHITECTURE COMPLIANCE WITH NRC INTERIM STAFF GUIDANCE
FOR HIGHLY INTEGRATED CONTROL ROOMS

Meeting Summary

The U.S. Nuclear Regulatory Commission (NRC) held an observation public meeting on August 23, 2023, with SMR, LLC (SMR), a Holtec International Company (Holtec), to discuss the SMR-160 digital instrumentation and control (I&C) architecture compliance with NRC interim staff guidance (ISG).¹ SMR (Holtec) provided presentation slides and additional meeting materials to support the discussion during the public meeting.^{2,3,4,5} This meeting summary satisfies the SMR (Holtec)'s request for review and feedback on its preapplication meeting materials.

This virtual observation preapplication meeting had attendees from SMR (Holtec) and NRC staff. There were no members of the public observing the meeting. During the closed session of the meeting, SMR (Holtec) and NRC staff discussed proprietary information.

Preapplication engagements, including this meeting, provide an opportunity for the NRC staff to engage in early discussions with a prospective applicant to offer licensing guidance and to identify potential licensing issues early in the licensing process. No decisions or commitments were made during the preapplication meeting.

The following summarizes the discussion during the open session of the meeting that started at 1:30 PM.

- The U.S. Nuclear Regulatory Commission (NRC) staff opened the meeting by stating that it reviewed the meeting materials including the provided white paper. A full review could be requested by SMR (Holtec) but would take additional time due to the length and complexity of the white paper and would need to be prioritized with the current projects

¹ Letter from A. Brenner, "SMR, LLC Preapplication Meeting Materials for August 23, 2023 (Project No. 99902049)," dated August 10, 2023, Agencywide Documents and Access Management System (ADAMS) Accession No. ML23223A104, part of ML23223A103.

² SMR, LLC/Holtec International, "Enclosure 1: SMR, LLC/International, ISG-04 Conformance Analysis," August 23, 2023, ML23223A105 - Public, part of ML23223A103.

³ SMR, LLC/Holtec International, "Enclosure 2: SMR, LLC/Holtec International, ISG-04 Conformance Analysis," ML23223A106 - Proprietary, part of ML23223A103.

⁴ SMR, LLC/Holtec International, "Enclosure 3: SMR, LLC/Mitsubishi Electric Corp., Functional Independence Evaluation Based on ISG-04," August 23, 2023, ML23223A107 - Proprietary, part of ML23223A103.

⁵ SMR, LLC/Holtec International, "Enclosure 4: SMR, LLC, Affidavit," August 23, 2023, ML23223A108 - Public, part of ML23223A103.

under review. The NRC staff requested SMR (Holtec) walk through that white paper contents as this would aid with any further review.

- Following the NRC staff's opening remarks and introduction of key participants, SMR (Holtec) opened its presentation with the meeting agenda and purpose of the meeting to familiarize the NRC staff with the SMR-160 I&C architecture focusing on the communication interfaces, and to review the regulatory approach related to digital I&C communications. SMR (Holtec) stated the desired outcome to obtain feedback from the NRC staff on its approach for complying with associated regulations, to go over the specific ways the SMR-160 I&C complies with available guidance, and to discuss future revisions to NRC guidance or regulation in this area.
- SMR (Holtec) stated its licensing strategy for SMR-160 I&C follows the licensing process in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50⁶, the guidance in DNRL-ISG-2022-01, which provides guidance for I&C content, and Regulatory Guide (RG) 1.70, which provides additional I&C guidance.^{7,8} The DNRL-ISG refers to an approach in the design specific review standard (DSRS) prepared for the NuScale design certification application, which is generic to digital I&C systems, incorporated lessons learned from recent light-water reactor (LWR) designs, and emphasizes the fundamental I&C design principles – independence, redundancy, repeatability, and diversity and defense-in-depth.
- The NRC staff pointed out that the I&C guidance in the DNRL-ISG intended to provide a list of what is reviewed in a construction permit application (CPA), including digital I&C attributes, and a comprehensive diagram and description of the I&C architecture. The NRC staff stated that it referenced the NuScale DSRS was to highlight an approach for an overarching I&C architecture in contrast to the system-based approach in NUREG-0800, Standard Review Plan⁹.
- SMR (Holtec) stated that from a safety analysis perspective, its CPA preliminary safety analysis report (PSAR) Chapter 7 would be structured to align with NuScale DSRS guidance. The NRC staff pointed out that following the NuScale DSRS could be an acceptable approach and recommended that SMR (Holtec) submit its analysis and provide justification as to why the NuScale DSRS applies to its design.
- For communications independence, SMR (Holtec) stated in its presentation that its data communication system meets IEEE Std 603-1991, Section 5.6, which conforms to the guidance for the separation and isolation of the data processing functions of interconnected computers in IEEE Std 7-4.3.2-2016, and that RG 1.152 endorses IEEE

⁶ Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, "Domestic Licensing of Production and Utilization Facilities."

⁷ U.S. NRC, Interim Staff Guidance, DNRL-ISG-2022-01, "Safety Review of Light-Water Power-Reactor Construction Permit Applications," October 31, 2023, ML22189A099.

⁸ U.S. NRC, Regulatory Guide 1.70, Revision 3, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, LWR Edition," October 5, 2010, ML011340122.

⁹ U.S. NRC, NRC Regulation NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," March 9, 2021, <https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0800/index.html>.

Std 603-1991, Section 5.6.^{10,11,12} The NRC staff added that RG 1.152, Revision 4 was issued in July 2023 and endorses IEEE Std 7-4.3.2-2016, which in turn incorporated DI&C-ISG-04 Highly-Integrated Control Rooms – Communications Issues (HICRc) (ISG-04).^{13,14}

- SMR (Holtec) proposed utilizing the ISG-04 guidance to comply with the regulations related to digital I&C and to conform with the guidance in the NuScale DSRS. The NRC staff pointed out that, at a high-level, ISG-04 was incorporated into the NuScale DSRS, and that using the NuScale DSRS would essentially be the same as using ISG-04. The staff further recommended reviewing the latest NRC staff guidance in RG 1.152 Revision 4.
- The NRC staff clarified for SMR (Holtec) that in general ISGs, such as ISG-04, are retired once their interim guidance is incorporated into its parent guidance. In the meantime, the NRC staff recommended that SMR (Holtec) reference RG 1.152, Revision 4, and IEEE Std 7-4.3.2-2016. IEEE Std 7-4.3.2-2016 recently incorporated the criteria in ISG-04. The NRC staff added that it currently has no plans to consolidate ISG-04 into a Branch Technical Position or into NUREG-0800.
- Prior to concluding the open session, SMR (Holtec) indicated that at the closed session it would provide an overview of the I&C architecture, focusing on communication between redundant portions of a safety system, and between safety systems and other systems. SMR (Holtec) would also provide a summary of how the SMR-160 I&C architecture complies with staff positions associated with the three focus areas of ISG-04, interdivisional communications, command prioritization, and multidivisional control and display stations.

The open session ended at 1:58 PM.

The following summarizes the closed session discussion:

- SMR (Holtec) presented its proposed SMR-160 I&C Architecture, including details on interdivisional communications, command prioritization, and multidivisional control and display stations. SMR (Holtec) engaged NRC staff to clarify or explain technical topics related to communication elements, interdivisional communications, safety and non-safety equipment control commands, signal prioritization, and diverse actuation.

¹⁰ IEEE Standard 603-1991, “IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations,” December 31, 1991, <https://ieeexplore.ieee.org/document/159411>.

¹¹ IEEE Standard 7-4.3.2-2016, “IEEE Standard Criteria for Programmable Digital Devices in Safety Systems of Nuclear Power Generating Stations,” August 25, 2016, <https://ieeexplore.ieee.org/document/7552419>.

¹² U.S. NRC, Regulatory Guide 1.52, Revision 3, “Criteria for Use of Computers in Safety Systems of Nuclear Power Plants,” June, 2010, ML102870022

¹³ U.S. NRC, Regulatory Guide 1.52, Revision 4, “Criteria for Programmable Digital Devices in Safety-Related Systems of Nuclear Power Plants,” July 25, 2023, ML12159A013.

¹⁴ U.S. NRC, Interim Staff Guidance DI&C-ISG-04, Revision 1, “Interim Staff Guidance on Highly-Integrated Control Rooms – Communications Issues (HICRc),” March 2009, ML083310185.

- The NRC staff pointed out that the amount of information and the level of detail provided in the ISG-04 Conformance white paper and the presentation exceeds what is normally seen or required at the construction permit (CP) phase. At the CP phase, applications normally go over high-level implementation of items in ISG-04, without specific design details that are likely still unavailable or being developed. SMR (Holtec) clarified with the staff that although the NRC staff would issue a safety evaluation report at the CP phase, generally no final regulatory safety findings are made at this phase. The main focus of the CPA review is to determine if the preliminary design meets the applicable regulatory requirements and guidance for the issuance of a CP (in accordance with 10 CFR 50.34, 10 CFR 50.35, and 10 CFR 50.40)^{15,16,17}. Essentially, the CPA review looks at the preliminary design for reasonable assurance that the proposed facility can be constructed and operated at the proposed location without undue risk to the health and safety of the public, and that any remaining safety questions will be satisfactorily resolved before construction is completed.
- SMR (Holtec) said it would be mindful and strategic with the level of detail provided in its CPA depending on what is being requested from the NRC staff. The NRC staff noted that high-level or general information is more appropriate for obtaining preapplication feedback from the NRC staff for the purposes of validating approaches and developing a strategy leading to the CPA. Similarly, more details and specialized information is more appropriate for final designs where the NRC staff is asked to provide a regulatory safety finding. In particular, the NRC staff stated that it typically expects during the preapplication phase a comprehensive diagram and explanation of the I&C architecture and high-level plans for implementation, as required by ISG-04.
- The NRC staff stated that the MELCO topical report (TR), JEXU-1041-1008 (R3), currently under review covers a lot of the same areas of the ISG-04 Conformance white paper.¹⁸ The NRC staff added that the review of the MLCO TR will result in a final regulatory safety finding. During this preapplication phase, if the NRC staff were to review the ISG-04 Conformance white paper, it would only be to provide broad technical feedback and not a final regulatory safety finding. The NRC staff cautioned that taking the time to do a comprehensive review of the ISG-04 Conformance white paper would take away resources from the MELCO TR review, due to limited NRC staff resources. SMR (Holtec) acknowledged there would not be any final regulatory safety findings for the White Paper or for any of the other preapplication engagements, and it would have discussions and coordinate with the MELCO development team. SMR (Holtec) added that it would further consider the request for white paper review, and that if a request for review was made, SMR (Holtec) would provide specific questions, topics, or sections of the white paper to better focus the NRC staff's review.
- SMR (Holtec) stated that these preapplication engagements were meant to discuss design specifics and provide an opportunity to obtain initial feedback from the NRC staff. The NRC staff pointed out that there may be some overlap between the information provided in the ISG-04 Conformance white paper and the MELCO TR information currently under review. The NRC staff expressed concern about providing feedback on

¹⁵ 10 CFR 50.34, "Contents of applications; technical information."

¹⁶ 10 CFR 50.35, "Issuance of Construction Permits."

¹⁷ 10 CFR 50.40, "Common Standards."

¹⁸ Mitsubishi Electric Corporation, Topical Report, "JEXU-1041-1008-NP, Rev. 3, Safety System Digital Platform – MELTAC – Topical Report," June 30, 2023, ML23167C171- Proprietary.

the white papers on topic areas that overlap with the ongoing evaluation of the MELTAC TR. In response, SMR (Holtec) explained that the topics covered in the white paper are intended to be independent of the MELTAC TR being evaluated and that there should be no conflict with providing technical feedback on the white paper. SMR (Holtec) also explained that the two sets of documents were intended to be reviewed independently. There are, however, several topical areas, including communication independence and IEEE 603 compliance that are being evaluated for MELTAC platform compliance and these evaluation conclusions would not be provided as feedback on the white paper before the MELTAC TR review is completed.

- The NRC staff added that for approved TRs, (including the MELCO TR, if approved) the safety evaluation would have a conditions and limitations section for addressing applicability of the report, referred to as “plant specific action items,” and generic design considerations, referred to as “generic open items.” These are provided such that an applicant seeking to incorporate by reference the approved topical report would need to address plant specific action items and generic open items resulting from the NRC staff’s review. Ideally a TR should be completed for it to be incorporated by reference into a CPA. The NRC staff added that there is benefit in submitting TRs early to get NRC staff’s evaluation done in a more focused and efficient manner. The staff cautioned that the evaluation of the TR must be completed before issuance of a CP license.
- The NRC staff clarified there is the option of requesting finality on certain aspects of a design in a CPA, in which case providing more details would be appropriate as the NRC staff would be making final regulatory safety findings. Once approved, the NRC staff considers these design aspects final and incorporated into the Operating License Application. In addition, any later changes in these final design features would require a formal design amendment against the CP, and potentially changes to schedules and milestones.
- SMR (Holtec) stated that at this point it does not intend to submit an application specific TR based on the MELCO TR for the SMR-160 design. SMR (Holtec) acknowledged that it needs to look at the applicability of other approved TRs to potentially incorporate by reference.

The closed session ended at 3:22 PM