

U.S. NUCLEAR REGULATORY COMMISSION SUMMARY OF THE JULY 19, 2023,
OBSERVATION PREAPPLICATION PUBLIC MEETING
WITH SMR, LLC (A HOLTEC INTERNATIONAL COMPANY)
TO DISCUSS SMR-160 VERIFICATION AND VALIDATION OF CODES

Meeting Summary

The U.S. Nuclear Regulatory Commission (NRC) held an observation public meeting on July 19, 2023, with SMR, LLC (SMR), a Holtec International Company (Holtec), to discuss preapplication information related to the SMR-160 verification and validation (V&V) of codes.^{1,2} Specifically, SMR (Holtec) requested the meeting to discuss and receive the NRC staff feedback on its questions related to these topics in its presentation materials.^{3,4} This meeting summary satisfies the SMR (Holtec) request for review and feedback on its preapplication meeting materials. Email interactions⁵ between the NRC staff and SMR (Holtec) in preparation for the public meeting, as well as post public meeting notable items from related NRC staff meetings are included in this meeting summary.

This virtual observation preapplication meeting had attendees from SMR, LLC and its contractors, Holtec, NRC staff, and members of the public. The NRC staff and SMR (Holtec) discussed proprietary information during the closed session.

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 open session started at 1:30 pm.

The following summarizes the discussion during the open session of the meeting:

- After opening remarks and introductions, SMR (Holtec) described the purpose of the meeting to provide SMR (Holtec) anticipated plans to complete and document all V&V of the codes it plans to use, and to gain alignment with the NRC staff on sufficient V&V information for a construction permit application (CPA) acceptance and approval.

¹ Letter from J. Hawkins, SMR, LLC Preapplication Meeting Materials for July 19, 2023," dated June 26, 2023, Agencywide Documents and Access Management System (ADAMS) Accession No. ML23177A185, part of package ML23177A184.

² SMR, LLC, Enclosure 1, "Affidavit," dated June 26, 2023, ML23177A188 – Public, part of package ML23177A184.

³ SMR, LLC, "Enclosure 2, "SMR, LLC, Holtec International, Meeting Presentation Materials for July 19, 2023," dated July 19, 2023, ML23177A187, part of package ML23177A184.

⁴ SMR, LLC, "Enclosure 3, "SMR, LLC, Meeting Presentation Materials," dated July 19, 2023, ML23177A186 – Proprietary, part of package ML23177A184.

⁵ Email from Carolyn Lauron to Justin Hawkins, SMR, LLC, "NRC Staff Questions and SMR (Holtec) Responses re: July 19, 2023, Public Meeting Materials - SMR-160 Code Verification and Validation and Evaluation Methodologies (99902049)", July 25, 2023, ML23206A030

- SMR (Holtec) provided an overview of the interim staff guidance (ISG) in DNRL ISG-2022-01⁶ (DNRL ISG). Methodologies that address transient and accident analysis are typically submitted for NRC staff review and approval in topical reports (TRs). These TRs are used by NRC staff to support a finding that a proposed facility can be constructed and operated without undue risk to public health and safety under 10 CFR 50.35.⁷ SMR (Holtec) noted that the expectation from the DNRL ISG is that the Preliminary Safety Analysis Report (PSAR) include verification that the loss-of-coolant accident (LOCA) evaluation methods used are applicable and approved for use, that the non-LOCA evaluation methods are under active NRC staff review, and that any open items can be reasonably addressed and resolved in the final safety analysis report (FSAR).
- SMR (Holtec) pointed out that the DNRL ISG states that it is expected that the facility's design at the construction permit (CP) stage is preliminary in nature and subject to change in the future. Consistent with 10 CFR 50.35, some technical and design information may provide at a later stage of licensing as long as the NRC staff is confident that any missing information and open safety questions can be resolved before the completion of facility construction. For example, some evaluation methods can be under the NRC staff review at the time of CP issuance.
- The NRC staff stated that 10 CFR 50.34 provides the minimum amount of information required in a CPA. The NRC staff added that, in general, Regulatory Guide (RG) 1.70⁸ distinguishes what needs to be in a PSAR, the FSAR, or both which is designated as "SAR."
- The NRC staff pointed out that 10 CFR 50.34(a)(4) requires compliance with 10 CFR 50.46⁹ in order to issue a CP. However, for other methods not associated with 10 CFR 50.46 compliance, the review of referenced TRs should be mature enough so that the NRC staff has reasonable confidence that any remaining safety questions have a clear path to resolution. While it is best to have all methods reviewed and approved prior to CPA submittal, there may be flexibility in not having final approval of non-LOCA methods at the time of CP issuance, but at a minimum the maturity of the method must be sufficient for the NRC staff to make a finding that the facility can be constructed and operated safely, i.e. that the NRC staff can make a 10 CFR 50.35 safety finding.
- The NRC staff clarified that the DNRL ISG, like all ISGs, supplements existing guidance. RG 1.70 and Standard Review Plan (SRP) NUREG-0800,¹⁰ Chapter 15 remain valid guidance to consider, and that the term "non-LOCA evaluation methods" used in the ISG is meant to broadly represent any methodology not associated with 10 CFR 50.46.

⁶ U.S. NRC, Interim Staff Guidance DNRL ISG-2022-01, "Safety Review of Light-Water Power Reactor Construction Permit Applications," October 2022, ML22189A099.

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

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

⁹ 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors."

¹⁰ U.S. NRC, Standard Review Plan NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," <https://www.nrc.gov/reading-rm/doc-collections/nuregs/Staff/sr0800/index.html>.

RG 1.70 and the DNRL ISG provide the PSAR and FSAR guidance that NUREG-0800 does not cover.

- The NRC staff referred SMR (Holtec) to the previous revisions of the SRP for Chapter 15, particularly the 1981 version, which may provide helpful context and additional perspective on what the NRC staff reviews at the CP stage versus the operating license (OL) stage. The NRC staff added that in the 2007 update to the 10 CFR Part 52 licensing process, CP-specific guidance was removed to focus on guidance for the review of design certification and combined license (COL) applications.
- The NRC staff stated that they may use office instructions, such as LIC-117,¹¹ for the acceptance review to determine completeness and technical sufficiency of the application. Missing evaluation models (either as part of CPA or as a TR incorporated by reference) would constitute an incomplete application.

The NRC staff added that it is also important to keep in mind that even small modular reactors may have complex designs. As such, it is important to assure that there is enough evidence or objective basis in the application that NRC technical reviewers can readily make sense of the information and reach an appropriate safety finding.

The open session ended at 2:14 pm.

The closed session started at 2:18 pm.

The following provides a non-proprietary discussion of the closed session of the meeting:

- SMR (Holtec) briefed an estimated submittal schedule for the CPA and several anticipated TRs. The NRC staff engaged SMR (Holtec), clarifying submission plans and details on various TRs.
- SMR (Holtec) indicated that in an effort to understand the minimum threshold of content required for CPA acceptance and approval, SMR (Holtec) proposed providing some PSAR analyses based on “representative calculations.” SMR (Holtec) defined these as performing single calculations for each major design-basis initiating event, leveraging accepted and widely used industry standard codes, and using engineering judgement to determine inputs and assumptions to result in close-to-limiting conditions (rather than analyzing a full matrix of initial conditions, single failures, and treatment of non-safety systems). Each event would be evaluated either qualitatively or quantitatively as appropriate. These representative calculations would be re-analyzed and incorporated into the FSAR once code V&V is complete and evaluation methods are finalized. SMR (Holtec) anticipates this process will be an acceptable approach given the expectation that the bounding cases will be identified in the FSAR by V&V of codes, and final evaluation methodologies will not be significantly different than the representative calculations presented in the PSAR. SMR (Holtec) intends for the TRs to be completed well in advance of construction completion and operating license application (OLA) submittal.

¹¹ U.S. NRC, Office Instruction LIC-117, “Acceptance Review Process for New Nuclear Facility Licensing Applications,” ML20283A182, <https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20283A182>.

- Without the completed V&V methodologies available at the time of CPA submittal, the NRC staff stated that depending on the technical topic, it may be difficult to start reviews without the detailed methodologies. SMR (Holtec) responded that it will document methodologies on how calculations are performed for Chapter 15, such as identifying single failures that are being applied, treatment of non-safety systems, engineering judgements for limiting operating envelope, and limiting initial conditions. The methodology of applying models and performing analysis would likely be submitted as a TR, if not a technical report, with the CPA.
- The NRC staff stated that the more complete the information provided to the NRC staff prior to or simultaneously with the CPA, the better position the NRC staff will be in to conduct a predictable and reliable review. The NRC staff did not assess the feasibility of the SMR (Holtec) submission proposal because that would depend on additional information not discussed during the meeting (e.g., quality of the engineering judgements and insights provided to the NRC staff, the conservatism in the safety analysis, amount of technical detail in the CPA).
- SMR (Holtec) commented they would expect a 10 CFR Part 52 design certification application would require a more mature evaluation model in comparison to a construction permit application. The NRC staff stated that, in terms of the Chapter 15 safety analysis, there is similarity in what is expected to be included in a CPA versus a design certification application. 10 CFR 50.34 and 10 CFR 52.47¹² are almost identical in this area except the CPA design is preliminary. Historically, the CP stage is when the NRC staff does the bulk of its review of transients and accident analyses. At the OL phase the NRC staff focuses on what changed, and typically not a full SAR Chapter 15 review.
- NRC staff noted there should be proper feedback (such as by regular application updates) for updating information going into the CPA or information being incorporated by reference into the CPA, given that there could potentially be changes to methods, analysis, and codes arising from the NRC staff's separate reviews of TRs describing supporting methodologies.
- The NRC staff shared that a CPA review with several TR reviews at the same time would put a strain on resources for the NRC staff, and likely the applicant as well.
- SMR (Holtec) inquired about the possibility of exemptions for getting a CP (for example from 10 CFR 50.34(a)(4) requirements). The NRC staff indicated that, at this point it would be difficult to answer or to provide feedback on whether or not exemptions can be granted given limited information and the preliminary nature of the discussions. The NRC staff added that compliance with 10 CFR 50.34(a)(4) as well as complying with all of 10 CFR 50.34 is the basis and provides confidence for the NRC staff that the facility can be constructed and operated without undue risk to public health and safety. Absent compliance with 10 CFR 50.34, the NRC staff would be challenged to make such a finding.
- On the question of whether or not there is flexibility or leniency in requirements for the content of application and issuance of a construction permit, the NRC staff stated

¹² 10 CFR 52.47, "Contents of Applications; Technical Information."

10 CFR 50.35 and 10 CFR 50.34 are separate regulations and need to be met independently; one regulation does not supersede the other.

The meeting was adjourned at 3:05 pm.

After the meeting, the NRC staff further considered the supplemental information provided by SMR (Holtec) and provided the following additional feedback:

- SMR (Holtec) noted the safety evaluation for the Kairos Hermes Test Reactor CPA¹³ defers findings on Kairos' V&V to the OL review stage. SMR (Holtec) stated this was consistent with the Draft ISG DANU ISG-2022-01¹⁴ for non-light-water reactor (LWR) reactors, and suggested LWRs were being held to a higher standard than non-LWRs at the CP stage. The NRC staff clarified that the Hermes application was for a non-power reactor, while the SMR-160 is a power reactor, and that the Atomic Energy Act establishes a different threshold and standard for non-power reactors (including test and research reactors) versus power reactors. Accordingly, the NRC staff uses different guidance for the review of non-power reactors; NUREG-1537.¹⁵
- The NRC staff encouraged SMR (Holtec) to submit a public comment on Draft ISG DANU-ISG-2022-01 and noted this guidance may change prior to final issuance.
- The NRC staff recommended that SMR (Holtec) review pertinent guidance in RG 1.70, Section 1.5, "Requirements for Further Technical Information." The DNRL ISG also provides guidance that if required information of a novel design is not available at the time of CP application submittal, the PSAR should describe the preliminary design of the facility in sufficient detail to evaluate whether the facility can be constructed and operated without undue risk to public health and safety. The CP application must address all regulatory requirements applicable to a CP.
- The NRC staff noted that SMR (Holtec) could consider submitting a white paper describing the calculations that would be included in the CPA and a justification for deferring V&V of the evaluation models.

¹³ Safety Evaluation related to the Kairos Power LLC Construction Permit Application for the Hermes Test Reactor, ML23158A268

¹⁴ U.S. NRC, Draft Interim Staff Guidance DANU ISG-2022-01, "Advanced Reactor Content of Application Project, "Review of Risk-Informed, Technology-Inclusive Advanced Reactor Applications – Roadmap," ML22048B546

¹⁵ U.S. NRC Regulation, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors (NUREG-1537)," <https://www.nrc.gov/reading-rm/doc-collections/nuregs/Staff/sr1537/index.html>.