

U.S. NUCLEAR REGULATORY COMMISSION SUMMARY OF THE JUNE 28, 2023,
OBSERVATION PREAPPLICATION PUBLIC MEETING
WITH SMR, LLC (A HOLTEC INTERNATIONAL COMPANY)
TO DISCUSS THE APPLICABILITY OF THE EMERGENCY CORE COOLING SYSTEM
EVALUATION MODELS TO THE SMR-160 DESIGN

Meeting Summary

The U.S. Nuclear Regulatory Commission (NRC) held an observation public meeting on June 28, 2023, with SMR, LLC (SMR), a Holtec International Company (Holtec), to discuss preapplication information related to emergency core cooling system evaluation models for the SMR-160 design. Specifically, SMR (Holtec) requested the meeting to discuss the SMR-160 loss-of-coolant accident (LOCA) acceptance criteria, the applicability of 10 CFR Part 50, Appendix K to the SMR-160 design, and a potential exemption from 10 CFR 50.46 for the SMR-160 cladding material.¹ SMR (Holtec) provided presentation slides to support the discussion during the public meeting.^{2, 3} This meeting summary satisfies the SMR (Holtec) 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:

- Following introductions, SMR (Holtec) opened its presentation with the purpose of the meeting to provide the NRC staff with an overview of the SMR-160 LOCA acceptance criteria, to discuss the applicability of 10 CFR Part 50, Appendix K, and to identify an exemption to 10 CFR 50.46 as a result of the SMR-160 cladding material.^{4, 5} SMR (Holtec) requested staff feedback on the presentation.

¹ Letter from J. Hawkins, "SMR, LLC Preapplication Meeting Materials for June 28, 2023," dated June 14, 2023, Agencywide Documents and Access Management System (ADAMS) Accession No. ML23165A106, part of ML23165A105.

² SMR, LLC, "Enclosure 2 - SMR, LLC Meeting Presentation Materials for June 28, 2023," June 14, 2023, ML23165A108 - Public, part of ML23165A105.

³ SMR, LLC, "Enclosure 3 - SMR, LLC Meeting Presentation Materials for June 28, 2023," June 14, 2023, ML23165A107 - Proprietary, part of ML23165A105.

⁴ Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix K, "Emergency Core Cooling System Evaluation Models."

⁵ 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors."

- SMR (Holtec) provided background on the presentation by stating that the SMR-160 LOCA evaluation model will follow Regulatory Guide (RG) 1.203 and satisfy the applicable requirements in 10 CFR Part 50, Appendix K (Appendix K).⁶ SMR (Holtec) noted that the SMR-160 is designed to reduce the consequences of design-basis LOCAs when compared with the existing large light-water reactor fleet and that some of the phenomena for which Appendix K was developed do not occur during SMR-160 design-basis LOCAs.
- The remaining information in the presentation included proprietary information for discussion during the closed session.
- There were no members of the public observing the meeting.

The open session ended at 1:38 PM.

The following summarizes the closed session discussion:

- SMR (Holtec) noted that specific break locations discussed previously with the NRC staff are assumed not within the scope of the design-basis LOCAs discussed during this meeting.
- In response to an NRC staff question, SMR (Holtec) responded that the computer code it plans to use can analyze breaks applicable to its design. SMR (Holtec) noted that although it does not expect certain phenomenon to occur during an SMR-160 transient, the computer code has the capability to analyze it.
- Based on the discussion on Slide 5, SMR (Holtec) indicated it plans to consider the NRC staff feedback concerning the SMR-160 conservative surrogate acceptance criteria proposed to replace the peak cladding temperature, maximum local oxidation, and core-wide hydrogen generation acceptance criteria defined in 10 CFR 50.46.
- In discussing Slide 7 on the sources of heat required in Appendix K, the NRC staff referenced Information Notice 2009-23 when considering bounding fuel pellet thermal conductivity.^{7,8} With respect to the question on Slide 8, the NRC staff and SMR (Holtec) discussed decay heat removal and noted that a future discussion on fuel management could provide further context.
- With respect to the information on Slides 10 and 11 related to blowdown phenomena, the NRC staff noted that the approach for the break flow discharge models appears reasonable, and suggested SMR (Holtec) review details of previously approved Appendix K evaluation models to determine whether an exemption was found necessary in similar cases. SMR (Holtec) confirmed that it intends to validate and determine the adequacy of the model for its design. The NRC staff commented that, while elements of

⁶ U.S. NRC, Regulatory Guide 1.203, "Transient and Accident Analysis Methods," Initial Issuance, December 2005. <https://www.nrc.gov/docs/ML0535/ML053500170.pdf>

⁷ U.S. NRC, Information Notice 2009-23, "Nuclear Fuel Thermal Conductivity Degradation," October 8, 2009. <https://www.nrc.gov/docs/ML0915/ML091550527.pdf>

⁸ U.S. NRC, Information Notice 2009-23, "Nuclear Fuel Thermal Conductivity Degradation," Supplement 1, October 26, 2012. <https://www.nrc.gov/docs/ML1217/ML121730336.pdf>

the SMR (Holtec) conceptual approach for the end of blowdown appears reasonable, more in-depth discussions would be needed to understand the applicability of the SMR (Holtec) technical basis.

- During the discussion of the post blowdown phenomena and heat removal by the emergency core cooling system, the NRC staff noted that the SMR-160 design should consider the spectrum of containment pressures. Following a discussion of the modelling codes for the containment analysis, the NRC staff noted that the approach seems reasonable; however, considering design differences between the SMR-160 and the conventional pressurized-water reactors for which Appendix K requirements were established, more details and discussion on how the phenomena are decoupled would be needed.
- The NRC staff commented that overall, the exemption approaches described in the presentation make sense for the SMR-160 design and noted further review of past exemption details regarding the Moody model.
- In discussing the critical heat flux (CHF) and post CHF heat transfer details on Slide 13, the NRC staff noted CHF models need to be validated with data, including the thermal hydraulic code used to perform the CHF analysis.
- With respect to the pump modeling information discussed on Slide 14, the NRC staff requested details on the operation of the startup pump during a design-basis accident. Based on the information available, the NRC staff commented that the approach is clear.
- The NRC staff noted that in some cases, the Appendix K requirements clearly do not apply to the SMR-160 design while other requirements may not apply and SMR (Holtec) should look at past precedence and strategies employed in previously approved exemptions. The NRC suggested that consolidating the exemptions in one request, including the administrative items, could be efficiently reviewed and result in one evaluation.
- The NRC staff did not have any concerns regarding the cladding material exemption.

The meeting adjourned at 3:10 PM.