

U.S. NUCLEAR REGULATORY COMMISSION SUMMARY OF THE APRIL 5, 2023,
OBSERVATION PREAPPLICATION PUBLIC MEETING
WITH SMR, LLC (A HOLTEC INTERNATIONAL COMPANY)
TO DISCUSS THE SMR 160 LOSS-OF-COOLANT ACCIDENT ANALYSES UPDATE NO. 1

Meeting Summary

The U.S. Nuclear Regulatory Commission (NRC) held an observation public meeting on April 5, 2023, with SMR, LLC (SMR), a Holtec International Company (Holtec), to discuss preapplication information related to the SMR-160 design.¹ Specifically, SMR (Holtec) requested the meeting to discuss the first update to the SMR-160 loss-of-coolant accident (LOCA) analyses. SMR (Holtec) provided a White Paper for NRC staff review and presentation slides for 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, LLC, (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 following summarizes the discussion during the open session of the meeting:

- SMR (Holtec) provided an overview of the agenda and described the purpose of the meeting as giving a high-level overview of the progress on the SMR-160 LOCA exemption justification with the desired outcome of ensuring NRC staff understanding of the current progress and to obtain feedback, comments, and/or questions from the detailed information in the draft White Paper.
- SMR (Holtec) summarized the LOCA discussion during the October 19, 2022, public meeting.⁴ The October meeting included a discussion of NRC staff observations on

¹ Letter from J. Hawkins, "SMR, LLC Preapplication Meeting Materials for April 5, 2023 (Project No. 99902049)," dated March 29, 2023, Agencywide Documents and Access Management System (ADAMS) Accession No. ML23088A029, part of ML23088A028.

² SMR, LLC, "SMR, LLC Meeting Presentation Materials re SMR-160 LOCA Exemption Update # 1 for April 5, 2023," dated March 29, 2023, ML23088A031 – Public, ML23088A030 - Proprietary, part of ML23088A028.

³ SMR, LLC, "SMR, LLC Report HI-2230279 Rev. 0, LOCA Exemption Update White Paper (P)," dated March 29, 2023, ML23088A032, part of ML23088A028.

⁴ U.S. NRC, "10-19-22 Meeting Summary with SMR, LLC, a Holtec International Company, to Discuss Loss-of-Coolant Accident Analysis," dated January 30, 2023, ML22263A432, part of ML22263A388.

specific technical areas identified in the meeting materials.⁵ SMR (Holtec) noted that it has started developing material to support the information identified.

- After discussing its consideration of the LOCA guidance in NUREG-1829 and DG-1216 described in Slides 5 and 6, SMR (Holtec) summarized the information in the remaining presentation slides noting that the discussion details on the slides were proprietary and more appropriate for the closed session.^{6, 7} SMR (Holtec) noted that details for discussion during the closed session include specifications of the reactor coolant system (RCS), reactor pressure vessel (RPV), and steam generator (SGE); an estimated timeline for on-going and planned work on its LOCA analysis; and proposed future preapplication engagements.
- There were no comments or questions by any members of the public.

The open session ended at 1:54 pm.

The following provides a high-level, non-proprietary summary of the discussion during the closed session of the meeting:

- In response to the NRC staff's request for additional detail on the consideration of the LOCA guidance in NUREG-1829 and DG-1216, SMR (Holtec) described how it used the information to design the SMR-160 RCS and to inform the consideration of additional break sizes to determine bounding conditions for its analysis. The NRC staff noted that it would be difficult to justify that the conditions and stress limits are applicable without an analysis.
- The NRC staff asked for details on the scope of the potential exemption including the applicable regulation. SMR (Holtec) responded that the details for the potential exemption are under consideration. Based on the discussion, the NRC staff observed that the potential exemption appears to be related to 10 CFR 50.46 calculations and the primary-to-secondary source term. SMR (Holtec) confirmed that it plans to provide clarifications on the specific exemption in a future meeting.
- SMR (Holtec) described the work completed and that additional analysis related to the bounding break size to meet the offsite dose criterion is pending. SMR (Holtec) also provided a description of the post LOCA flood level.
- SMR (Holtec) provided a high-level overview of the design of the SGE and RPV. In response to the NRC staff's questions on the inspections of the RPV and SGE including eddy current testing of the SGE tubes, SMR (Holtec) described and provided the

⁵ U.S. NRC, "Enclosure 4 - Staff Observations on Materials for 10-19-22 Meeting with SMR, LLC, a Holtec International Company, to Discuss Loss-of-Coolant Accident Analysis," dated January 30, 2023, ML22304A002, part of ML22263A388.

⁶ U.S. NRC, NUREG-1829, "Estimating Loss-of-Coolant Accident (LOCA) Frequencies Through the Elicitation Process," dated March 2008, <https://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1829/>

⁷ U.S. NRC, Draft Regulatory Guide (DG), DG-1216, "Plant-Specific Applicability of Transition Break Size Specified In 10 CFR 50.46a," June 2010, ML100430356.

dimensions of certain components and connections. The NRC staff noted that it would need further detailed discussions on the inspections to support its review.

- The NRC staff noted that the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (BPV Code) provides requirements for materials that may apply to the Planar Inter-vessel Forging (PIF) welds and base material.⁸ The NRC staff requested additional details on how SMR (Holtec) would determine the materials to be used including any cladding of components. SMR (Holtec) responded that some design details are pending; however, additional, more stringent requirements would support its potential exemption.
- In response to the NRC staff's question, SMR (Holtec) confirmed that it had completed a stress analysis for secondary side depressurization and some of the mechanical design and analysis described on Slide 13. SMR (Holtec) noted that it has plans for mechanical supports activated during a seismic event. SMR (Holtec) noted that the scope of the analysis is not for determining the size of the break or the limiting break.
- SMR (Holtec) described the PIF and weld geometries and vessel joint categories on Slide 14. The NRC staff asked for more information on the weld connection to which SMR (Holtec) responded that details are pending. The NRC staff noted that the weld must be robust. Based on the description and figure of the weld, the NRC staff observed that similar weld connections have historically experienced issues.
- Based on the discussion of Slide 15, the NRC staff noted that the ASME BPV Code does not have requirements for welding two large, heavy components together and that the NRC staff would need more information on the design to support its review. The NRC staff referred to the two weld designs in Figure 7 of the White Paper.³ The NRC staff noted that the corner weld in the SMR-160 design may experience high stresses. The NRC staff observed that the other design shown in Figure 7 has a more favorable weld configuration that will most likely not experience high stresses in the weld.
- In discussing Slide 16, the NRC staff requested more information on the thermal stresses experienced in the SGE riser during operation and the forces experienced at connections among components inside the SGE. SMR (Holtec) described some of the design considerations and analyses for these components and connections and will consider the NRC staff feedback on flow forces in these areas as the design progresses. SMR (Holtec) confirmed that the SGE design includes access to inspect the welds not shown in the presentation materials. The NRC staff noted that based on the information provided, degradation is possible on either side of the riser.
- SMR (Holtec) noted that it will plan for a detailed discussion of operational considerations during the LOCA update meeting scheduled for September 2023.
- With respect to the future SMR (Holtec) work planned for its Leak-before-Break (LBB) analysis, the NRC staff noted that an LBB analysis does not appear to be applicable for this design to address dynamic effects. The NRC staff observed that a fracture mechanics analysis appears to be more applicable to address flow tolerances. The NRC

⁸ American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (BPV), <https://www.asme.org/codes-standards/bpvc-standards>

staff referred to SRP Section 3.6.3 that provides details on LBB evaluations and noted that a design implementing a leakage detection system satisfies the criteria in this SRP section.⁹

- The NRC staff noted that there is a temperature difference between the SGE riser and the SG shell and that the SGE tubes experience thermal loads faster than that of the SGE riser. The NRC staff also noted that the PIF welds on both sides could experience excessive stresses. SMR (Holtec) noted it has completed some preliminary analysis on thermal loads.
- With respect to the future work related to weld residual stress discussed on Slide 19, the NRC staff noted that inspections at the PIF provide weld residual stress information to determine weld robustness and flow tolerance. Based on the SMR-160 design that joins two large components, the NRC staff anticipates that it will be difficult to understand the weld residual stress inspection results for use in a fracture mechanics analysis. The NRC staff noted that there is experience with designs that have a set-in nozzle. Because the SMR-160 design is unique, the NRC staff noted that it would need a description and justification on the applicability of the ASME BPV Code and supporting experience with the weld design to support a future review. The NRC staff observed that a robust weld considers design, materials characteristics, and inspection results.
- SMR (Holtec) confirmed that it plans to provide as much justification to a potential exemption using the methods discussed in the presentation including probabilistic fracture mechanics methods. The NRC staff committed to having representatives familiar with the GRIZZLY code available to provide feedback.¹⁰
- Near the end of the meeting, the NRC staff requested that the next planned engagement on this topic include details on the goals for the exemption and the criteria for the methods used. In response to the NRC staff's question, SMR (Holtec) confirmed plans for a future engagement on the design and stresses including models used and analysis completed.

The meeting adjourned at 3:24 pm.

⁹ U.S. NRC, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 3.6.3, "Leak-Before-Break Evaluation Procedures," Revision 1, dated March 2007, ML063600396.

¹⁰ Idaho National Laboratory GRIZZLY code models the degradation of nuclear power plant systems, structures, and components. The code also simulates the ability of degraded components to safely perform under a variety of conditions. It can be applied to a variety of components with development initially focused on the embrittlement of reactor pressure vessels and concrete structures.
<https://inl.gov/nrc/code-descriptions/>