

**U.S. NUCLEAR REGULATORY COMMISSION SUMMARY OF THE FEBRUARY 22, 2023,**  
**OBSERVATION PREAPPLICATION PUBLIC MEETING**  
**WITH SMR, LLC (A HOLTEC INTERNATIONAL COMPANY)**  
**TO DISCUSS THE SMR-160 REACTOR PRESSURE VESSEL EMBRITTLMENT**

**Meeting Summary**

The U.S. Nuclear Regulatory Commission (NRC) held an observation public meeting on February 22, 2023, with SMR, LLC (SMR), a Holtec International Company (Holtec), to discuss preapplication information related to the SMR-160 reactor pressure vessel embrittlement.<sup>1</sup> Specifically, SMR (Holtec) requested the meeting to discuss and receive NRC staff feedback on the potential application of various embrittlement trend curves to the SMR-160 design. SMR (Holtec) provided presentation slides for the public meeting.<sup>2,3</sup> This meeting summary satisfies the SMR (Holtec) request for review and feedback on its preapplication meeting materials.

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.

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

The following summarizes the discussion during the meeting:

- After opening remarks and introductions, SMR (Holtec) started the presentation with the objective of the meeting to obtain NRC staff feedback on the reasonableness of applying different embrittlement trend curves in the generation of the SMR-160 Pressure-Temperature (P-T) curves. To support a more efficient meeting, and because no members of the public were observing the meeting, the NRC staff and the prospective applicant moved into the closed portion of the meeting to discuss proprietary information.
- The NRC staff asked for information on whether to expect a flux profile that is significantly different from that seen in the currently operating reactors. SMR (Holtec) indicated that it does not anticipate that the SMR-160 flux profile to be significantly different from what the NRC staff has previously reviewed.

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<sup>1</sup> Letter from J. Hawkins, "Submittal of SMR, LLC Preapplication Meeting Materials for February 22, 2023 (Project No. 99902049)," dated February 14, 2023, Agencywide Documents and Access Management System (ADAMS) Accession No. ML23045A002, part of ML23045A001.

<sup>2</sup> SMR, LLC, "Enclosure 2: SMR, LLC Meeting Presentation Materials for February 22, 2023," dated February 14, 2023, ML23045A004 – Public, part of ML23045A001.

<sup>3</sup> SMR, LLC, "Enclosure 1: SMR, LLC Meeting Presentation Materials for February 22, 2023 (P)," dated February 14, 2023, ML23045A003 – Proprietary, part of ML23045A001.

- The NRC staff noted that the geometry in the reactor design appears to be different from what it has reviewed previously and noted that SMR (Holtec) should consider streaming effects in the connecting area and temperature changes at various points in the vessel.
- The NRC staff asked for information on whether the surveillance data for embrittlement would be used to meet the requirements in 10 CFR Part 50, Appendix H, and whether the surveillance program would be consistent with the guidance in American Society for Testing and Materials (ASTM) Standard E185.<sup>4, 5</sup> In response to the NRC staff's question, SMR (Holtec) noted its plans to meet the requirements in 10 CFR Part 50 Appendix G and to use the surveillance data to validate its calculations.<sup>6</sup>
- The NRC staff encouraged collection of data early to determine its impact on this first-of-a-kind design and asked how the use of the surveillance data interfaces with the design. The NRC staff noted that consideration should be given to unexpected data because the design is outside the basis of the regulations.
- In response to the SMR (Holtec) question on the use of operating experience to inform a surveillance program, the NRC staff noted that operating experience is used routinely to inform a surveillance program for traditional designs and update embrittlement analyses; however, the traditional methodologies for use of surveillance data may not be appropriate for the SMR-160 design. The NRC staff encouraged SMR (Holtec) to consider a best estimate approach for its design.
- Based on the discussion of the SMR-160 preliminary design, the NRC staff noted that the unique design may be outside of the basis to use Regulatory Guide (RG) 1.99 and to meet the requirements in 10 CFR 50.61.<sup>7, 8</sup> Analyses to meet the requirements in 10 CFR 50.61 assume certain design responses not discussed during the meeting and a technical basis for an approach different from what was expected for a traditional design should be provided in an application for a unique design.<sup>9</sup>
- The NRC staff noted that if a regulatory guide to meet the regulatory requirements is not followed entirely, an applicant should provide a justification for the deviations and any data or calculations used should be accompanied with information regarding its applicability to the design and benchmarked for the design. The NRC staff emphasized that this is not a reflection of the quality of such work, rather, that any technical basis provided to the NRC should be of commensurate quality to that which supports the existing methodologies.

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<sup>4</sup> American Society for Testing and Materials (ASTM) Standard E185, "Standard Practice for Design of Surveillance Programs for Light-Water Moderated Nuclear Power Reactor Vessels."

<sup>5</sup> Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements."

<sup>6</sup> 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements."

<sup>7</sup> U.S. NRC, Regulatory Guide (RG) 1.99, "Radiation Embrittlement of Reactor Vessel Materials," Revision 2, May 1988, ML003740284.

<sup>8</sup> 10 CFR 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events."

<sup>9</sup> 10 CFR 50.61a, "Alternate fracture toughness requirements for protection against pressurized thermal shock events."

- The NRC staff observed that the SMR-160 reactor is smaller and more compact than traditional reactor designs and with less distance between the fuel assemblies, and the flux distribution at the periphery region of the core is much higher than the legacy pressurized water reactor designs. This may result in a higher neutron fluence with neutron energy greater than 1 MeV (million electron volt).

The meeting was adjourned at 2:50 PM.

After the meeting, the NRC staff noted that SMR (Holtec) may want to review “cavity streaming” that could affect the fluence for components around the reactor pressure vessel depending on factors such as the geometry of the well and surroundings.