From:	Carolyn Lauron
To:	"Justin Hawkins"
Cc:	Greg Cranston; Jordan Glisan; Michelle Hayes; "Andrew Brenner"
Subject:	NRC Staff Response to SMR-160 Question re: Polar Crane Analysis (Project 99902049)
Date:	Wednesday, March 8, 2023 6:30:00 AM

Hi Justin –

Please find the NRC staff response to the subject question below.
Please let me know if you have questions or need additional information.

Thanks,
Carolyn

Question:

Is there any guidance for whether the soil-structure interaction (SSI) analysis must consider the scenario that the containment polar crane is performing a heavy load lift?

Context:

SMR (Holtec) could not identify any related guidance in SRP 3.8.2 Steel Containment.[1] SMR (Holtec) noted that the AP1000 final safety evaluation report (FSER) identifies that the AP1000 seismic stick containment vessel model is coupled to the polar crane model, and that the polar crane is "parked" at one side of the containment. SMR (Holtec) interprets this as not needing to consider the crane to be performing a heavy load lift for analyzing the containment structure. However, SMR (Holtec) also noted that the AP1000 design certification document (DCD) states the polar crane is designed assuming the occurrence of the safe shutdown earthquake during handling of a critical load, such as the reactor vessel head.

NRC Staff Response:

The general guidance for determination of mass to be included in a model for dynamic seismic analysis, including SSI analysis, is provided in Paragraph II.1.D of NUREG-0800 Standard Review Plan (SRP), Section 3.7.2, Revision 4, and in Section 3.4.2 of ASCE Standard 4-16.[2, 3] In a detailed design of the polar crane and its supporting structure, the seismic effects of critical lifted loads required to be sustained by the crane during and following design earthquake events should be included in the appropriate design load combinations. In general, the weight of the crane (equipment weight) is considered a dead load, and as indicated in SRP 3.8.2, crane lift and moving loads are considered live loads.

References:

1. U.S. NRC, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Chapter 3, "Design of Structures, Components, Equipment, and Systems," Section 3.8.2, "Steel Containment," Revision 3, May 2010. (Agencywide Documents and Access Management System (ADAMS) Accession No. ML100630179)

2. U.S. NRC, NUREG-0800, SRP 3.7.4, “Seismic System Analysis,” Revision 4, July 2014. (ML13198A223)
3. American Society of Civil Engineers (ASCE) Standard 4-16, “Seismic Analysis of Safety-Related Nuclear Structures.”