NuScaleDCDocsPEm Resource

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Attachments: Issue List for Nuscale Section 4 5 1 MCB.docx

Bruce M. Bavol

Project Manager
NuScale, Licensing Projects Branch 1
Office of New Reactors
Nuclear Regulatory Commission
Work Phone: (301) 415-6715
Email: Bruce.Bavol@nrc.gov

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Issue List Regarding NuScale, Chapter 4, Section 4.5.1

Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix A, General Design Criterion (GDC) 14 states that, "[t]he reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, or of gross rupture." 10 CFR Part 50, Appendix A, GDC 26 states that, "[t]wo independent reactivity control systems of different design principles shall be provided. One of the systems shall use control rods, preferably including a positive means for inserting the rods, and shall be capable of reliably controlling reactivity changes to assure that under conditions of normal operation, including anticipated operational occurrences, and with appropriate margin for malfunctions such as stuck rods, specified acceptable fuel design limits are not exceeded."

In order for the staff to determine whether the NuScale design meets these criteria with regard to pressure-retaining and internal components of its control rod drive (CRD) system, the staff is requesting the following information.

Issue 4.5.1-1

NuScale Final Safety Analysis Report (FSAR) Sections 4.5.1 states "Figures 4.6-1, 4.6-5 and 4.6-6 are illustrations of the CRDM-to-CRA [control rod drive mechanism-to-control rod assembly] interface. Materials for the pressure-retaining components of the CRDMs are listed in Table 5.2-3 and include the latch housing, the rod travel housing, and the rod travel housing plug." The staff requests the following:

a) Table 5.2-3 of the NuScale FSAR specifies the materials for the reactor safety valves while Table 5.2-4 specifies the material for the reactor coolant pressure boundary (RCPB). Therefore, revise Section 4.5.1 to reference Table 5.2-4 in lieu of Table 5.2-3 to correct an editorial error.
b) The staff notes that there are no figures that show the interface of the CRD to the reactor pressure vessel (RPV) head or the CRD drive rod. The staff requests that a figure providing the connection (including bolting, welds and weld joint designs, etc.) of the CRD to the RPV head and the CRD drive rod and any welded or bolted connections, so that the staff can determine whether the inspections specified in Tables 5.2-6, 5.2-7 and 5.2-8 of the NuScale FSAR are acceptable and that the material for each particular application is acceptable to maintain its structural integrity to perform its required function.
c) Verify that the only pressure-retaining components of the CRD are the latch housing, the rod travel housing, and the rod travel housing plug, since Section 3.9.4.1.1 only specifies the latch housing and the rod travel housing as pressure boundary components, while Section 4.5.1.1 specifies the latch housing, the rod travel housing, and the rod travel housing plug. Upon verification of the RCBP components, revise the applicable sections accordingly to be consistent.

Issue 4.5.1-2

FSAR Section 4.5.1.2 states:

> For AISI Type 3XX series austenitic stainless steel subjected to sensitizing temperatures subsequent to solution heat treatment, the carbon content is limited to no more than 0.03 weight percent (wt%). CRDM weld filler metals listed in Table 4.5-1 are in accordance, as applicable, with SFA-5.4 and SFA-5.9, of ASME BPV Code, Section II, Part C…..Carbon content of austenitic stainless steel weld filler metals is limited to no more than 0.03 wt%.

However, Table 4.5-1 specifies the use of Type 304 stainless steel base material and filler metal types E308 and E316, which have higher carbon content than 0.03 wt%. Type 304L base material, and 308L and 316L weld filler metals have a carbon content no more than 0.03 wt%. Therefore, revise Table 4.5-1 to be consistent with FSAR Section 4.5.1.2 by indicating the use of “L grade” materials.

Issue 4.5.1-3

NuScale FSAR Section 4.5.1.3 specifies the use of nickel-chromium based alloy X-750 for the CRD springs. Revise FSAR 4.5.1.3 to include the heat treatment of this precipitation hardenable alloy that will be used for this application to ensure that the material properties of the component are such that it is capable of maintaining its structural integrity and performing its intended function.

Issue 4.5.1-4

Tier 1, FSAR Section 2.1.1 states “The CRDM pressure housings form the pressure boundary between the environments inside the RPV and the CNV [containment vessel]. The CRDM pressure housings consist of the latch housing and the rod travel housing.” The staff requests the following to complete its review:

a) Section 2.1.1 should be revised to include that the CRDMs are designed and constructed in accordance with Section III of the ASME Code, as this is the design basis of the components.
b) Verify what components of the CRDMs are pressure boundary and change the applicable sections accordingly since Tier 1, FSAR Section 2.1.1, Tier 2, FSAR Section 4.5.1 and Table 4.5-1 specify different components as being RCPB (such as latch housing, rod travel housing and travel housing plug).
c) The applicable CRDMs RCPB components should be included in Table 2.1-2 of the Tier 1 FSAR.