NuScaleDCRaisPEm Resource

From:	Cranston, Gregory
Sent:	Tuesday, November 20, 2018 12:19 PM
To:	Request for Additional Information
Cc:	Lee, Samuel; Dudek, Michael; Lavera, Ronald; Tesfaye, Getachew; Chowdhury, Prosanta; NuScaleDCRaisPEm Resource
Subject:	Request for Additional Information No. 511 eRAI No. 9613 (12.02)
Attachments:	Request for Additional Information No. 511 (eRAI No. 9613).pdf

Attached please find NRC staff's request for additional information (RAI) concerning review of the NuScale Design Certification Application.

Please submit your technically correct and complete response by January 14, 2019, RAI to the NRC Document Control Desk.

If you have any questions, please contact me.

Thank you.

Hearing Identifier: NuScale_SMR_DC_RAI_Public
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Request for Additional Information No. 511 (eRAI No. 9613)

Issue Date: 11/20/2018
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 12.02 - Radiation Sources
Application Section:

QUESTIONS

12.02-33

As a follow-up RAI to RAI 9266, Question 12.02-13, the staff is requesting additional information for the evaporation rate of the Reactor Building pool. More specifically the staff is seeking to understand the use of a non-conservative value for pool water temperature.

Basis:

10 CFR 52.47(a)(5) requires applicants to identify the kinds and quantities of radioactive materials expected to be produced during operation and the means for controlling and limiting radiation exposures within the limits set forth in 10 CFR Part 20. This relates to the assumed airborne concentrations of radionuclides as a result of assumed evaporation rates and other parameters that would impact the airborne concentrations.

10 CFR 20.1101(b) and 10 CFR 20.1003, require the use of engineering controls to maintain exposures to radiation as far below the dose limits in 10 CFR 20 as is practical. This relates to the design of the Reactor Building HVAC (RBV) system and its ability to remove heat and airborne radionuclides.

10 CFR 20.1204, "Determination of Internal Exposure", 10 CFR 20.1204, "Determination of Internal Exposure"; 10 CFR 20.1701, "Use of Process or Other Engineering Controls"; and 10 CFR 20.1702, "Use of Other Controls".

Background:

In discussions held with NuScale on RAI 9266, Question 12.02-12, the staff has questioned the use of 100°F pool surface water temperature when calculating the evaporation rate from the pool. The NuScale Technical Specification (TS) 3.5.3, "Ultimate Heat Sink" (UHS) bulk average temperature limit of 140°F is significantly greater than the temperature assumed for determining the evaporation rate.

In their response to RAI 9266, Question 12.02-13, NuScale stated:

"*The calculated airborne activity in the airspace above the reactor pool water is based on an evaporation rate from the reactor pool while the pool water temperature is at the design basis temperature for the Reactor Building HVAC (RBV) system, which is 100°F air temperature. Above this temperature, the RBV system may be unable to adequately cool the Reactor Building atmosphere, thereby potentially resulting in compensatory measures, such as increasing pool heat removal via the pool cooling systems, to return the pool water temperature below 100°F.*"

While operating within the design basis air temperature for the Reactor Building HVAC (RBV) would have some impact on pool surface water temperature, this does not necessarily limit UHS bulk average temperature to 100°F, the value used in NuScale's calculations to determine evaporation rates from pool. NuScale has not provided sufficient information related to elements of the Design Certification Application which establish a design basis for UHS bulk average temperature of 100°F that supports use as an initial condition the analysis of the evaporation rate from the pool. As such, since NuScale could foreseeably operate above 100°F UHS temperature, the staff requested the airborne equilibrium values of radioisotopes of concern when operating the UHS up to TS limit of 140°F or other appropriate limit justified by NuScale. NuScale has also not provided this information.

Staff confirmatory calculations have determined that an increased pool temperature would result in higher evaporation rates which would result in increased airborne radionuclide concentrations. The calculations indicate that operation near technical specification limits for UHS bulk temperature of 140° F could increase airborne tritium equilibrium values over 3 times the value provided by NuScale with UHS temperature of 100° F. In table 12.2-33:

Reactor Building Airborne Concentrations, NuScale has provided the airborne concentration of tritium as 1.87E-06 µCi/ml with the UHS temperature of 100° F. This value is approximately 9% of the Occupational Value of the Derived Air Concentration (DAC) for tritium (2.0E-05 µCi/ml).

10 CFR 20.1204(g)(2) Determination of internal exposure states:

(g) When a mixture of radionuclides in air exists, licensees may disregard certain radionuclides in the mixture if—

(2) The concentration of any radionuclide disregarded is less than 10 percent of its DAC,

and

(3) The sum of these percentages for all of the radionuclides disregarded in the mixture does not exceed 30 percent

With an assumption of 9% DAC value for airborne tritium, a licensee may take advantage of 10 CFR 20.1204(g)(2), and disregard the contribution of tritium in determination of internal exposure. Operation of the UHS bulk temperature above 100° F could foreseeably cause the airborne concentration of tritium to exceed the 10 CFR 20.1204(g)(2) threshold.

Questions:

To facilitate staff understanding of the application information in support of its reasonable assurance review regarding identifying the kinds and quantities of radioactive material expected to be produced during operations and the resulting radiation exposures, the staff requests the applicant respond to the following:

1. Revise DCA Table 12.2-36, "Input Parameters for Determining Facility Airborne Concentrations" to update the Pool surface water temperature to reflect NuScale TS 3.5.3, Ultimate Heat Sink (UHS) bulk average temperature limit of 140°F, or establish a design basis UHS temperature for controlling radionuclide evolution to limit evaporation and update the resultant change in Pool evaporation rate.

2. In addition the staff requests NuScale to update DCA Table 12.2-33, "Reactor Building Airborne Concentrations," to reflect changes to reactor building equilibrium airborne concentrations as a result of increased pool evaporation rate.

OR

1. Provide a COL Item in DCA section 12.5 that states that the COL Applicant is responsible for developing the operational programmatic elements that ensure internal and external occupational exposures resulting from an increased UHS temperature remain below regulatory limits.