NuScaleDCRaisPEm Resource

From: Cranston, Gregory
Sent: Saturday, August 12, 2017 7:37 AM
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Cc: NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Schaperow, Jason; Hayes, Michelle; Franovich, Rani
Subject: Request for Additional Information No. 168, RAI 8977 (19)
Attachments: Request for Additional Information No. 168 (eRAI No. 8977).pdf

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

Please submit your technically correct and complete response within 60 days of the date of this RAI to the NRC Document Control Desk.

If you have any questions, please contact me.

Thank you.

Gregory Cranston, Senior Project Manager
Licensing Branch 1 (NuScale)
Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission
301-415-0546

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Request for Additional Information No. 168 (eRAI No. 8977)

Issue Date: 08/12/2017
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: 19

QUESTIONS

19-27

Regulatory Basis

10 CFR 52.47(a)(27) states that a Design Certification (DC) application must contain a Final Safety Analysis Report (FSAR) that includes a description of the design-specific Probabilistic Risk Assessment (PRA) and its results. 10 CFR 52.47(a)(23) states that a DC application for light-water reactor (LWR) designs must contain an FSAR that includes a description and analysis of design features for the prevention and mitigation of severe accidents (e.g., challenges to containment integrity caused by core-concrete interaction, steam explosion, high-pressure melt ejection, hydrogen combustion, and containment bypass). For staff to make a finding that the applicant has performed an adequate evaluation of the risk from severe accidents in accordance with Standard Review Plan (SRP) 19.0, the applicant is requested to respond to the questions below.

Request for additional information

a) The applicant used a large release frequency metric of less than 10^{-6} large releases per year and defined a large release as an acute exposure of greater than 200 rem to an individual located at a distance of 0.167 miles from the reactor for 96 hours. SRP 19.0 directs the staff to determine whether the applicant has adequately demonstrated that the risk associated with the design compares favorably against the Commission's goals. In order to make this finding, the applicant is requested to add information to Chapter 19 of the NuScale FSAR to demonstrate its large release frequency metric, including its large release definition, is equivalent to or less than the Commission's Safety Goal Policy's quantitative health objective for prompt fatality risk.

b) The applicant is requested to clarify the text in Chapter 19 of the FSAR by adding the following:

   a. Identify the scenarios in which the applicant compared the predicted dose directly against the large release definition of 200 rem at 0.167 miles to classify whether the scenario results in a large release.

   b. Identify the scenarios in which the applicant compared the predicted radionuclide release against the MACCS back-calculated radionuclide release equivalent to the large release definition of 200 rem at 0.167 miles to classify whether the scenario results in a large release.

c) For at-power accidents, "Probabilistic Risk Assessment Large Release Frequency Definition," ER-P000-7004-R0, and "Release Fraction Determination for PRA Large Release," ER-P000-7005, describe (1) the use of MACCS to translate the large release definition of 200 rem over 96 hours into an equivalent environmental radionuclide release and (2) a hand calculation showing that releases from a leaking containment (as opposed to a failed containment) are smaller than this (i.e., less than a large release). In the FSAR, the applicant used the iodine release fraction as the metric for this comparison. The applicant is requested to add clarifying information to Chapter 19 of the FSAR describing how the following were addressed in this comparison: (1) other aspects of the environmental release such as release timing, release rate, other radionuclides (e.g., cesium) and (2) other potentially important phenomena such as changes in wind direction during the 96-hour exposure period.

d) “Code Manual for MACCS2,” NUREG/CR-6613, Vol. 1, states “The dispersion of a plume of material released in the wake of a building is subject to a large degree of uncertainty. For that reason, MACCS should not be used for estimating doses at distances of less than 0.5 km [0.31 miles] from laboratory or industrial-facilities.” The applicant’s discussion on page 10 of “Probabilistic Risk Assessment Large Release Frequency Definition,” ER-P000-7004-R0, indicates that the applicant recognized this uncertainty and attempted to address it by applying a building wake model to both the short and long faces of the reactor building and identifying the largest dose. The applicant is requested to add information to Chapter 19 of the FSAR describing its validation of the assumptions and input used in its MACCS predictions of plume concentration at 0.167 miles from the reactor for its large release assessment. The information should include a discussion of its parameterization of the spatially dependent dispersion parameters (sigma-y and sigma-z) in MACCS’s Gaussian plume model and its treatment of meteorological phenomena such as building wake, plume lift, and meander, as applicable.