Discussion Topics for the August 13 and 19, 2019
Public teleconference with NuScale

A. NRC staff would like to discuss some apparent inconsistencies and issues with RAI responses. Some examples are below:
    a. In the response to RAI 8775, Question 12.03-1, NuScale indicates that they "submitted a request to be exempted from the dose analysis aspects of 10CFR 50.34(f)(2)(viii)," as described in DCA Part 7, Section 16. As discussed previously, the exemption is from post-accident sampling, not from meeting the dose limits. Therefore, please revise the response to RAI 8775, Question 12.03-1 to remove this statement.
    b. In the response to RAI 9682, Question 12.03-64, NuScale states, that while exempt from 10 CFR 50.34(f)(2)(viii) in its entirety, "The NuScale design maintains the capability to obtain samples as described in FSAR Section 9.3.2." This statement is inconsistent with the exemption in that NuScale is being exempt from sampling. Also in the FSAR markups associated with the response to Question 12.03-64, the Table 1.9-5 still discusses the COL item for post-accident sampling contingency plans. This should also be revised.
    c. NuScale indicates that there are no vital areas under 10 CFR 50.34(f)(2)(vii), yet operators are required to take actions to perform monitoring under 10 CFR 50.44(c)(4). An example of this is the proposed FSAR markups to Table 1.9-5 in the response to RAI 9044, Questions 09.03.02-2 and 09.03.02-3. This should be revised to indicate that NuScale has analyzed actions necessary to perform hydrogen and oxygen monitoring. All similar information in RAI responses and the FSAR should also be revised accordingly.

B. In RAI-9268 Question 12.02-11, staff asked NuScale to provide a listing of radionuclide concentrations in the CNV air volume for post- accident conditions, and provide in the DCD a listing of radionuclide concentrations in the RCS liquid volume for post-accident conditions.

    As noted in their response, dated July 22, 2019, NuScale explained how they determined that source term in the upper containment volume, and that this source term, along with a surrogate CVCS line break outside of containment and under the Bioshield, was used to determine the source term from the radioactive material that was assumed to be under the Bioshield.

    The staff used the methods described to derive the source term under the bioshield, and as a check, compared that source term to the dose rates reported by NuScale in the document referenced below. Because of differences between the staff results and the NuScale results, the staff is seeking to better understand the methodology employed by NuScale to determine dose rates under the bioshield.

C. In the draft response to RAI 9690, Question 01.05-40, the applicant provides several reasons why they believe that the radiological impacts of leakage from the systems associated with hydrogen and oxygen monitoring need not be assessed. These include that if the systems have leakage during normal operation the leakage would be known and would be remedied. However, it is unclear how controlling system in-leakage during normal operation when the systems are under a vacuum or near atmospheric pressure would provide assurance that leakage is controlled during accident conditions when the system could be at significant positive pressure.

While the exact design specifications are not known for the systems associated with monitoring (such as flow rates and maximum allowable leakage requirements), the staff has performed scoping calculations based on the criteria in ANSI/HPS N13.1-2011, which is referenced by NuScale as the design criteria for the sampling system. Based on this, the staff has determined that the potential may exist for significant offsite and main control room dose consequences from leakage associated with systems used to monitor hydrogen and oxygen. In addition, while COL Item 9.3-1 requires that a COL applicant that references the NuScale design will submit a leakage control program, the goals of the leakage control program are not known (i.e. what is an acceptable amount of leakage) and it is unclear how leakage testing during normal operations will provide reasonable assurance that actual leakage during accident conditions (e.g. at higher pressures and temperatures) does not exceed acceptable values.

In addition, it does not appear to staff that the other information provided in the draft response provides acceptable justification for why leakage from systems associated with hydrogen and oxygen monitoring need not be assessed. For example, NuScale indicates that no other applicants perform a dose analysis from leaks from sampling or monitoring systems, yet the staff is unaware of any other design with a hydrogen and oxygen monitoring system being used to meet 10 CFR 50.44(c)(4), similar to the NuScale design. In addition to the questions below, NuScale's justification for not needing to consider offsite and main control room dose consequences due to leakage from these systems may also be discussed.

Based on the above information, the staff has the following questions (the basis for staff asking these questions include 10 CFR 50.34(f)(2)(xxvi), 10 CFR 50.34(f)(2)(xxviii), and 10 CFR 52.47(a)(2)(iv)):

1. Please provide a conservative evaluation of the acceptable total amount of leakage for the systems associated with hydrogen and oxygen post-accident monitoring (e.g., CES, CFDS, and PSS) and provide the basis for the values, including any margin in the assumed leakage rate (e.g. the RG 1.183 assumption of 2 times the expected allowable leakage rate), and the earliest time assumed for the un-isolation of containment, including justification for why the values chosen do not challenge offsite and main control room dose limits. Describe the radiological source term (kinds and quantities) assumed to be present in the atmosphere of the containment vessel during the time frames evaluated for the impact to the control room and offsite dose limits. Include information in the FSAR establishing the required maximum leak rate for systems associated with hydrogen and oxygen post-accident monitoring.

2. Provide an explanation of how leak testing during normal operation could be used to provide assurance that leakage limits during accident conditions is not exceeded, including any installed instrumentation and describe the processes that need to be implemented by licensees to provide reasonable assurance that leakage during operation is below the analytically assumed value. Include in this discussion minimum detectable inleak rate from piping under a vacuum, minimum detectable out leakage rate from systems down-stream of the containment evacuation pumps. Describe how this leakage would be determined separately from leakage from other systems. Please include a discussion of how leakage during normal operation will be assessed for those

portions of the CFDS used to perform combustible gas monitoring, since that system is only in use when de-watering and refilling the reactor vessel. In this discussion describe how leakage from a liquid filled system will be used assess leakage from a vapor filled system.

3. DCD Section 9.3.2.2.3 indicates that the design pressure of the CES piping downstream of the containment isolation valves is 250 psig and that there are temperature limitations associated with the use of the systems. In addition, in several other areas of the application and in RAI responses, NuScale has indicated that there are pressure and temperature limits associated with establishing hydrogen and oxygen post-accident monitoring, and therefore, the onset of hydrogen and oxygen post-accident monitoring must be delayed until the pressure and temperature limits of the systems are reached. However, DCD Table 3.2-1 indicates that for numerous components associated with the CES, CFDS, and process sampling system that, "pressure boundary components of any monitoring path outside of containment shall be designed to withstand combustion events corresponding to the capability of containment." What is the source or reference for this requirement? If these systems are designed to the pressure and temperature limits of containment, there would be no need to wait for pressure and temperature to decrease to establish monitoring. Please explain the intent of this statement in DCD Table 3.2-1, clarify the design limitations for these systems, and correct any discrepancies in the application.

4. Separate from the above discussions, the staff has a question related to applicable requirements regarding the actions necessary to un-isolate containment and initially establish hydrogen monitoring. While NuScale has agreed to perform a scoping calculation to provide assurance that the dose to an operator performing actions to initiate post-accident hydrogen and oxygen monitoring is within 5 rem, the FSAR markup of Tier 2, Table 1.9-5, in the response to RAI 9044, Question 09.03.02-3 (Date July 31, 2019), indicates that there are no areas within the NuScale design (other than the main control room and technical support center), that are within the scope of 10 CFR 50.34(f)(2)(vii). Staff interprets this to mean that NuScale's position is that there are no areas, besides the main control room and technical support center, that need to be designed to permit adequate access post-accident (i.e. there are no important areas that need to be designed to permit access post-accident, besides the main control room and technical support center). Provided that NuScale is required to provide the capability to perform hydrogen and oxygen monitoring in accordance with 10 CFR 50.44(c)(4), the staff does not understand the reasoning for NuScale's position that 10 CFR 50.34(f)(2)(vii) not apply to the actions necessary to establish hydrogen and oxygen monitoring. Please provide justification for why the areas requiring access associated with establishing hydrogen and oxygen monitoring are not within the scope of 10 CFR 50.34(f)(2)(vii), given that NuScale is required to have the capability to perform hydrogen and oxygen monitoring.

D. NuScale has indicated previously that spiking of noble gases would result in noble gas concentrations of at least one radionuclide exceeding the core damage values. The staff performed confirmatory calculations of noble gas spiking and does not believe noble gas

spiking will result in values nearly as high as the core damage noble gas values. Staff would like to discuss including noble gas spiking in the TR.

E. Finally, Appendix B of the TR indicates that the appendix describes the methodology for calculating doses in the CNV and bioshield envelope regions. However, it also indicates that the results of this calculation methodology may be used as inputs to develop EQ dose values for regions beyond the NPM. The staff believes that Appendix B should be revised to clearly specify that it is only to calculating EQ doses in the CNV and bioshield envelope regions and is not to be used for calculating doses for fluid transported outside of these areas.