NuScaleDCRaisPEm Resource

From:	Cranston, Gregory
Sent:	Wednesday, February 14, 2018 9:14 AM
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Subject:	Request for Additional Information No. 369 RAI No. 9329 (10.2)
Attachments:	Request for Additional Information No. 369 (eRAI No. 9329).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.

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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. 369 (eRAI No. 9329)

Issue Date: 02/14/2018
Application Title: NuScale Standard Design Certification - 52-048
Operating Company: NuScale Power, LLC
Docket No. 52-048
Review Section: 10.02 - Turbine Generator
Application Section: 10.2

QUESTIONS

10.02-3

GDC 4 requires, in part, that SSCs important to safety be "appropriately protected against dynamic effects, including the effects of missiles …" According to SRP 10.2, the GDC 4 requirement, as it relates to the turbine generator system (TGS) for the protection of SSCs important to safety from the effects of turbine missiles, is met by providing the turbine with an overspeed protection system (with suitable redundancy and diversity) to minimize the probability of generation of the turbine missiles. The SRP guidance also specifies that overspeed protection would be achieved by including in the design a normal speed load control system and two independent diverse emergency overspeed protection trip systems (typically a primary, and an independent and redundant backup) that trips the turbine at approximately 110 percent of the rated turbine speed.

In its response to RAI 8853, NuScale states that its turbine generator design uses an electronic trip system in lieu of a mechanical trip as an independent and redundant to the mechanical trip system. It also states that the electronic emergency trip system fulfills the role of both the mechanical and electrical emergency overspeed trip systems described in SRP 10.2.III.C and 10.2.III.D. However, it should be noted that the guidance provided in the SRP specifies that overspeed protection is to be achieved by including in the design a normal speed-load control system which cuts off steam at approximately 103 percent of rates turbine flow, and two independent emergency overspeed protection trip systems (a primary and an independent and redundant backup) that trips the turbine at approximately 110 percent of the rated turbine speed.

During the licensing of the H.B. Robinson unit 2 plant in 1970, the Advisory Committee on Reactor Safeguards (ACRS) identified the installation of "a second completely independent turbine speed control system designed to meet nuclear protection system criteria for redundancy, separation, and reliability to reduce the probability of an overspeed condition." The use of two emergency trip systems provide a backup overspeed turbine trip capability to the primary overspeed control system (governor) if it fails to trip the turbine. Typically applicants that do not use a mechanical overspeed trip device for the emergency trip function rely on redundant, diverse electrical overspeed trip systems to perform the emergency overspeed trips when the turbine speed exceeds 110 percent of rated speed (see AP1000 DCD, Revision 19). The NuScale RAI response states that, for the emergency trip function, the single electrical

overspeed trip system included in the NuScale design fulfills the role of the two independent diverse emergency overspeed protection trip systems called for in SRP 10.2.III.C and 10.2.III.D. The staff finds the diversity and redundancy criteria for the turbine emergency overspeed trip system cannot be accomplished with a single overspeed trip system. Therefore, the NuScale turbine overspeed protection system does not satisfy SRP 10.2, Acceptance Criteria 1, as it applies to GDC 4 in terms regarding the protection system having "suitable redundancy" to minimize the probability of generation of turbine missiles.

Turbine missiles resulting from destructive overspeed failures could be generated if the overspeed protection system malfunctions and turbine speed exceeds the design overspeed. NuScale FSAR Section 3.5.1.3 states that "safety-related and risk-significant SSCs within the reactor and control buildings" are protected from the effects of turbine missiles by limiting the generation of missiles from the turbine generators to less 10^{-5}; however the applicant doesn't provide any justification for such small number. In fact, another existing RAI (no. 9058) requests the applicant to include a COL item so that the COL applicant is left with demonstrating the less than 10^{-5} assertion. Since the proposed turbine overspeed control system does not provide the level of protection that is outlined in the guidance provided in SRP 10.2, the staff requests the applicant to include (or to extend its response to RAI 9058) a COL item to have the COL applicant confirm that the selected turbine, and the associated control and overspeed protection systems, provides sufficient overspeed protection so that probability of turbine missile generation does not exceed the missile generation probability specified in FSAR section 3.5.1.3. The COL item should also have the COL applicant addressing how the selected set points will protect against destructive overspeed taking into account the 3600 rpm turbine speed.