

## NuScaleDCRaisPEm Resource

---

**From:** Cranston, Gregory  
**Sent:** Wednesday, August 02, 2017 12:43 PM  
**To:** RAI@nuscalepower.com  
**Cc:** NuScaleDCRaisPEm Resource; Lee, Samuel; Chowdhury, Prosanta; Betancourt, Luis; Tabatabai, Omid; Jung, Ian  
**Subject:** Request for Additional Information No. 117, RAI 8993 (7.0)  
**Attachments:** Request for Additional Information No. 117 (eRAI No. 8993).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

**Hearing Identifier:** NuScale\_SMR\_DC\_RAI\_Public  
**Email Number:** 138

**Mail Envelope Properties** (4aee945e5b7044e6ba2242d7728611b3)

**Subject:** Request for Additional Information No. 117, RAI 8993 (7.0)  
**Sent Date:** 8/2/2017 12:42:52 PM  
**Received Date:** 8/2/2017 12:42:55 PM  
**From:** Cranston, Gregory

**Created By:** Gregory.Cranston@nrc.gov

**Recipients:**

"NuScaleDCRaisPEm Resource" <NuScaleDCRaisPEm.Resource@nrc.gov>  
Tracking Status: None  
"Lee, Samuel" <Samuel.Lee@nrc.gov>  
Tracking Status: None  
"Chowdhury, Prosanta" <Prosanta.Chowdhury@nrc.gov>  
Tracking Status: None  
"Betancourt, Luis" <Luis.Betancourt@nrc.gov>  
Tracking Status: None  
"Tabatabai, Omid" <Omid.Tabatabai-Yazdi@nrc.gov>  
Tracking Status: None  
"Jung, Ian" <Ian.Jung@nrc.gov>  
Tracking Status: None  
"RAI@nuscalepower.com" <RAI@nuscalepower.com>  
Tracking Status: None

**Post Office:** HQPWMSMRS08.nrc.gov

<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>
MESSAGE	554	8/2/2017 12:42:55 PM
Request for Additional Information No. 117 (eRAI No. 8993).pdf		159763

**Options**

**Priority:** Standard  
**Return Notification:** No  
**Reply Requested:** No  
**Sensitivity:** Normal  
**Expiration Date:**  
**Recipients Received:**

## Request for Additional Information No. 117 (eRAI No. 8993)

Issue Date: 08/02/2017

Application Title: NuScale Standard Design Certification - 52-048

Operating Company: NuScale Power, LLC

Docket No. 52-048

Review Section: 07.0.DSRS - Instrumentation and Controls - Introduction and Overview of Review Process

Application Section: DCD, Part 2 - Tier 2, Section 7.0

### QUESTIONS

#### 07.0.DSRS-1

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

10 CFR 50.55a(h) requires compliance with the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 603-1991. Clause 6.8.1 of IEEE Std. 603-1991, requires in part that allowances for uncertainties between the analytical limit and device setpoint be determined using a documented methodology.

10 CFR 52.47(a)(2) requires in part that the applicant to provide a description and analysis of the structures, systems, and components of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor[e], upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished. It is expected that the standard plant will reflect through its design, construction, and operation an extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products. The description shall be sufficient to permit understanding of the system designs and their relationship to the safety evaluations.

NuScale Design Control Document (DCD), Part 2 – Tier 2, Table 1.6-2, "NuScale Referenced Technical Reports," provides a list of technical reports (TeR) that are incorporated by reference in the NuScale DCD. Specifically, NuScale DCD, Tier 2, Chapter 7, "Instrumentation and Control," references TeR-0616-49121, Revision 1, "NuScale Instrument Setpoint Methodology." Per the requirements of 10 CFR 50.36 and Clause 6.8.1 of IEEE Std. 603-1991, an applicant must provide a description of their setpoint control program and the instrument setpoint methodology used in determining setpoints. Therefore, the staff requests for TeR-0616-49121, Revision 1 to be incorporated by reference in NuScale DCD, Part 2 – Tier 2, Table 1.6-2.

#### 07.0.DSRS-2

Title 10 of the *Code of Federal Regulations* (10 CFR) 52.47(a)(2) requires in part that the applicant to provide a description and analysis of the structures, systems, and components (SSCs) of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor[e], upon which these requirements have been established, and the evaluations required to show that safety functions will be accomplished. It is expected that the standard plant will reflect through its design, construction, and operation an extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products. The description shall be sufficient to permit understanding of the system designs and their relationship to the safety evaluations.

NuScale Design Control Document (DCD), Part 2 – Tier 2, Chapter 7, “Instrumentation and Controls,” incorporates by reference topical report (TR)-1015-18653, “Design of Highly Integrated Protection System Platform,” Revision 1. TR-1015-18653 identifies 65 application specific action items (ASAs) that must be implemented for NRC approval of the Highly Integrated Protection System platform for safety-related applications in any nuclear power plant. Table 7.0-2, “Highly Integrated Protection System Topical Report (HIPS TR) Application Specific Information Cross References,” provides a cross-reference of the ASAs with the Chapter 7, “Instrumentation and Control,” subsections in which the ASAs are specifically addressed. However, the staff was not able to find the disposition of ASAs 1 through 12 in NuScale DCD, Part 2 – Tier 2 Chapter 7. In addition, NuScale DCD, Part 2 – Tier 2, Chapter 1, “Introduction and General Description of the Plant,” references the incorrect staff’s approved revision of TR-1015-18653. The staff requests the applicant to:

1. Document the disposition of ASAs 1 through 12 in NuScale DCD, Part 2 – Tier 2 Chapter 7.
2. Modify Table 1.6-1, “NuScale Referenced Topical Reports,” to change the revision number of TR-1015-18653 from “Revision 1” to “Revision 2.”
3. Modify Table 7.0-2 in NuScale DCD, Part 2 – Tier 2, Chapter 7 to cross reference the ASAs with the new numbering identified in TR-1015-18653, Revision 2.

#### 07.0.DSRS-3

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(h) requires compliance to the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 603-1991. IEEE Std 603-1991, Clause 5.6 requires independence among (1) redundant portions of a safety system, (2) safety systems and the effects of DBEs, and (3) safety systems and other systems. IEEE Std. 7-4.3.2-2003, endorsed by Regulatory Guide (RG) 1.152, Revision 2, Clause 5.6, “Independence,” provides guidance on how digital systems can meet the IEEE Std. 603 requirements. This clause of IEEE Std. 7-4.3.2 states that, in addition to the requirements of IEEE Std. 603-1991, data communication between safety channels or between safety and nonsafety systems shall not inhibit the performance of the safety function. Guidance on interdivisional communications appears in the interim staff guidance DI&C-ISG-04.

NuScale Design Control Document (DCD), Part 2 – Tier 2, Chapter 7, “Instrumentation and Controls,” incorporates by reference topical report (TR)-1015-18653, “Design of Highly Integrated Protection System Platform,” Revision 1. TR-1015-18653 identifies 65 application specific action items (ASAs) that must be implemented for NRC approval of the Highly Integrated Protection System platform for safety-related applications in any nuclear power plant. Table 7.0-2, “Highly Integrated Protection System Topical Report (HIPS TR) Application Specific Information Cross References,” of NuScale DCD, Part 2 – Tier 2, Chapter 7, provides a cross-reference of the ASAs with the Chapter 7 subsections in which the ASAs are specifically addressed.

ASAI-22 states that “*An applicant or licensee referencing this SE must verify that the safety network provides electrical, physical, and communications independence and security requirements for communication from safety- to nonsafety-related systems.*” In addition, ASAI-53 states that “*An applicant or licensee referencing this SE must verify that the safety network provides communications independence and security requirements for communication from safety- to nonsafety-related systems.*”

From the information contained in the dispositions for ASAI-22 and ASAI-53, it is not clear to the NRC staff how security requirements for communication from safety- to nonsafety-related systems are

met. Document in Table 7.0-2 and the Chapter 7 subsection(s) where the security requirements for communication from safety- to nonsafety-related systems are addressed.

#### 07.0.DSRS-4

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(h) requires compliance to IEEE Std 603-1991. Clause 5.8.3 requires that, if the protective actions of some part of a safety system have been bypassed or deliberately rendered inoperative for any purpose other than an operating bypass, continued indication of this fact for each affected safety group shall be provided in the control room.

NuScale Design Control Document (DCD), Part 2 – Tier 2, Chapter 7, “Instrumentation and Controls,” incorporates by reference topical report (TR)-1015-18653, “Design of Highly Integrated Protection System Platform,” Revision 1. TR-1015-18653 identifies 65 application specific action items (ASAI) that must be implemented for NRC approval of the Highly Integrated Protection System platform for safety-related applications in any nuclear power plant. Table 7.0-2, “Highly Integrated Protection System Topical Report (HIPS TR) Application Specific Information Cross References,” of NuScale Design Control Document (DCD), Part 2 – Tier 2, Chapter 7, provides a cross-reference of the ASAI with the Chapter 7 subsections in which the ASAI are specifically addressed.

ASAI-29 states that “*An applicant or licensee referencing this SE must describe how the HIPS platform bypass status information is used to automatically actuate the bypass indication for bypassed or inoperable conditions, when required, and provide the capability to manually activate the bypass indication from within the control room.*” Table 7.0-2, “Highly Integrated Protection System Topical Report (HIPS TR) Application Specific Information Cross References,” provides a cross-reference of the ASAI with the Chapter 7 subsections in which the ASAI are specifically addressed.

Table 7.0-2, “Highly Integrated Protection System Topical Report (HIPS TR) Application Specific Information Cross References,” of DCD, Part 2 – Tier 2, Chapter 7, provides a cross-reference of the ASAI with the Chapter 7 subsections in which the ASAI are specifically addressed. From the information contained in the disposition for ASAI-29, it is not clear to the NRC staff where the operational and maintenance bypasses are met. For example, Table 7.0-2 did not provide a cross-reference for ASAI-29 to NuScale, Part 2 – Tier 2, Section 7.2.4, “Operating and Maintenance Bypasses.” Document in Table 7.0-2 and the Chapter 7 subsection(s) where operational and maintenance bypasses are addressed.

#### 07.0.DSRS-5

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(h) requires compliance to the Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 603-1991. IEEE Std. 603-1991 does not directly discuss digital systems, but states that guidance on the application of the criteria in IEEE Std. 603-1991 for safety systems using digital programmable computers is provided in IEEE/ANS 7-4.3.2-1982. Guidance on applying the safety system criteria to computer-based safety systems is provided in Regulatory Guide 1.152, Revision 3, which endorses IEEE Std. 7-4.3.2-2003 (an updated version to the 1982 edition). When sole verification of test and calibration data is provided on a separate computer, Clause 5.5.2 requires verification and validation (V&V), configuration management, and quality assurance (QA) for test and calibration functions of the separate computer. Likewise, Clause 5.5.2 requires V&V, configuration management, and QA when the test and calibration function is built into the safety system computer. In other words, the only case where V&V, configuration management, and QA for test and calibration functions would not be required would be when these functions reside on a separate computer

and do not provide the sole verification of test and calibration data for the safety system computer. Clause 5.5.3 of IEEE Std. 7-4.3.2-2003 states, in part, that whenever self-diagnostics are applied, for the system design address: 1) self-diagnostics performed during system startup, 2) self-diagnostics performed periodically while the computer system is operating, and 3) failure reporting of the self-diagnostic results.

NuScale Design Control Document (DCD), Part 2 – Tier 2, Chapter 7, “Instrumentation and Controls,” incorporates by reference topical report (TR)-1015-18653, “Design of Highly Integrated Protection System Platform,” Revision 1. TR-1015-18653 identifies 65 application specific action items (ASAI) that must be implemented for NRC approval of the Highly Integrated Protection System platform for safety-related applications in any nuclear power plant. Table 7.0-2, “Highly Integrated Protection System Topical Report (HIPS TR) Application Specific Information Cross References,” of DCD, Part 2 – Tier 2, Chapter 7, provides a cross-reference of the ASAI with the Chapter 7 subsections in which the ASAI are specifically addressed.

*ASAI-47 states that “An applicant or licensee referencing this SE must confirm that the manufacturer followed the same design, development, and iV&V processes for test and calibration functions as for all other HIPS platform functions.”*

*ASAI-48 states that “An applicant or licensee referencing this SE that relies on a separate computer for the sole verification of test and calibration data should ensure adequate iV&V, configuration management, and quality assurance for the test and calibration functions of the separate computer.”*

*ASAI-49 states that “An applicant or licensee referencing this SE must confirm that the manufacturer followed the same design, development, and iV&V processes for self-diagnostics functions as for all other HIPS platform functions.”*

From the information contained in the dispositions for ASAI 47 to 49, it is not clear to the NRC staff where design, development, and independent verification and validation (iV&V) processes for the test and self-diagnostics functions as for all other HIPS platform functions are met. For example, Table 7.0-2 did not provide a cross-reference for ASAI-47 to NuScale, Part 2 – Tier 2, Section 7.2.1, “Quality.” Document in Table 7.0-2 and the Chapter 7 subsection(s) where the design, development, and iV&V processes for the test and self-diagnostics functions are addressed.

#### 07.0.DSRS-6

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(h) requires compliance to IEEE Std 603-1991. Digital I&C Interim Staff Guidance-04 (DI&C ISG-04), “Highly Integrated Control Room – Communications,” Revision 1, provides design criteria for communication and functional independence between redundant divisions of safety systems. Staff Position 1, Point 12, states that communication faults should not adversely affect the performance of required safety functions in any way. Point 12 includes 12 examples of credible communication faults for consideration, as applicable.

NuScale Design Control Document (DCD), Part 2 – Tier 2, Chapter 7, “Instrumentation and Controls,” incorporates by reference topical report (TR)-1015-18653, “Design of Highly Integrated Protection System Platform,” Revision 1. TR-1015-18653 identifies 65 application specific action items (ASAI) that must be implemented for NRC approval of the Highly Integrated Protection System platform for safety-related applications in any nuclear power plant. Table 7.0-2, “Highly Integrated Protection System Topical Report (HIPS TR) Application Specific Information Cross References,” of NuScale Design Control Document (DCD), Part 2 – Tier 2, Chapter 7, provides a cross-reference of the ASAI with the Chapter 7 subsections in which the ASAI are specifically addressed.

ASAI-57 states that, *“An applicant or licensee referencing this SE must configure the slave modules (e.g., SFMs and EIMs) to alarm and assume a fail-safe state.”*

The TR-1015-18653 SE concluded that ASAI-57 is necessary to establish full conformance to DI&C-ISG-04, Section 1, Position 12. Table 7.0-2 identifies the disposition of ASAI-57 in DCD, Part 2 – Tier 2, Section 7.2.3, “Reliability, Integrity, and Completion of Protective Action.” However, the staff was not able to find any information in this section regarding how the slave modules (e.g., SFMs and EIMs) are configured to provide an alarm in the main control room and assume a fail-safe state. For example, the staff found no discussion of how the slave communication modules in the MIB bus fails into a safe state and provides an alarm in the main control room. Document in Table 7.0-2 and the Chapter 7 subsection(s) where the configuration of the slave modules to alarm and assume a fail-safe state are addressed.