May 12, 2017

MEMORANDUM TO: Samuel Lee, Chief
Licensing Branch 1
Division of New Reactor Licensing
Office of New Reactors

FROM: Omid Tabatabai, Senior Project Manager **/RA/**
Licensing Branch 1
Division of New Reactor Licensing
Office of New Reactors

SUBJECT: SUMMARY OF APRIL 18 AND 20, 2017, PUBLIC MEETINGS WITH NUSCALE POWER, LLC, TO DISCUSS THE U.S. NUCLEAR REGULATORY COMMISSION STAFF'S QUESTIONS RELATED TO CHAPTER 7, "INSTRUMENTATION AND CONTROLS," OF THE NUSCALE DESIGN CERTIFICATION APPLICATION (DOCKET NO. 52-048)

On April 18 and 20, 2017, representatives of the U.S. Nuclear Regulatory Commission (NRC) and NuScale Power, LLC, (NuScale) held a public meeting, and a separate closed meeting at the NRC headquarters located at 11545 Rockville Pike, Rockville, Maryland 20852. The purpose of these meetings was to discuss several NRC staff questions related to Chapter 7, "Instrumentation and Controls," of NuScale's design certification application (DCA). A complete copy of NuScale's DCA is available on the NRC public Webpage at https://www.nrc.gov/reactors/new-reactors/design-cert/nuscale/documents.html.

Enclosure 1, "Summary of NRC Staff Questions and NuScale Responses," captures NRC staff questions, and NuScale's responses that were discussed during the two separate meetings. NuScale Power, LLC has reviewed and verified that the staff has accurately captured its responses.

The agenda and list of meeting attendees are included in Enclosures 2 and 3, respectively. The meeting notices are available in the NRC's Agencywide Documents Access and Management System under Accession Nos. ML17094A362 and ML17096A214. There were no handouts used at this meeting. To facilitate the discussions, as needed, participants referred to a number of diagrams and pages in DCA Chapter 7 that are publically available.

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Docket No. 52-048

cc: NuScale DC Listserv

Enclosures:
1. Summary of NRC Staff Questions and NuScale Responses
2. Attendees
3. Agendas

SUMMARY OF APRIL 18 AND 20, 2017, PUBLIC MEETINGS WITH NUSCALE POWER, LLC, TO DISCUSS THE U.S. NUCLEAR REGULATORY COMMISSION STAFF'S QUESTIONS RELATED TO CHAPTER 7, "INSTRUMENTATION AND CONTROLS," OF THE NUSCALE DESIGN CERTIFICATION APPLICATION (DOCKET NO. 52-048)

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Summary of NRC Staff Questions and NuScale Responses

Tier 1, Section 2.5.2, "Module Protection System"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
T1-1	4-11-17	2.5-14	Inspections, Tests, Analyses, & Acceptance Criteria (ITAAC)-2: Explain what preventative measures for software changes are available other than tunable parameters (e.g., revision changes)?	**Status:** Resolved/Closed The applicant clarified that ITAAC-2 is only applicable for changes of tunable parameters in the Non-Volatile Memory. Revision changes for software changes are covered under NuScale's configuration program. No further actions are needed.
T1-2	4-11-17	2.5-16	ITAAC-18, 19, 20: Explain why the Design Commitments and Acceptance Criteria (AC) are different from standard ITAAC I17.	**Status:** Resolved/Closed The applicant clarified that the Design Commitments and AC are design-specific. No further actions are needed.
T1-3	4-11-17	2.5-16	ITAAC-21: Explain why the AC is different from standard ITAAC I18.	**Status:** Resolved/Closed The applicant clarified that the AC is design-specific. No further actions are needed.
T1-4	4-11-17	2.5-16	ITAAC-22: Is this part of standard ITAAC I19?	**Status:** Resolved/Closed The applicant clarified that ITAAC-22 is part of standard ITAAC I19. No further actions are needed.

T1-5	4-11-17	2.5-17	Which ITAAC addresses standard ITAAC I20?	**Status:** **Resolved/Closed** The applicant clarified that ITAAC I20 is not applicable to the NuScale design. No further actions are needed.
T1-6	4-11-17	2.5-17	fers from standard ITAAC 22.	**Status:** **Resolved/Closed** The applicant clarified this item at the 4/20/17 public meeting. The minimum control of displays listed in ITAAC 25 are a result of manual actions derived from the human factors program while for standard ITAAC 22. No further actions are needed.
T1-7	4-11-17	2.5-17	Explain why ITAAC 26 differs from standard ITAAC 23.	**Status:** **Resolved/Closed** The applicant clarified that the ITAAC is design-specific. No further actions are needed.
T1-8	4-11-17	2.5-17	Which ITAAC addresses standard ITAAC I24?	**Status:** **Resolved/Closed** The applicant clarified that this ITAAC standard is not applicable to the NuScale design. No further actions are needed.

T1-9	4-11-17	2.5-17	Explain why ITAAC 27 differs from standard ITAAC 25 concerning lubrication.	**Status: Resolved/Closed** The applicant clarified that the verification of lubrication does not meet the first principles described in draft NEI 15-02. ITAAC should verify design features installed for the life of the plant. Lubrication of reactor trip breakers is not a permanent design feature because lubrication is performed periodically on a maintenance schedule. No further actions are needed.

Tier 2, Section 7.0, "Instrumentation and Controls - Introduction and Overview"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.0-1	4-11-17	7.0-39	Figure 7.0-4, "Separation Group A Communication Architecture," shows that the Bypass/Trip switch for the Safety Function Module (SFM) remains in an intermediate or neutral position when neither "bypass" or "trip" is selected. However, this is contrary to Figure 7.1-1a, "Module Protection System And Plant Protection System Trip or Bypass Switch Logic," which shows that there is no intermediate or neutral position and the switch would either be positioned in the "bypass" or "trip" position. Explain this inconsistency.	**Status: Resolved / Confirmatory Item** The applicant agreed to correct this inconsistency in the DCD to show the Bypass/Trip switch to be either positioned in the "bypass" or "trip" position.
7.0-2	4-11-17	7.0-6	Section 7.0.4.1.2, "Reactor Trip System": This section states that the Actuation Priority Logic (APL) accepts commands from three sources: (1) digital trip signal from the Safety Function Module (SFM); (2) non-digital manual trip signal from its associated Reactor Trip System (RTS) division; and (3) non-digital manual control signals from the Module Control System (MCS). Explain the prioritization logic among these three sources.	**Status: Resolved / Confirmatory Item** The applicant agreed to include a statement in the DCD to explain the prioritization logic among these three sources.
7.0-3	4-11-17	7.0-9	Section 7.0.4.2, "Neutron Monitoring System," states, in part, that: "*When the NPM is in transit to or from refueling bay of the plant, neutron monitoring is not required. Equipment with the potential to cause core alterations, such as control rod drives, has been disconnected or disabled prior to NPM movement*." Explain how monitoring will be performed while the NPM is in transit.	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. The applicant stated that when the NPM is in transit to or from refueling bay of the plant, neutron monitoring is not required. Equipment with the potential to cause core alterations, such as control rod drives, has been disconnected or disabled prior to NPM movement. No further actions are needed.
7.0-5	4-11-17	7.0-15	Section 7.0.4.5, "Module Control System": This section states, in part, that: "*The MCS uses logic processing in the cases where redundant input/output channels are used. Some logic supports the redundant-channel architecture used by the MPS, while other logic directly supports the process systems. The logic processing of multiple channels can include two, three, or four input signals*." The chapter does not provide sufficient information to understand the "logic processing"	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. No further actions are needed.

			algorithm. For example, Section 7.1.7 states that: "*The logic processing for the reactor trip and engineered safeguards protective functions are very simple. Trip determination is performed by a simple comparator (e.g., bistable) or, at most, by the use of simple arithmetic functions to perform the trip determination function*." As written, it is unclear when a comparator or an arithmetic function is used and what/how is the "arithmetic function" used. This comment also applies to the equivalent discussion for the Plant Control System (PCS) in Section 7.0.4.6.	
7.0-6	4-11-17	7.0-19	Section 7.0.4.5.1, "Module Control System Segmentation": Concerning the Control Rod Drive System (CRDS) segmentation, this section states, in part, that: "*Rod withdrawal may not be performed when thermal reactor power is between zero and 15 percent*." Provide an explanation of what would be the potential consequences of withdrawing control rods between zero and 15 percent thermal power and how is it prevented (e.g., technical specifications, interlocks).	**Status: Resolved / Confirmatory Item** The applicant clarified that the sentence contained a typographical error. The applicant stated that the sentence in question would revised to read: "Automatic rod withdrawal may not be performed when thermal reactor power is between zero and 15 percent." Additionally, the applicant stated the consequence of the rod control malfunctions including uncontrolled withdrawal of control rods below 25% power are presented in Section 15.4.1 of the FSAR".
7.0-7	4-11-17	7.0-19	Section 7.0.4.5.2, "Postulated digital-based Common Cause Failure Evaluation of the Module Control System, "states that: "*The separation of CVCS letdown, makeup and CVCS pressure control on to different MCS segments precludes postulated digital-based CCFs causing events that are not bounded by the plant safety analysis*." The staff agrees that a design feature such as segmentation could be used to reduce the likelihood of a CCF. The sentence as written implies	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. Item (1): The applicant stated that the segmentation and the

			that segmentation by itself was enough to preclude a postulated CCF that is beyond the plant safety analysis. 1. How did the applicant determine that segmentation was enough without the need for other design attributes such as independence/diversity? 2. Concerning the evaluation of Digital-Based CCFs of the CRDS Segment, this section states that: "*The reactor is critical at 100 percent power and the regulating group is at the power dependent insertion limit (PDIL)*." What was the technical basis for assuming this initial power level versus a lower initial power level (which could lead to a more severe reactor power transient)?	use of two different FPGA technologies can preclude a postulated CCF. Item (2): The technical basis for this initial power level is based on the safety analysis. The staff will perform an audit of the D3 Coping Analysis Technical Report.
7.0-8	4-11-17	7.0-26	Section 7.0.4.7, first bullet, states, "*self-powered neutron detectors…*" Figure 7.0-12 on page 7.0-48 shows that the NMS Ex-core instrumentation has a Power Supply. Define "self-powered" in this context. Clarify whether there is a "power supply" or if the detectors are "self-powered."	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. Section 7.0.4.7 is for the In-Core Instrumentation System which is different than the Neutron Monitoring System shown in Figure 7.0-12. Neutron Monitoring System is described in Section 7.0.4.2. The In-Core Instrumentation System uses self-powered neutron detectors (SPNDs). The signals generated by these SPNDs are processed by separate electronics that will require a power supply. The detectors shown in Figure 7.0-12 are for the Neutron Monitoring System and do require a power supply." No further actions are needed.
7.0-9	4-11-17	7.0-36	Figure 7.0-1, "Overall Instrumentation and Control System Architecture Diagram," did not provide an adequate diagram of the overall I&C system architecture, especially with the non-safety systems. Provide a diagram that shows the connections of the MCS systems to the MPS.	**Status: Resolved/Closed** The applicant provided an overview of the overall I&C

				system architecture at the 4/18/17 public meeting. This overview clarified the connections of the MCS systems to the MPS. No further actions are needed.
7.0-10	4-11-17	7.0-45	Figure 7.0-10, "Module Protection System Gateway Diagram," shows the three 24-hour timers in the safety function module (SFM) FPGA for the MPS Gateway. These three 24-hour timers are connected to the input sub-modules (ISM). What is the purpose of the remaining input sub-module in this SFM?	**Status: Resolved / Confirmatory Item** The applicant stated that the remaining input in the ISM is not used. The applicant agreed to delete this remaining unused ISM in Figure 7.0-10.

Tier 2, Section 7.1.1, "Design Bases and Additional Design Considerations"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.1.1-1	4-11-17	7.1-5	Section 7.1.1.2.1, "Protection Systems": This section states that: "*The ESFAS delays are a product of sensor response time, signal processing time, and actuation device delays. A standard 1.0-second signal processing time is applied for all ESFAS signals*." a. Provide additional explanation for how this delay is distributed among the different portions of the protection path. Provide a single-line diagram (one for the ESFAS and another for the RTS) to illustrate how this 1.0-second delay is distributed across the path. b. This comment also applies to the MPS digital portion of the RTS function.	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. The basis for the 1.0-second delay is from the safety analysis. The applicant further stated that Section 7.7 of the HIPS topical report provides the calculation used to determined worst-case digital time response for an MPS channel. Finally, the response time is covered by ITAAC No. 17 of Table 2.5-7. No further actions are needed.
7.1.1-2	4-11-17	7.1-90	Note 2 of Table 7.1-18, "Table 7.1-18: Digital Sensors Credited for Mitigating Anticipated Operational Occurrences and Postulated Accidents," states, in part that "*The design basis for the digital-based RCS flow sensor is to ensure minimum RCS flow rates exist during dilution events to ensure proper mixing within the RCS*." Correlate Note 2 with the respective design basis event in Table 7.1-18.	**Status: Resolved / Confirmatory Item** The applicant agreed to correlate Note 2 with the respective design basis events in Table 7.1-18.

Tier 2, Section 7.1.5, "Diversity and Defense-in-Depth"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.1.5-1	4-11-17	7.1-21	Section 7.1.5 "Diversity and Defense-in-Depth" states, in part, "*This assessment focused on the MPS which is the only safety-related digital I&C system*." However, Section 7.0.2 "Instrumentation and Control System Classification" states in part, "*The I&C systems classified as safety-related are the MPS and the NMS*." Why does the D3 assessment not consider the NMS in its assessment?	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. The NMS consists of analog components. The D3 assessment focused on the MPS which is the only safety-related digital I&C system. No further actions are needed.
7.1.5-2	4-11-17	7.1-22	Section 7.1.5.1.1, Guideline 1 - Choosing Blocks," states, in part, the following about the non-Class 1E Monitoring and Indication Block: "*These operator workstations exist on an human machine interface network that is separate from the MCS control network, and are a physical subset of equipment and software in the MCS. As a result, internal failures, including the effects of software errors, do not propagate to other equipment or software*." Please explain the basis for stating that: "*internal failures, including the effects of software errors, do not propagate to other equipment or software*." For example, Figure 7.1-4 shows that the communication between the non-Class 1E Monitoring and Indication Block and the MCS is bi-directional, which implies that [potential] errors could be propagated between the two systems.	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. The applicant clarified that in addition to physical subset of equipment, functional diversity exist between the non-Class 1E Monitoring and Indication block and the MCS block such that one block may generate erroneous signals but not cause another block to fail. A block receiving erroneous signals continues to function correctly in response to all correct or incorrect inputs. No further actions are needed.

7.1.5-3	4-11-17	7.1-24	Section 7.1.5.1.2 states in part, "*Assessment of diversity within this block is intended to demonstrate how a digital-based CCF of a safety-related sensor would be limited to a single function type." It also states, "Within a sensor block, each function type is based on different designs from different manufacturers*." It also states, "*Between Sensor Block I and II, there are two sets of digital-based level measurement sensors and each set is from a different design organization (i.e. vendor or supplier)*." a. Does this mean that a digital CCF of one of the digital-based level sensors would only affect the functionality of that level sensor and not any other sensor in Sensor Block I and II? b. Are there also two sets of pressure and flow sensors between Sensor Block I and II?	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. The applicant stated that digital CCF of safety-related level sensors would be limited to a single sensor block and would not affect any other (i.e., flow, pressure) digital function type. In addition, the applicant confirmed that there are no two diverse sets of pressure and flow sensors between Sensor Block I and II. A CCF of a digital-based pressure sensor in Sensor Block I or II could affect all the digital-based pressure sensors in both sensors blocks. Same applies to the digital flow sensors. No further actions are needed.

7.1.5-4	4-11-17	7.1-24	Section 7.1.5.1.6, "Guideline 6 - Postulated Common Cause Failure of Blocks," states that: "*The EIMs that only perform decay heat removal actuation are considered to be unaffected by a digital-based CCF that affects EIMs that perform decay heat removal and containment isolation*." a. State the basis for this assumption. (For example, if the basis is the use of two different FPGA technologies, it should be explicitly stated in the discussion. b. Would the plant-level results/consequences be any different if you were to assume otherwise?	**Status: Resolved / Confirmatory Item** Item (a): The applicant stated that the basis for this statement was functional diversity between EIMs in a given safety block. The applicant clarified that the intent of the quoted text is to identify the possible spurious actuations caused by a digital-based CCF. A digital-based CCF that causes an entire safety block to not initiate protective actions when required is mitigated by the two different FPGA technologies. No further actions are needed. **Status: Resolved/Closed** Item (b): The applicant clarified this item at the 4/18/17 public meeting. The applicant stated that plant-level results would be unaffected by a digital-based CCF (see coping analysis). The staff will perform an audit of the D3 Coping Analysis Technical Report.

7.1.5-5	4-11-17	7.1-32	Section 7.1.5.1.6, "Guideline 6 - Postulated Common Cause Failure of Blocks," states that: "*Because of the limited period in time in which safety-related components are controlled by non-Class 1E controls, it is not considered credible for a digital based CCF to occur while the enable nonsafety control permissive is active. As a result, no digital-based CCF within the non-Class 1E Monitoring and Indication can directly prevent or spuriously initiate protective actions*." 1. BTP 7-19 only lists the following two options to eliminate consideration of software based or software logic based CCF: (1) diversity and (2) testability. Therefore, the rationale provided by the applicant is not sufficient to eliminate consideration of CCF. Provide adequate technical justification for this assertion or assess the consequences associated with the CCF in question. 2. Define "limited period" and explain how is the time duration for this switch to be in the enabled position controlled/minimized.	**Status: Resolved/Closed** Item (1): The applicant clarified this item at the 4/18/17 public meeting. The actuation and priority logic (APL) within each EIM prevents the non-Class 1E Monitoring and Indication block from preventing the initiation of protective actions. Indirect spurious initiation of protective actions from the non-Class 1E Monitoring and Indication Block is only possible if the enable nonsafety control switch is active. In all other conditions, a CCF within Non-Class 1E Monitoring and Indication block cannot spuriously initiate a protective action. No further actions are needed. **Status: Resolved / Confirmatory Item** Item (2): The applicant agreed to provide a pointer to Chapter 13 where a definition of what is meant by "limited period" will be included in a referenced document.

7.1.5-6	4-11-17	7.1-32	Section 7.1.5.1.6, "Guideline 6 - Postulated Common Cause Failure of Blocks," states that: "*Because of the limited period in time in which safety-related components are controlled by non-Class 1E controls, it is not considered credible for a digital based CCF to occur while the enable nonsafety control permissive is active. As a result, no digital-based CCF within the non-Class 1E Monitoring and Indication can directly prevent or spuriously initiate protective actions.*" Comments 7.1.5-5.1 and 7.1.5-5.2 above also apply to: 1. The following statements later in this section dealing with the Module Control System (MCS): "*Because of the limited period in time in which safety-related components are controlled by non-Class 1E controls, it is not considered credible for a digital-based CCF to occur while the enable nonsafety control permissive is active. As a result, a digital-based CCF within the MCS block cannot directly prevent MPS from initiating protective actions and cannot directly command MPS to spuriously initiate protective actions*." 2. The following statements in Section 7.1.5.2.2 (Results of Coping Analyses for Postulated Digital-Based Common Cause Failure Vulnerability): "*RCS flow rate is a function of reactor power in the NuScale design, such that low RCS flow is only possible during startup conditions. The low-low RCS flow protective function is credited for actuating RTS and CVCS isolation in the event of a MHS malfunction that causes an RCS flow reversal. This event is not considered credible in combination with a digital-based CCF of the RCS flow sensor due to the very short, and limited operating window where the MHS failure could occur*."	**Status: Resolved / Confirmatory Item** The applicant agreed to provide a pointer to: (1) Revise Chapter 7 to include the pointer to Chapter 13. (2) Revise a document to be referenced in Chapter 13 to describe the operational attributes of "limited period."

7.1.5-7	4-11-17	7.1-35	Section 7.1.5.1.9, "Guideline 9 - Output Signals," states that: "*The MCS uses extensive self-checking to detect malfunction of the input/output equipment, memory parity errors, lost or spurious communication interrupts, program hangups (control and data acquisition), and other feasibility checks that indicate erroneous operation*." a. What actions does the equipment take (e.g., automatic trip) in response to a detected malfunction? b. What indications at the Control Room does the equipment provide in order to alert the operator of a detected malfunction?	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. The applicant stated that the equipment would go to its intended safe condition in response to a detected malfunction. In addition, the applicant stated that the operators in the control room would have the indications of any equipment malfunction at the MCS displays. No further actions are needed.

7.1.5-8	4-11-17	7.1-35	Section 7.1.5.1.10, "Guideline 10 - Diversity for Anticipated Operational Occurrences," states that: "*The digital sensors identified are vulnerable to a Type 3 failure; however, it is not credible to assume a concurrent Type 3 failure of the digital sensors. Instead, a digital-based CCF is assumed to occur with a particular subset of the digital sensors*." This section also states that: "*…there is sufficient diversity between Sensor Block I and II to prevent Type 3 failures from concurrently affecting the pressurizer level sensors in both Sensor Block I and II*." However, the discussion in the section does not address why there is sufficient diversity between the sensor blocks to justify the assumption that a "*CCF is assumed to occur with a particular subset of the digital sensors*." If the basis is the use of two different FPGA technologies then it should be explicitly stated in the discussion.	**Status: Resolved / Confirmatory Item** The applicant clarified this item at the 4/18/17 public meeting. The applicant described that there are three safety-related digital-based sensor function types: flow, level, and pressure. The applicant described that each function type depends on different physical effects that require unique processing algorithms to obtain the desired parameter (flow, pressure, level) and that this equipment diversity results in a digital-based CCF being limited to one function type. The applicant stated that a digital-based CCF of safety-related level sensors would be limited to a single sensor block and would not affect any other (i.e., flow, pressure) digital function type. In addition, the applicant confirmed that there are no two diverse sets of pressure and flow sensors between Sensor Block I and II. A CCF of a digital-based pressure sensor in Sensor Block I or II could affect all the digital-based pressure sensors in both sensors blocks. Same applies to the digital flow sensors. No further actions are needed.

				The applicant described this information using Table 7.1-13, Table 7.1-14, and Table 7.1-15.
7.1.5-9	4-11-17	7.1-35	Section 7.1.5.2.2, "Results of Coping Analyses for Postulated Digital-Based Common Cause Failure Vulnerability," states, in part, that "*The analysis summary is provided below for the flow, level and pressure safety-related digital-based sensors for pressure, level and flow*." Provide the location of the referenced summary analysis for the level safety-related digital-based sensor.	**Status: Resolved / Confirmatory Item** The applicant clarified this item at the 4/18/17 public meeting. The applicant stated that a digital-based CCF of safety-related level sensors would be limited to a single sensor block and would not affect any other (i.e., flow, pressure) digital function type. As a result, no summary is needed for the level safety-related digital-based sensor. The applicant agrees to remove level in the quoted text
7.1.5-10	4-11-17	7.1-35	Section 7.1.5.2.2 states that the results of the coping analysis concluded the AOO and PA acceptance criteria were met. Provide the D3 Coping Analysis Technical Report.	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. The applicant stated the results of the coping analysis is found in 7.1-18 of the DCD. The staff will perform an audit of the D3 Coping Analysis Technical Report.

Tier 2, Section 7.1.8, "Hazard Analysis"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.1.8-1	4-11-17	7.1-58	Section 7.1.8, "Hazard Analysis," does not describe whether or not the hazard analysis was analyzed for all modes of operation. If the hazard analysis analyzed all modes of operations then it should be explicitly stated in the discussion. If not, discuss why the hazard analysis was not analyzed for all modes of operation.	**Status: Resolved / Confirmatory Item** The applicant agreed to include a statement in the DCD to state the hazard analysis was performed for all modes of operation.
7.1.8-2	4-11-17	7.1-59	Section 7.1.8, "Hazard Analysis," states in part, that "*The hazards analysis methodology described is a living process, performed through the system design life cycle. The cross-referencing of hazard conditions, safety constraints, and functional design requirements ensures that potentially hazardous conditions not previously identified by other analysis methods are mitigated by feedback into the design of the system functional requirements*." Provide an ITAAC that will verify that the constraints identified through the hazard analysis have been satisfied.	**Status: Open** This item will be later discussed at a future public meeting. The applicant stated that the hazard analysis would be covered by ITAAC No.1 of Table 2.5-7, "Module Protection System and Safety Display and Indication System Inspections, Tests, Analyses, and Acceptance Criteria." Hazards analysis has been completed for the hardware for the MPS and the NMS systems. The staff will perform an audit of hazard analysis reports. Section 7.1.8 describes the software-related contributory hazards as verified by ITAAC 02.05.01, (Tier 1 Table 2.5-7 item #1). NMS is an analog system and has no software design.

Tier 2, Section 7.2.1, "Quality"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.2.1-1	4-11-17	7.2-1	In conjunction with the guidance provided in Standard Review Plan (SRP) Section 17.5, there are additional software elements that should be reviewed to evaluate the applicant's overall quality assurance (QA) program for development of an Instrument and Control (I&C) safety system. These elements are described in Chapter 7 of the draft Design Specific Review Standard for the mPower iPWR Design (ADAMS Accession No. ML12314A197). The development of software used in I&C safety systems should progress according to a defined lifecycle, meaning the evolution of the software, from conception through retirement, is clearly delineated. Many different lifecycle models exist for software development. Each lifecycle model is comprised of a sequence of stages that may overlap and/or iterate at various stages dependent on the model. This guidance does not recommend a particular lifecycle model; however, the applicant's QA program should contains a description of the lifecycle model stages and activities, including inputs and outputs that will be implemented during the development of software used for I&C safety systems.	**Status: Resolved/Closed** The applicant clarified that the overall quality assurance program complies with NQA-1-2008 and NQA-1a-2009. No further actions are needed.

Tier 2, Section 7.2.2, "Equipment Qualification" AND Technical Report, "NuScale Instrument Setpoint Methodology"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.2.2-1	4-11-17	7.2-27	Were environmental control systems used in the NuScale Design? What are those environmental control systems?	**Status: Resolved / Confirmatory Item** The applicant agreed to include a statement in the DCD that the MPS and NMS do not rely on environmental control systems to function in order to perform their required safety functions during AOOs and postulated accidents.
7.2.2-2	4-11-17	TR-10	Section 2.0, "Background," of the NuScale Instrument Setpoint Methodology Technical Report, last paragraph alludes to new qualification program(s). Where are these programs discussed? Are the existing standards sufficient to cover the new environmental envelopes that will be required?	**Status: Resolved/Closed** The applicant clarified there is no new EQ program at the 4/18/17 public meeting. No further actions are needed.

Tier 2, Section 7.2.4, "Operating and Maintenance Bypasses"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.2.4-1	4-11-17	7.2-36	Section 7.2.4.1, "Operating Bypass," states, "*Most of the ESFAS components are not tested at power since they cause a trip or engineered safety feature (ESF) actuation and need to be tested during an outage*." Which ESFAS components are tested at power?	**Status: Resolved/Closed** The application clarified this item at the 4/18/2017 public meeting. The self-tests of the EIM is performed at power without affecting ESFAS components. However, the decision on which ESFAS components (e.g., containment isolation valves) to be tested at power is an operational decision to be made by the plant operators. No further actions are needed.

Tier 2, Section 7.2.7, "Setpoints" AND Technical Report, "NuScale Instrument Setpoint Methodology"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.2.7-1	4-11-17	7.2-38	Section 7.2.7 implies that methodology only applies to RTS and ESFAS setpoints. Are there no other safety-related setpoints (e.g., RIS 2006-17 and TS)?	**Status: Resolved/Closed** The applicant clarified that the methodology only applies to RTS and ESFAS setpoints and that there are no other safety-related setpoints. No further actions are needed.
7.2.7-2	4-11-17	7.2-38	Section 7.2.7, 3rd paragraph correctly states conformance to ISA 67.04-1994, Part 1, however, the methodology on page 11 states that this application uses the 2006 version. Describe the difference between the ISA 67.04-2006 and ISA 67.04-1994 versions and justify any differences. Chapter 1 should be revised to show exception to RG 1.105, Revision 3 as it pertains to its endorsement of the 1994 version of ISA 67.04	**Status: Resolved / Confirmatory Item** The applicant agreed to modify Chapter 1 to show exception to RG 1.105, Revision 3 as it pertains to its endorsement of the 1994 version of ISA 67.04.
7.2.7-3	4-11-17	7.2-39	Section 7.2.7, last paragraph states that the methodology includes setpoint calculations. The Tables (labeled setpoint calculations) do not adhere to the methodology; therefore, the staff does not agree that the tables are setpoint calculations.	**Status: Resolved/Closed** The applicant clarified that these tables establish initial setpoints for the NuScale design. These tables will not be reviewed in the staff's safety evaluation. No further actions are needed.
7.2.7-4	4-11-17	TR-21	Last sentence of Section 3.2.3, "M&TE Uncertainties," is covered by Assumption 5.1 and need not be restated.	**Status: Resolved / Confirmatory Item** The applicant agreed to clarify in the technical report which assumptions are valid for the methodology vs the assumptions related to the setpoints calculations in Section 6.0 of the technical report.

7.2.7-5	4-11-17	TR-31 and 32	One thing that is different is that the ISA 67.04-2006 version leaves out allowable value (AV). The methodology does comply with RIS 2006-17, which uses both +/- As-Found Tolerance (AFT) as a quasi AV. In section 4.4.1, last paragraph that describes what is required if outside of AFT. Similar statement in SCP Section 5.5.10, item iii. AFTtotal = Performance and Test Acceptance Criteria (PTAC). Clarify last part of sentence. As written, it implies that a safety activation was required and the device did not function. This is outside the scope of the setpoint methodology.	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. No further actions are needed.
7.2.7-6	4-11-17	TR-37	Define margin between Limiting Safety System Setting (LSSS) and Nominal Trip Setpoint (NTSP). Section 4.1.4 describes margin as "a value based on engineering judgement", whereas, figure 4-2, reflects margin as equal to or greater than PTAC, where AFTtotal = Performance and Test Acceptance Criteria (PTAC).	**Status: Resolved / Confirmatory Item** The applicant agreed to correct this inconsistency in the technical report to define Margin as greater than or equal to PTAC.
7.2.7-7	4-11-17	TR-38	Section 4.4.1, "Operability Determination and Evaluation," last sentence: What is meant by "do not function;" calibration during shutdown is after the fact and therefore the implication is that they "may not have functioned."	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. No further actions are needed.
7.2.7-8	4-11-17	TR-39	The staff agrees that these assumptions are used in the preliminary calculations (i.e., appendices). Describe how these assumptions go away once the instruments have been procured.	**Status: Resolved / Confirmatory Item** The applicant clarified this item at the 4/18/17 public meeting (see Status to Item 7.2.7-4).
7.2.7-9	4-11-17	TR-40	Where is Table 5-1, "Protective functions with accident environment effect uncertainties applied," discussed in methodology? Describe how this table is used in conjunction with Section 5 of methodology or delete. Also, are Tables 5-1 and 5-2 considered assumptions?	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. No further actions are needed.

7.2.7-10	4-11-17	TR-48	Add documentation requirements to the methodology. Add the term “document” to flowchart where appropriate.	**Status: Resolved / Confirmatory Item** The applicant agreed to clarify to add the term “document” to flowchart where appropriate.
7.2.7-11	4-20-17	None	The staff found that the NuScale Instrument Setpoint Methodology technical report was not classified as incorporated by reference (IBR). This report must be reclassified as an IBR	**Status: Open** The staff will issue a RAI on this item. The applicant agreed that the technical report must be identified as an IBR document in the DCD.
7.2.7-12	4-20-17	None	During the 4/20/17 public meeting, the staff requested the applicant to provide: 1. Definition of Channel Check 2. What is the frequency stated in the applicant’s setpoint frequency program. 3. The terms “parameters” and “variables” are loosely used in the application. Need better definitions.	**Status: Open** The applicant agreed to provide this information in support of a future public meeting.
7.2.7-13	4-20-17	TR-48	During the 4/20/17 public meeting, the staff requested the applicant to add a statement on Section 5.8 to refer to Table 5-1.	**Status: Resolved / Confirmatory Item** The applicant agreed to add the statement suggested by the staff in the technical report.
7.2.7-14	4-20-17	7.2-39	During the 4/20/17 public meeting, the staff requested the applicant to modify the following statement in the DCD to state that the setpoint calculations in the technical report are “calculated setpoints.” *The methodology includes uncertainty and setpoint calculations. The detailed setpoint calculation processes for the MPS are described in the NuScale Power, LLC, TR-616-49121 "NuScale Instrument Setpoint Methodology Technical Report," (Reference 7.2-27) and may change according to the plant-specific data.*	**Status: Resolved / Confirmatory Item** The applicant agreed to modify the DCD to state that the setpoint calculations in the technical report are “calculated setpoints.”

Tier 2, Section 7.2.10, “Interaction Between Sense and Command Features and Other Systems”				
No.	**Date**	**Page**	**Staff’s Comment**	**Status**

7.2.10-1	4-11-17	7.2-47	Section 7.2.10, "Interaction between Sense and Command Features and Other Systems," states that: "*The MCS uses a median signal select algorithm to prevent a single failure in MPS from causing a transient in the control system that would require a protective action*." Explain what testing has been performed to verify that this control algorithm will not prevent a protective action when needed? .	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. No further actions are needed.
7.2.10-2	4-11-17	7.2-48	Section 7.2.10, "Interaction between Sense and Command Features and Other Systems," states that: "*When one signal is good, then the process controller uses that signal*." Who makes the determination when one signal is good (i.e., MCS or the operator)? If MCS, what would it use as the basis for the determination and would the operator be informed of the decision reached by MCS?	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. No further actions are needed.
7.2.10-3	4-11-17	7.2-48	Section 7.2.10, "Interaction between Sense and Command Features and Other Systems," states that: "*When three inputs are determined to be good, the median signal is transferred as the input to the control process.*" Who makes the determination when one signal is good (i.e., MCS or the operator)? If MCS, what would it use as the basis for the determination and would the operator be informed of the decision reached by MCS?	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. No further actions are needed.
7.2.10-4	4-11-17	7.2-48	Section 7.2.10, "Interaction between Sense and Command Features and Other Systems," states that: "*If one of the input signals is tagged as bad, then an average of the two remaining signals is used as the input to the control process*." a. Why the average? b. The above question also applies to the following statement later in the section: "*When two of the four signals are bad, the MCS will use the average value of the remaining two valid inputs*."	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. No further actions are needed.

7.2.10-5	4-11-17	7.2-48	Section 7.2.10, "Interaction between Sense and Command Features and Other Systems," states that: "*When two of the inputs are marked as bad, the one remaining good signal is used by the control process*." a. Will the operator be informed by MCS during such scenario as it does not seem to support the single-failure criteria? b. The above question also applies to the following statement later in the section: "*When a single value is good, MCS uses the value of the single good input for control*."	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. No further actions are needed.

Tier 2, Section 7.2.12, "Automatic and Manual Control"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.2.12-1	4-11-17	7.2-50	Section 7.2.12.2, "Manual Control" states that: "*If enabled by the operator using the safety-related enable nonsafety control switch, the capability for manual component level control of ESF equipment is possible using nonsafety discrete hard-wired inputs from the MCS to the HWM*." a. How feasible is it to inadvertently actuate this switch? b. How will operators in the control room be made aware of a mis-positioned switch? The above question also applies to the "Override" switch discussed later in this section.	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. The applicant stated that the enable nonsafety control switch would be covered by administrative controls. The applicant also stated that operators in the control room will be made aware of a mis-positioned switch via an alarm. No further actions are needed.
7.2.12-2	4-11-17	7.2-51	Section 7.2.12.2," Manual Control" states that: "*There are two MCR isolation switches for each NPM that when repositioned, isolate the MPS manual actuation switches and the enable nonsafety switch for each NPM's MPS in the MCR to prevent spurious actuation of equipment due to fire damage*." Are there any switches that need to be repositioned to allow control from the RSS if the MCR needs to be abandoned due to a fire or similar causes?	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. This item is covered in Chapter 18 of the DCA. No further actions are needed.

Tier 2, Section 7.2.14, "Human Factors Considerations"				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
7.2.14-1	4-11-17	7.2-58	Section 7.2.14.1," Module Protection System," states that: "*Valve position, for example, is shown on SDIS displays and allows an operator to identify safety valves in motion or in the safety position*." Are there any equivalent indications provided to the operators when equipment is out-of-service? c. How feasible it is to inadvertently actuate this switch? d. How will operators in the control room be made aware of a mis-positioned switch? e. The above question also apply to the "Override" switch discussed later in this section.	**Status: Resolved/Closed** The applicant clarified this item at the 4/18/17 public meeting. This item is covered in Chapter 18 of the DCA. No further actions are needed.

Technical Report: Nuclear Steam Supply System Advanced Sensor				
No.	**Date**	**Page**	**Staff's Comment**	**Status**
TR-AS-1	4-11-17	TR-8	Section 2.0, "Background," paragraph five, describes the type of cable to be used in containment. Why does the setpoint methodology have assumption 5.4? Intermediate range (IR) value/foot of cable should either be purchased via purchase specifications or calculated in setpoint calculation (which would require an IR methodology).	**Status: Resolved / Confirmatory Item** The applicant clarified this item at the 4/20/17 public meeting (see Status to Item 7.2.7-4).
TR-AS-2	4-11-17	TR-9	Section 2.2, "Spares," discusses new algorithm. Is this algorithm established in Chapter 15? Is it needed for a setpoint calculation? Is it addressed in Technical Specifications?	**Status: Resolved/Closed** The applicant clarified this item at the 4/20/17 public meeting. The design is in phase 2. This item will be evaluated at a later phase of the four-phase process for sensor selection. No further actions are needed.
TR-AS-3	4-11-17	TR-10	Need explanation for several assumptions. For example, the maintenance assumptions in Section 2.3, "Maintenance Assumptions:" The applicant needs to clarify which items are assumptions, background, or design guidance in Section 2.4	**Status: Resolved / Confirmatory Item** The applicant agreed to clarify in the technical report which assumptions are valid for the methodology vs the assumptions related to the sensors.
TR-AS-4	4-11-17	TR-15	The note above Table 4-1, "Temperature sensor list," conflicts with the quantity listed in Table 4-1. **Note:** The exact number of T_{hot} and T_{cold} RTDs in the RCS will be determined at later time after completion of CFD analysis and placement study.	**Status: Resolved/Closed** The applicant clarified this item at the 4/20/17 public meeting. This item will be evaluated during Phase 3 of the four-phase process for sensor selection. No further actions are needed.

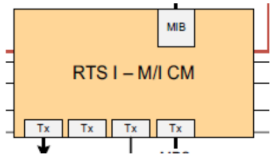
TR-AS-5	4-11-17	TR-19	Why don't temperature and radiation impact the statements made in Sections 4.1.3.2, "Location," and 4.1.3.3, "Installation," concerning no reactor pressure vessel environment effects on resistance temperature detectors (RTDs)?	**Status: Resolved/Closed** The applicant clarified this item at the 4/20/17 public meeting. The RTDs will undergo equipment qualification during Phase 4 of the four-phase process for sensor selection. No further actions are needed.
TR-AS-6	4-11-17	TR-20	Section 4.1.3.4, "Maintenance, provides more information on cross-calculation of RTDs." In Section 4.1.4, "Future Work," discuss how it pertains to information needed by the guidance from DSRS Section 7.2.15, "Calibration and Testing," item 6.	**Status: Resolved / Confirmatory Item** The applicant agreed to include in Section 4.1.4, "Future Work," how it pertains to information needed by the guidance from DSRS Section 7.2.15.

Resolution of Editorial Comments: NuScale's Design Certification Application (DCA)

Category: Editorial Comments			
No.	**Date**	**Editorial Comment**	**Response/Status**
E-1	4-11-17	Several places in Chapter 6 of the DCA references the term "Class 1E" equipment or instrumentation. For example, • Section 6.2.1.7 references Class 1E instruments. • Section 6.2.4.2.2.3, Page 6.2-34, last paragraph, states, in part, that "*each secondary system containment isolation valve (SSCIV) has remote Class 1E position indication in the main control room*." The term "Class 1E" should be replaced with "safety-related." Update the DCA accordingly.	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.

Category: Editorial Comments			
E-2	4-11-17	Section 7.1.1.2.1 (Protection Systems): This section states that: "The MPS Separation Groups A, C, and Division I equipment are located in rooms on the 75'-0" elevation of the Reactor Building (RB) and Separation Groups B, D, and Division II equipment are located on the 86'-0" elevation (see Figure 1.2-13 and Figure 1.2-14, respectively)." In addition, it states "The NMS Separation Group A and C signal processing equipment is located in the MPS Separation Group A and C (Division I) equipment rooms on the 75'-0" elevation of the RB, and NMS Separation Group B and D signal processing equipment is located in the MPS Separation Groups B and D (Division II) equipment rooms on the 86'-0" elevation of the RB (see Figure 1.2-13 and Figure 1.2-14, respectively). The texts refer to the incorrect figure numbers in Tier 2, Chapter 1. Correct the text as follow (deleted text is shown in red and added text is shown in blue): "…(see Figure 1.2-1~~3~~4 and Figure 1.2-1~~4~~5, respectively."	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.
E-3	4-11-17	Section 7.2.2.1, "Instrumentation and Controls Qualification": This section states that: "Protection from natural phenomena for the MPS and NMS-excore processing electronics is provided by the location of the MPS and NMS-excore cabinets in the reactor building on the 75'-0" and 86'-0" elevations (Figures 1.2-13 and 1.2-14, respectively) which is a Seismic Category I, reinforced concrete structure." The text refers to the incorrect figure numbers in Tier 2, Chapter 1. Correct the text as follow (deleted text is shown in red and added text is shown in blue): "…(see Figure 1.2-1~~3~~4 and Figure 1.2-1~~4~~5, respectively."	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.
E-4	04-18-17	Section 7.0.4.1.3, "Engineered Safety Feature Actuation System" states that: "*For the pressurizer heater, the undervoltage trip circuit is de-energized, and the shunt trip circuit is energized*." In addition, Note 3 of Figures 7.1-1ad, "Reactor Trip Breaker Division I A" to 7.1-1an, "Pressurizer Heater Breaker Trip Backup Heater B" states that: T*HE SHUNT TRIP COIL IS NORMALLY DE-ENERGIZED; WHEN THE SHUNT TRIP RELAY IS DE-ENERGIZED, SHUNT TRIP COIL IS ENERGIZED TO TRIP THE BREAKER OPEN."* Discuss power source of the Shunt Trip Coil. Update the DCA accordingly.	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.

Category: Editorial Comments			
E-5	04-18-17	Add statement to Section 7.2.13.3, "Remote Shutdown Station" to state the use of control transfer devices in the remote shutdown station should initiate an alarm in the main control room. Update the DCA accordingly.	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.
E-6	04-18-17	Table 7.1-1: Module Protection System Design Basis Events has a duplicate for the "Decrease in Feedwater Temperature," event. Correct the text as follow (deleted text is shown in red and added text is shown in blue):: "~~Decrease~~ Increase in Feedwater Temperature."	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.
E-7	04-18-17	Add a note to Figure 7.0-1, "Overall Instrumentation and Controls System Architecture Diagram" to state that the Maintenance WorkStation and the MPS Gateway are nonsafety-related.	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.
E-8	04-18-17	Add a note to Figure 7.0-1, "Overall Instrumentation and Controls System Architecture Diagram to discuss the bidirectional signals on backplane for the MPS segment.	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.
E-9	04-18-17	Remove the Wide-range containment pressure parameter from Table 7.1-13, "Effects of Digital-Based Common Cause Failure of Level Function Type on Sensor Block I." Table 7.1-9, "Sensor Inputs to Module Protection System," lists this sensor as a Digital Sensor Type/Nonsafety-Related.	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.

Category: Editorial Comments			
E-10	04-18-17	Add "SPARE" to the remaining ISM input in Figure 7.0-10, "Module Protection System Gateway Diagram."	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.
E-11	04-18-17	Figure 7.0-5, "Separation Group A and Division I Reactor Trip System and Engineered Safety Features Actuation System Communication Architecture," mislabeled the "RTS – I M/I CM."  Correct the text in the figure as follow (deleted text is shown in red and added text is shown in blue): "RTS – I M~~/~~IB CM"	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed with this proposed change.
E-12	04-20-17	ITAAC No. 1 of Table of Table 2.5-7, "Module Protection System and Safety Display and Indication System Inspections, Tests, Analyses, and Acceptance Criteria," states in part that: "*The MPS design and software are implemented using a quality process composed of the following software lifecycle phases, with each phase having outputs which satisfy the requirements of that phase.*" However, the lifecycle processes seems to be a system/design lifecycle. Update the DCA accordingly.	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed the lifecycle shown in the ITAAC table is a system/design lifecycle. The applicant agreed to modify the ITAAC and the DCA to correct this inconsistency.

Category: Editorial Comments

E-13	04-20-17	Table 2.5-6, “Important Human Actions Controls,” of Tier 1 has four components with no Tag Numbers.	**Status: Resolved / Confirmatory Item** In the 04-18-17 public meeting, the applicant agreed to update Table 2.5-6 to provide the Tag Numbers of the referenced four components.

Tag No.	Component Description	Operation
CFDS Emergency Flooding		
NA	Enable nonsafety control switch	Enable
NA	Containment isolation system bypass enable switch	Enable bypass

CVCS Injection Following Containment Isolation		
NA	Enable nonsafety control switch	Enable
NA	Containment isolation system bypass enable switch	Enable bypass

Meeting Agenda

Tuesday, April 18, 2017

Time	***Topic***	***Speaker***
8:30-10:30	NuScale I&C Architecture (OPEN)	NuScale
10:30-10:45	Break	
10:45-11:15	Discussion of Staff's Questions (OPEN)	NRC/NuScale
11:15-11:30 am	Opportunity for Public Comment	Public
11:30-1:00 pm	Lunch/Break	
1:00-2:30 pm	NuScale I&C Architecture (OPEN)	NuScale
2:30-2:45 pm	Break	
2:45-4:30 pm	Discussion of NRC Staff Questions (OPEN)	NRC/NuScale

Thursday, April 20, 2017

Time	***Topic***	***Speaker***
8:30-10:30	NuScale I&C Architecture (OPEN)	NuScale
10:30-10:45	Break	
10:45-11:15	Discussion of Staff's Questions (OPEN)	NRC/NuScale
11:15-11:30 am	Opportunity for Public Comment	Public
11:30-1:00 pm	Lunch/Break	
1:00-2:30 pm	NuScale I&C Architecture (CLOSED)	NuScale
2:30-2:45 pm	Break	
2:45-4:30 pm	Discussion of NRC Staff Questions (CLOSED)	NRC/NuScale

Enclosure 2

LIST OF ATTENDEES

April 18, 2017

NAME	AFFILIATION
Jeff Kosky	NuScale
Rufino Ayala	NuScale
Darrell Gardner	NuScale
Brian Gardes	NuScale
Jason Pottorf	NuScale
Jennie Wike	NuScale
Steve Mirsky	NuScale (Phone)
Gary Hawkins	Ultra electronics
Luis Betancourt	NRC/NRO
Dinesh Taneja	NRC/NRO
Brian Arnholt	NuScale
Steve Pope	NuScale
Joe Ashcraft	NRC/NRO
Derek Halverson	NRC/RES
Ian Jung	NRC/RES
Chris Summer	Holtec
Warren Odess-Gillet	Westinghouse
Sam Lee	NRC/NRO
Dawnmatthews Kalathiveettli	NRC/NRO
Yaguang Yang	NRC/NRO
Sergiu Basturescu	NRC/NRO
Omid Tabatabai	NRC/NRO

April 20, 2017

NAME	AFFILIATION
Jeff Kosky	NuScale
Rufino Ayala	NuScale
Darrell Gardner	NuScale
Brian Gardes	NuScale
Jason Pottorf	NuScale
Steve Pope	NuScale
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Tristan Grover	NuScale
Brandon Hansen	NuScale
Karl Gross	NuScale
Paul Butchart	NuScale
Joe Ashcraft	NRC/NRO
Derek Halverson	NRC/RES
Ian Jung	NRC/RES
Chris Summer	Holtec
Warren Odess-Gillet	Westinghouse
Sam Lee	NRC/NRO
Dawnmatthews Kalathiveettli	NRC/NRO
Yaguang Yang	NRC/NRO
Sergiu Basturescu	NRC/NRO
Gary Hawkins	Ultra Electronics
Dinesh Taneja	NRC/NRO
Boyce Travis	NRC/NRO
Clinton Ashley	NRC/NRO
Luis Betancourt	NRC/NRO
Craig Harbuck	NRC/NRO
Andrea Kim	NRO/DCIP
Ashley Ferguson	NRO/DCIP
Aaron Armstrong	NRO/DCIP
Paul Prescott	NRC/DCIP
Omid Tabatabai	NRC/NRO