POLICY ISSUE
(Information)

April 5, 2021 SECY-21-0039

FOR: The Commissioners

FROM: Margaret M. Doane
Executive Director for Operations

SUBJECT: ELIMINATION OF THE SHIFT TECHNICAL ADVISOR FOR THE NUSCALE DESIGN

PURPOSE:

The purpose of this paper is to inform the Commission of (1) NuScale Power LLC's (NuScale's) proposal to eliminate the shift technical advisor (STA) position from its control room staff and (2) the U.S. Nuclear Regulatory Commission (NRC) staff's performance-based approach for approving NuScale's proposal, which constitutes a first-of-a-kind approach to control room staffing and represents a shift from existing agency and industry practices, with implications for Commission policy. This paper does not address any new commitments or resource implications.

SUMMARY:

The NRC established the STA position as a short-term action following the accident at Three Mile Island Nuclear Station, Unit 2 (TMI-2), to improve the ability of the on-shift operating crew to recognize, diagnose, and effectively respond to plant transients and abnormal conditions. The long-term actions resulting from the accident at TMI-2 were to improve the qualifications of shift managers and senior operators and upgrade the human-machine interfaces in the main control room.[1] However, even with the completion of the long-term actions, the Commission

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[1] NUREG-0737, *Clarification of TMI Action Plan Requirements*, Enclosure 3, Clarification Item I.A.1.1, "Shift Technical Advisor," page 3-3 (November 1980) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML051400209).

and the NRC staff supported the continued use of the STA position to provide engineering and accident assessment capability and enhance plant safety.[2]

In Topical Report (TR)-0420-69456, Revision 1, "NuScale Control Room Staffing Plan," dated December 17, 2020 (ADAMS Accession No. ML20352A473), NuScale proposed to use a minimum control room staffing plan for its small modular reactor design that does not include the STA position. Specifically, NuScale proposed to eliminate the STA position based on its design's upgraded control room interfaces, reduced reliance on operator actions, and the industry-led upgrades to the qualifications of shift managers and senior reactor operators (SROs) in accordance with TMI-2 long-term actions.

In its safety evaluation (SE) (ADAMS Accession No. ML21007A270 (non-public), ML21012A363 (public)) of TR-0420-69456, Revision 1, the staff has determined that the STA role is not necessary for the safe operation of a NuScale plant. The staff based this determination on the following:

- the staff's review of the results of a control room staffing validation test;
- the staff's review of a task analysis for control room operators;
- features of the control room human-system interface (HSI) design;
- a reduced reliance on operator actions;
- training program requirements for licensed operators at a NuScale plant;
- the availability of a second SRO to assist the control room supervisor (CRS); and
- ample time to ask for assistance from other off-shift resources without challenging plant safety functions.

While the staff's finding in its SE of TR-0420-69456, Revision 1, applies only to the NuScale design, the staff anticipates future requests for reviews of staffing plans that do not include an STA. In its review of such staffing plans, the staff expects to apply a similar framework to that used in its review of NuScale TR-0420-69456, Revision 1. This paper describes that framework in further detail.

BACKGROUND:

Following the accident at TMI-2, on March 28, 1979, the NRC staff conducted several studies to determine why the accident occurred and what could be done to prevent the recurrence of the same or a similar accident. These studies concluded, among other things, that a number of actions should be taken to improve the ability of the shift operating personnel to recognize, diagnose, and effectively deal with plant transients or other abnormal events. To address the recommended improvements, the NRC initiated short-term and long-term actions. One short-term action required each nuclear power plant to have on duty by January 1, 1980, a qualified person, the STA, with a bachelor's degree or equivalent in a science or engineering

[2] Commission Policy Statement on Engineering Expertise on Shift, 50 Fed. Reg. 43,621–43,623 (October 28, 1985); Education for Senior Reactor Operators and Shift Supervisors at Nuclear Power Plants; Policy Statement, 54 Fed. Reg. 33,639–33,641 (August 15, 1989); SECY-93-193, *Policy on Shift Technical Advisor Position at Nuclear Power Plants*, (July 13, 1993, ADAMS Accession No. ML12257A691).

discipline, and with specific training in the plant's response to off-normal events and in accident analysis of the plant. The agency communicated this requirement to all operating nuclear plants in a letter from H.R. Denton dated October 30, 1979 (ADAMS Accession No. ML093421099). The NRC published guidance on the STA requirement through NUREG-0578, "TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations," issued July 1979 (ADAMS Accession No. ML090060030), and later clarified the STA requirement in NUREG-0737, Section I.A.1.1. The NRC mandated implementation of the guidance in NUREG-0578 and NUREG-0737 through plant-specific confirmatory orders.[3]

The NRC intended the STA to serve in an advisory capacity to the shift supervisor (i.e., shift manager) to provide additional technical and analytical support for the operations staff and to advise the shift supervisor on actions to terminate or mitigate the consequences of abnormal events or accident conditions.[4] The STA reports to the shift supervisor during off-normal plant conditions in an advisory capacity. At a multiunit site, the STA may serve more than one unit. The shift supervisor can direct the STA to work in the control room or in the onsite technical support center, or to work as a liaison between technical support personnel and the shift supervisor.[5] With regard to the role and responsibilities of the STA, NUREG-0578 states that "when assigned as shift technical advisor, these personnel are to have no duties or responsibilities for manipulation of controls or command of operations."

The NRC originally established the STA role as an interim measure to increase the technical capability of the on-shift staff until long-term actions were complete, as stated in NUREG-0737:

> The need for the STA position may be eliminated when the qualifications of the shift supervisors and senior operators have been upgraded and the man-machine interface in the control room has been acceptably upgraded. However, until those long-term improvements are attained, the need for an STA program will continue.

The NRC never promulgated guidance or criteria specifying the level of upgrading required for licensed operators and the control room interfaces that would be acceptable to the NRC for eliminating the STA position. However, in the years following the accident at TMI-2, the NRC amended requirements and published guidance related to operator qualifications and control room interfaces, which are described in detail below.

Improvements to Licensed Operator Qualifications after the Accident at TMI-2

The Commission approved additional experience requirements for SROs, more extensive use of simulators in training, greater NRC involvement in administering initial licensing and requalification examinations, and increased the passing grade for the written examination for prospective operators.[6] On March 14, 1985, the NRC endorsed accreditation by the

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[3] The NRC published plant-specific confirmatory orders for post-TMI-related issues in the *Federal Register* (*see, e.g.*, Baltimore Gas and Electric Co. (Calvert Cliffs Nuclear Power Plant, Units No. 1 and 2); Order Confirming Licensee Commitments on Post-TMI Related Issues, 46 Fed. Reg. 37,573 (July 21, 1981).

[4] NUREG-0578, Appendix A, Section 2.2.1.b, "Shift Technical Advisor," pp. A-49–A-50.

[5] NUREG-0737, Enclosure 3, Clarification Item I.A.1.1, page 3-3.

[6] Memo from Samuel J. Chilk to Lee V. Gossick, dated April 30, 1979 (ADAMS Accession No. ML19248C214), SECY-79-330 (May 14, 1979, ADAMS Accession No. ML12236A758), SECY-79-330A (May 29, 1979, ADAMS Accession No. ML12236A759), SECY-79-330B (June 12, 1979, ADAMS Accession No. ML12236A760), SECY-79-330C (July 2, 1979, ADAMS Accession No.ML12236A761), SECY-79-330D (July 5, 1979, ADAMS

Institute of Nuclear Power Operations (INPO) of training programs with the assumption that accredited programs "will provide appropriately qualified personnel."[7] By 1987, the NRC had established requirements concerning operator licensing, licensed operator requalification, and plant-referenced simulators in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' licenses." In April 1993, the NRC published its final rule on training and qualification of nuclear power plant personnel.[8] The NRC continues to recognize INPO accreditation to meet the requirement in 10 CFR 55.31(a)(4) for a "Commission-approved training program" that is based on a systems approach to training (SAT).

Improvements to Control Room Interfaces after the Accident at TMI-2

The staff published guidance for reviewing control room designs and identifying and correcting design deficiencies in order to bring control rooms into compliance with human factors engineering (HFE) principles (NUREG-0700, "Human-System Interface Design Review Guidelines," first published in 1981). The staff also published guidance for the design of the safety parameter display system to assist control room operators in evaluating the plant safety status and aid in the rapid detection of abnormal operating conditions (NUREG-0696, "Functional Criteria for Emergency Response Facilities," issued February 1981). In January 1982, the NRC established requirements in 10 CFR 50.34, "Contents of applications; technical information," for the control room to have a design that reflects state-of-the-art human factors principles and a safety parameter display console to provide operators information about the safety status of the plant.[9]

In addition to publishing guidance and amending requirements related to control room interfaces and operator qualifications, the NRC also evaluated how the STA requirement was being implemented.[10] After several years of experience with the use of an STA at operating reactors, the Commission issued a policy statement on Engineering Expertise on Shift (50 FR 43621; October 28, 1985), which provided facility licensees with two options for providing engineering expertise on-shift: (1) continued use of a dedicated STA or (2) a combined SRO/STA. The Commission stated, "while it is the Commission's preference that licensees move toward the dual-role (SRO/STA) position, continuation of an approved STA program remains an acceptable option." The combined SRO/STA position is satisfied by assigning a licensed SRO with STA qualifications to the crew as one of the required on-shift SROs,[11] preferably as the shift manager. The policy statement also updated the STA qualifications as follows:

Accession No. ML12236A762), SECY-79-330E (July 30, 1979, ADAMS Accession No. ML12236A763), SECY-79-330F (September 11, 1979, ADAMS Accession No. ML12236A764), Memo from Samuel J. Chilk to Lee V. Gossick, dated November 27, 1979 (ADAMS Accession No. ML051660025).

[7] Commission Policy Statement on Training and Qualification of Nuclear Power Plant Personnel, 50 Fed. Reg. 11,147–11,148 (March 20, 1985).

[8] Commission Policy Statement on Training and Qualification of Nuclear Power Plant Personnel, 58 Fed. Reg. 21,904–21,912 (April 26, 1993); *see* 10 CFR 50.120, "Training and qualification of nuclear power plant personnel."

[9] Part 50—Domestic Licensing of Production and Utilization Facilities, 50.34(f) Additional TMI-Related Requirements (47 FR 2301–2302; January 15, 1982).

[10] IE Circular 81-04, "The Role of Shift Technical Advisors and Importance of Reporting Operational Events," dated April 30, 1981, https://www.nrc.gov/reading-rm/doc-collections/gen-comm/circulars/1981/cr81004.html; NUREG/CR-3396, *Experience with the Shift Technical Advisor Position* (March 1984).

[11] 10 CFR 50.54(m)(2)(i).

> Trained according to NUREG-0737, Item I.A.1.1 with one of the following education alternatives:
>
> 1. Bachelor's degree in engineering from an accredited institution;
>
> 2. Professional Engineer's [PE] license, obtained by the successful completion of the PE examination;
>
> 3. Bachelor's degree in engineering technology from an accredited institution, including course work in the physical, mathematical, or engineering sciences; or
>
> 4. Bachelor's degree in a physical science from an accredited institution, including course work in the physical, mathematical, or engineering sciences.[12]

In this same policy statement, the Commission acknowledged that long-term initiatives had resulted in "an improvement in the capabilities and qualifications of the shift crew and their ability to diagnose and respond to accidents."

In 1989, after considering a proposal to make a degree mandatory for SROs, the Commission issued a policy statement on education needs for SROs and shift supervisors at nuclear power plants that urged "nuclear plant licensees to continue to develop and implement programs that permit operating personnel to obtain college degrees from accredited institutions." It added the following:

> The Commission reaffirms its position, set forth in the Policy Statement on Engineering Expertise on Shift, that it is important to have engineering and accident assessment expertise available to the operating crew at all nuclear power plants. The STA has proven to be a worthwhile addition to the operating staff by providing an independent engineering and accident assessment capability, and we support continuation of this position.[13]

In SECY-93-193, the staff discussed the achievement of long-term efforts related to the STA position, such as the implementation of symptom-based emergency operating procedures, the SAT-based process for operator training programs, and the incorporation of much of the STA training program material into SRO training programs. With regard to the STA position, the staff stated the following in SECY-93-193:

> The staff believes that the need for an assigned STA at individual reactor sites remains and should be considered with respect to the primary goal of maintaining a control room staff organization that is effective in responding to plant events….
>
> The staff also believes that NRC and industry long-term initiatives have collectively led to significant improvements in on-shift engineering expertise, including the capabilities, training, and qualifications of the shift crews and their ability to diagnose and respond to events.

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[12] Commission Policy Statement on Training and Qualification of Nuclear Power Plant Personnel, 50 Fed. Reg. 11,147–11,148 (March 20, 1985).

[13] Education for Senior Reactor Operators and Shift Supervisors at Nuclear Power Plants; Policy Statement, 54 Fed. Reg. 33,639–33,641 (August 15, 1989).

Currently, all operating power reactors in the United States have an STA on-shift, and the STA is required to have either PE license or a Bachelor of Science degree in engineering, engineering technology, or physical science. The position may be standalone or combined with one of the required on-shift SRO positions. The STA does not need to be a licensed SRO, but many utilities use licensed SROs to fill the STA position. In addition to providing independent assessment during abnormal and emergency conditions, many licensees use the STA to perform independent reviews of technical specification operability, reportability evaluations, emergency plan declarations, and risk assessments. Licensee technical specifications often incorporate the STA position. Under 10 CFR 50.120, STA training programs must be based on a SAT as defined by 10 CFR 55.4, "Definitions."

DISCUSSION:

NuScale's Approach

In TR-0420-69456, Revision 1, NuScale proposes to operate up to 12 units with an on-shift staff of 2 SROs and 1 Reactor Operator (RO), at a minimum. In its proposed revised staffing plan, one of the SRO-licensed individuals performs the combined role of control room supervisor/shift manager and the second SRO-licensed individual is assigned to a RO-designated station, as either "RO 1" or "RO 2." NuScale proposes to eliminate the STA position because it believes the two conditions in which the STA position may be eliminated as stated in NUREG-0737 are met: (1) shift supervisor and senior operator qualifications and training programs have been upgraded by industry and include training on generic fundamentals, mitigating core damage, and transient and accident analysis, and (2) the NuScale control room was designed using human factors principles and is, therefore, upgraded.

NuScale states that the passive design features and lower operational complexity of its plant, which results in no required operator actions during design-basis events and only two operator actions that are considered important for the mitigation of beyond design-basis events, combined with the improvements to overall safety of the NuScale power plant reduce the need for the additional oversight that an STA would provide. NuScale also states that its validation testing and results demonstrate that operators are successful at recognizing and mitigating events using the NuScale control room HSI.

Staff's Approach and Considerations

The staff examined NuScale's proposal for eliminating the STA position to determine whether a designated person on each shift, with either a PE license or a degree in physical science, engineering, or engineering technology, to provide "an independent engineering and accident assessment capability" as described by Commission policy, is needed for a NuScale plant and/or is provided by an alternative means. The staff considered features of the NuScale control room HSIs that allow for accident assessment, the reduced reliance on operator actions at a NuScale plant, the results of task analysis and validation testing performed by NuScale, the availability of a second SRO on-shift, and the requirements and guidelines for licensed operator qualifications and training. The results of the staff's review are discussed in detail below.

(1) The NuScale Control Room Human-System Interface

As discussed in Chapter 18, "Human Factors Engineering," of the staff's final safety evaluation report (FSER) for the NuScale design certification application (ADAMS Accession No. ML20023B605), the staff concluded that the NuScale control room design reflects state-of-

the-art human factors principles in accordance with 10 CFR 50.34(f)(2)(iii). During a series of validation tests, the staff observed that test personnel could accurately interpret control room indications, understand the status of units, and identify actions to be taken. The staff also observed that the test personnel maintained high levels of situational awareness. The staff's observations were consistent with overall situational awareness measurements recorded by NuScale during their validation testing.

At operating reactors, a significant task that the STA performs is monitoring the status of the critical safety functions (CSFs) during abnormal and emergency events. Typically, the STA must analyze multiple distinct control room indications to determine the status of each CSF. In the NuScale design, CSF monitoring is automated and continuous. The control room HSI design provides "at-a-glance" assessment and helps operators quickly understand CSF status; control room operators do not need to scroll through multiple unit interfaces to view operational parameters or locate specific indications spread throughout the control room. The plant notification system alerts control room operators to changes in CSF status and operators can also view CSF status directly using dedicated displays at their workstations as well as at the standup workstation for each unit. These dedicated CSF displays subsequently direct operators to procedure steps for restoring CSFs from a computer-based network of emergency operating procedure instructions. During validation testing, the staff observed that the crew was able to accurately assess the CSFs well within the time established as the performance criterion for that task in the validation test scenario guides.

The staff concluded that the control room HSI displays and alarms for CSF monitoring serve as an acceptable alternative to a dedicated STA for assessing the status of CSFs during abnormal conditions because they allow the operators to rapidly verify CSF status for all units. In addition, the HSI directs operators on what actions to take to restore CSFs similar to how an STA would advise operators on what actions to take based on an assessment of CSF status.

The staff also observed that specific features of the NuScale HSI design enable the crew to identify when it is necessary to implement the emergency plan, assess adherence to the technical specifications, and select the proper procedures in the absence of an STA who is specifically trained in these duties. For example, a highly visible notification prompts the crew to assess whether an emergency action level (EAL) has been exceeded. Also, the emergency operating procedures are integrated into the HSI design and are symptom based, meaning that operators do not need to diagnose an event in order to respond to it. Rather, the operators implement procedures based on plant indications in the control room. The integration of plant procedures into the HSI automates the selection of applicable plant procedures and reduces the need for an STA to advise the CRS on the procedures to use in both normal and abnormal operating conditions. Therefore, the staff concluded that these HSI features help the crew to identify abnormal events and respond to them effectively, which reduces the need for a dedicated STA to perform that function at a NuScale plant.

(2) Reduced Reliance on Operator Actions

The NuScale design does not credit any operator actions to mitigate anticipated operational occurrences, infrequent events, or accidents associated with the transient and accident analyses in Chapter 15, "Transient and Accident Analyses," of the NuScale final safety analysis report. Automated actions place each NuScale Power Module in a safe state for at least 72 hours without operator actions even with assumed failures.[14] As part of the probabilistic risk

[14] NuScale Standard Plant Design Certification Application, FSER, Part 2, Tier 2, Chapter 15, Revision 5, Section 15.0.0.6.4, "Required Operator Actions" (July 2020, ADAMS Accession No. ML20224A504).

assessment for the NuScale design certification application, NuScale identified two risk-important human (i.e. operator) actions for the analyzed beyond-design-basis events. In Chapter 18 of the FSER, the staff found that these operator actions are relatively simple and require few steps. The staff also found that control room displays and alarms inform the operator of the status of the plant, and procedures direct the operators when to take these actions based on plant status.

The NRC initially intended the STA position to provide engineering expertise during abnormal operations to improve the effectiveness of the operating crew. The 1985 Commission Policy Statement on Engineering Expertise on Shift states the following:

> The Commission continues to stress the importance of providing engineering and accident assessment expertise on shift. In this Policy Statement, "accident assessment" means immediate actions needed to be taken while an event is in progress.

Because operators at a NuScale plant do not need to perform any operator actions for the design-basis transients and accidents, and there are no immediate operator actions for any of the analyzed beyond design basis events, the staff found that Commission policy on the function of the STA for accident assessment purposes is not applicable to the NuScale design.

(3) Revised Staffing Plan Validation and Task Analysis

The staff's review and audit of the revised staffing plan focused on whether the proposed minimum control room staffing could successfully accomplish the most demanding tasks under conditions that reflect real-world challenges, including the demands of multitasking. As documented in the staff's SE of TR-0420-69456, Revision 1, the staff reviewed both the methodology and the test results of the Revised Staffing Plan Validation (RSPV) test that NuScale conducted to demonstrate that its proposed complement of three licensed operators could safely operate the plant during challenging, high-workload conditions while maintaining workload within acceptable levels, maintaining adequate situational awareness of plant conditions, and demonstrating acceptable task performance. The staff also observed video recordings of the RSPV scenario test trials. The staff concluded the RSPV test method is acceptable, and the test results show that the staffing proposal is acceptable.

In support of the revised staffing plan, NuScale reassessed the tasks originally assigned to the STA position and found that the majority of the STA tasks were for oversight functions that were redundant to tasks assigned to the CRS position, such as "evaluate plant conditions during transients." NuScale determined that the CRS position could sustain the oversight tasks alone without impacting CRS workload because the position was already responsible for all oversight tasks, including those previously assigned to the STA. Tasks for emergency plan assessment and implementation were reassigned to the shift manager or to the CRS when functioning in the dual-role as CRS/shift manager. For most emergency plan tasks, the control room operators would also be able to rely on the emergency response organization for assistance. Tasks associated with administrative duties for nonemergency notifications were also reassigned to the shift manager or dual-role CRS/shift manager. If necessary, the crew can delay these types of tasks until it has time to address them. After reassigning the STA tasks to the shift manager, CRS, or dual-role CRS/shift manager, NuScale concluded that a three-person crew is adequate to support the task reassignments because of "the low number of tasks, the high amount of time available to identify and complete the tasks, and the redundant nature of how specific HFE tasks assigned to the CRS can also be peer checked by the second SRO on the crew." While

the CRS is primarily responsible for completing the tasks, the second SRO on-shift is qualified to complete the same CRS-designated tasks and can back up the CRS when necessary.

While reviewing video recordings of the RSPV test trials during an audit, the staff observed that the test personnel were able to perform the tasks that had been reassigned from the STA task list to them. For example, RO 2 performed safety function status checks. The task performance, workload, and situational awareness results of the RSPV test and a readiness assessment, in which NuScale tested the three-person model using the same scenarios that were used for validation of the six-person model, show that the tasks were completed successfully in these scenarios without the STA. Therefore, the test results support the elimination of the STA position by demonstrating that the tasks previously allocated to the STA can be performed by the other crew members while maintaining task performance, workload, and situational awareness at acceptable levels.

The staff concluded that the task analysis and RSPV test results support the elimination of a dedicated STA at a NuScale plant.

(4) Availability of the Second Senior Reactor Operator on Shift

The staff considered the significant role the STA has at operating reactors in advising or making recommendations to the CRS and shift manager. For example, the STA provides technical advice to the shift manager and the CRS on topics such as the implementation of the emergency plan, assessment of equipment operability and adherence to technical specifications, and proper procedure selection and implementation during abnormal events. In the revised staffing plan described in TR-0420-69456, Revision 1, the shift manager (when this person is different from the CRS) and the second SRO on-shift can assist or make recommendations to the CRS during normal operations and abnormal events. The second SRO on-shift receives the same training on the emergency plan, operability, and technical specifications as the SRO that functions in the CRS role.

While reviewing the RSPV test trials, the staff observed that the second SRO on-shift was available to assist the CRS in this capacity, and the SRO's workload as a crew member in the RO position did not preclude the SRO from acting in this backup role. Therefore, the staff concluded that the second SRO on-shift is qualified and available to perform independent assessment of abnormal events and provide advice to the CRS similar to the role of an STA.

Licensed Operator Training and Qualifications

One of the conditions of the topical report is that licensed operators at a NuScale plant will receive training on the math, physics, thermodynamics, and component design topics relevant to nuclear power plant operations. They will also receive training on mitigating core damage and various plant-specific topics, including transient and accident analysis. The NRC mandated these training topics for the STA position in the immediate aftermath of the TMI-2 accident.[15] Additionally, another condition of the topical report is that licensed operator training programs will comply with the applicable license operator training program requirements described in 10 CFR Part 55 and 10 CFR 50.120 for SAT-based training programs as defined in 10 CFR 55.4.

[15] *See* NUREG-0578, Appendix A, Section 2.2.1.b, page A-50. This guidance was mandated via plant-specific confirmatory orders.

The NRC also established simulator requirements after the accident at TMI-2 to help ensure that operators are trained to identify and respond to abnormal events. Therefore, licensed operators at a NuScale plant will also receive training to diagnose and respond to plant transients and accidents on either a plant-referenced simulator or a Commission-approved simulator. Applicants for an operator's license must pass an NRC examination, which includes an operating test administered in the simulator, to ensure they can effectively and competently operate the plant. Although the staff has not yet reviewed and approved the training program for a NuScale plant facility licensee, it will be an SAT-based program due to the existing regulations and, thus, will include job-specific training.

The staff concluded that training on generic fundamentals (i.e., math, physics, thermodynamics, and component design topics that are of specific relevance to the operation of a nuclear power plant) and mitigation of core damage, use of a plant-referenced simulator during training, and implementation of SAT-based training programs are significant improvements to operator training programs that have been implemented following the accident at TMI-2, and such additions would help provide assurance that operators will effectively identify and respond to abnormal events in the plant.

Current qualification standards do not require an SRO or RO to have a degree.[16] However, current qualification standards require an on-shift STA to have a technical degree or a PE license, similar to the STA education requirements. Therefore, the staff considered whether it was necessary to require one of the on-shift operators to have a technical degree or PE license. NuScale stated that the licensed operator training program requirements listed in the topical report provide sufficient engineering knowledge for a NuScale control room operator.[17] The staff determined it is not necessary for one of the on-shift operators to have either a PE license or a Bachelor of Science degree in engineering, engineering technology, or physical science because the HSI design features allow the operators to easily understand plant conditions and what actions to take, the operator training programs require demonstrating an understanding of engineering principles specific to nuclear power plant operations, and there is low operational complexity and no operator actions required for the analyzed accidents. Additionally, if operators are faced with a situation not covered by training or procedures, they have time, without challenging plant safety functions, to obtain engineering expertise from off-shift resources such as plant system engineers, reactor engineers, the emergency response organization, and other subject matter experts.

Potential Applicability of the Approach

The proposed staffing plan described in the topical report is applicable to a NuScale facility that meets the criteria listed in Section 1.5, "Conditions of Applicability," of the topical report. Other applicants and licensees may propose staffing plans that do not have an STA. The staff would consider such proposals on a case-by-case basis using similar criteria to those that the staff used to review NuScale's proposal to eliminate the STA position. Specifically, the staff would consider how plant and HSI design elements, the proposed staffing plan and the

[16] ACAD-10-001, "Guidelines for Initial Training and Qualification of Licensed Operators," is a proprietary document maintained by the National Academy for Nuclear Training and used for the accreditation of operator training programs. The NRC staff has reviewed ACAD-10-001, Revision 1, and found it acceptable for complying with the Commission's regulations for training and qualification of nuclear power plant personnel. The NRC endorsed use of ACAD-10-001, Revision 1, dated November 2016, in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Revision 11, (February 2017,ADAMS Accession No. ML17038A432).

[17] NuScale response to NRC Request for Additional Information No. 9789 on the NuScale standard design approval application, dated December 17, 2020 (ADAMS Accession No. ML20352A483).

associated concept of operations, as well as data from performance-based tests and task analyses, could affect the need for an STA.

CONCLUSION:

The staff recognizes that the STA position has been a valuable addition to the on-shift crew at operating reactors for over 40 years; however, the staff, using a performance-based approach, found that the following elements collectively support the elimination of the STA for a NuScale plant:

- the NuScale control room HSI design, which reflects state-of-the-art HFE principles and includes features that alert the crew when a CSF is challenged, a plant parameter has exceeded an EAL, and a system/component may be inoperable;

- the NuScale plant design, which reduces operational complexity (compared to operating reactors), does not require operator actions during design-basis events, and provides an overall improvement in safety;

- the results of the RSPV test, which have demonstrated that operators can interpret the indications provided on the HSI with adequate performance across a variety of measures;

- the availability of a second SRO on-shift who can provide advice, assistance and an independent assessment of events;

- the licensed operator training program, as detailed in the topical report, which prepares operators to effectively identify and respond to abnormal events in the plant; and

- the on-shift operators have time, without challenging plant safety functions, to get assistance from off-shift resources, if faced with a situation that is not covered by training or procedures.

NuScale has demonstrated that its proposed minimum staffing complement can perform successfully in challenging operational scenarios without the use of an STA. Given this combination of elements, the staff found that that the STA position is not necessary for the safe operation of a NuScale plant.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection.

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Date: 2021.04.05 09:53:28 -04'00'

Margaret M. Doane
Executive Director
for Operations

SUBJECT: ELIMINATION OF THE SHIFT TECHNICAL ADVISOR FOR THE NUSCALE DESIGN DATED: April 5, 2021

ADAMS Accession No.: ML21060A823 **SECY-012**

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