

March 9, 2021

Project No. 99902078

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Submittal of Presentation Materials Entitled "ACRS Presentation: NuScale Control Room Staffing Topical Report," PM-100281, Revision 0

The purpose of this submittal is to provide presentation materials to the NRC for use during the upcoming Advisory Committee on Reactor Safeguards (ACRS) meeting on March 16, 2021.

The enclosure to this letter is the nonproprietary presentation entitled "ACRS Presentation: NuScale Control Room Staffing Topical Report," PM-100281, Revision 0

This letter makes no regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions, please contact Jim Osborn at 541-360-0693 or at JOsborn@nuscalepower.com.

Sincerely,



Carrie A. Fosaaen
Director, Regulatory Affairs
NuScale Power, LLC

Distribution: Anna Bradford, NRC
Michael Snodderly, NRC
Michael Dudek, NRC
Getachew Tesfaye, NRC
Bruce Bovol, NRC

Enclosure: "ACRS Presentation: NuScale Control Room Staffing Topical Report," PM-100281, Revision 0

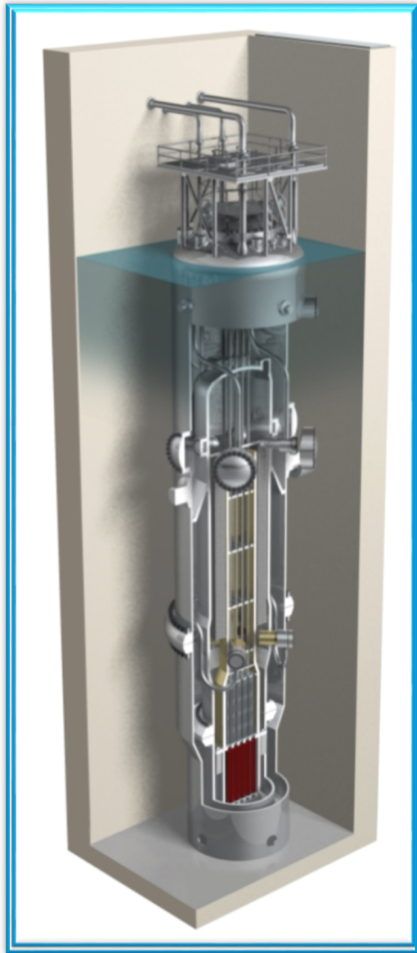
Enclosure:

“ACRS Presentation: NuScale Control Room Staffing Topical Report,” PM-100281,
Revision 0

ACRS Presentation

NuScale Control Room Staffing Topical Report

March 16, 2021



Presenters

Jim Osborn

Licensing Engineer 4

Doug Bowman

Plant Operations Supervisor

Patrick Leary

Senior Reactor Operator 5

Nadja Joergensen

Licensing Supervisor

Agenda

- Regulatory requirements
- Topical report purpose
- Topical report overview
- Design certification application (DCA) control room staffing
- Revised control room staffing
- Shift technical advisor (STA)
- Questions

Regulatory Requirements and Guidance

- NUREG-0800 Chapter 18
 - Appendix B- Methodology to Assess the Workload of Challenging Operational Conditions in Support of Minimum Staffing Level Review
- 10 CFR 50.54(m)
 - Minimum staffing requirements per shift for on-site staffing at nuclear power units
- 10 CFR 50.120(b)(2)(iii)
 - STA training program

Topical Report Purpose

- The topical report is intended to be used as an alternate method for a future licensee to establish minimum licensed operator control room staffing.
- A future license applicant will use the approved topical report as a technical basis to support an exemption request from:
 - 10 CFR 50.54(m), or
 - Other alternative control room staffing regulations (e.g., design certification rule)
 - And, 10 CFR 50.120(b)(2)(iii)
- This future licensee would adopt the control room staffing levels from the topical report as part of their Technical Specifications

Topical Report Timing

- Maintain same NRC Staff to review changes
 - Participated in multiple audits and visited the simulator several times
 - Knowledgeable on NuScale design
 - Familiar with the human system interface
 - Knowledgeable of the unique concept of operations
- Standard design application (SDA) to be submitted at a later date, and will incorporate by reference the topical report
- Provides pathway for future applicants to request exemptions and establish minimum staffing requirements

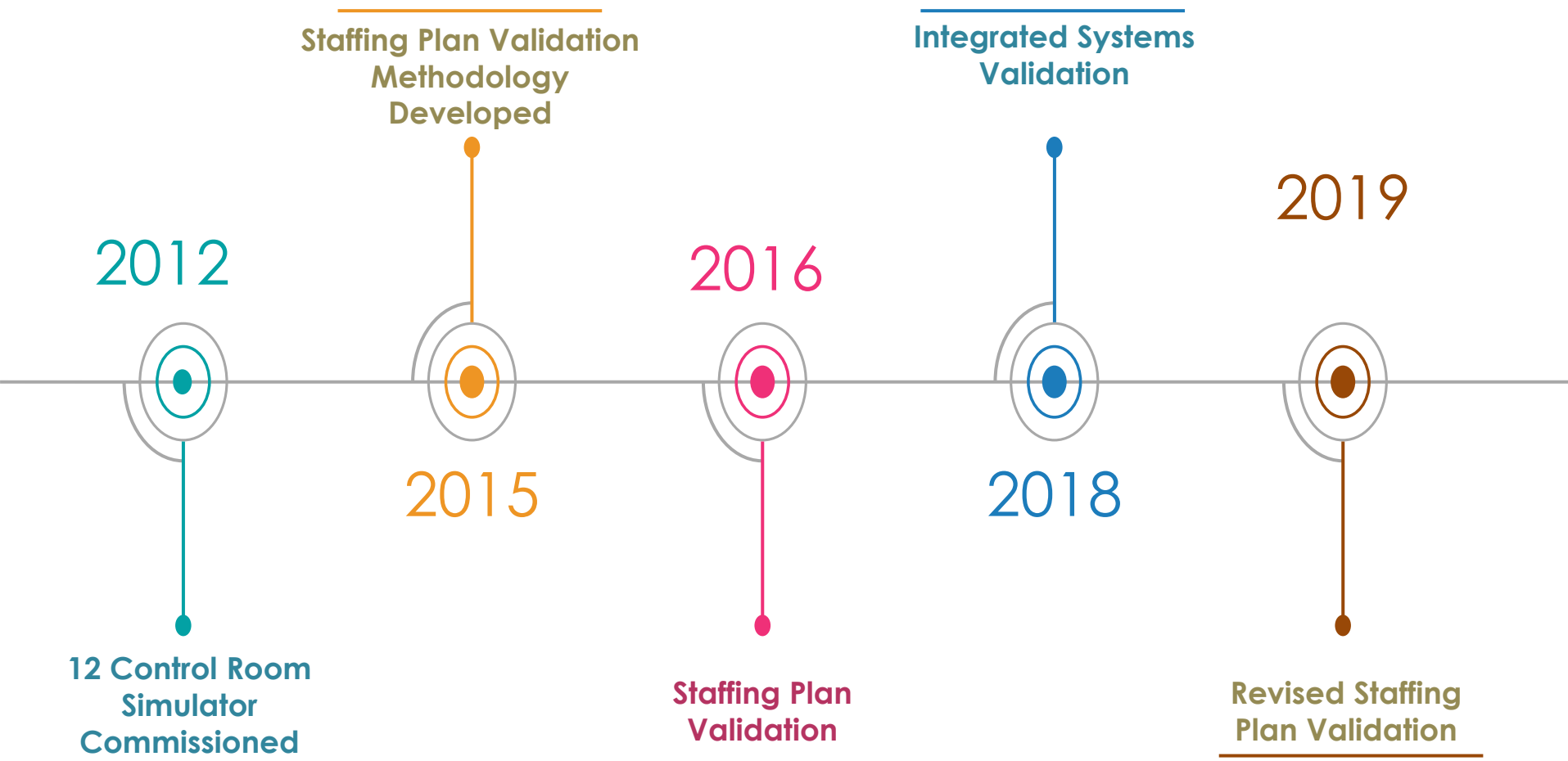
Contents of Topical Report

- Regulatory acceptance criteria and requirements
- Conditions of applicability
- Input to staffing plan from Human Factors Engineering Program
 - Task Analysis
 - Staffing and Qualification Analysis
- Analysis of the STA position
- Additional staffing considerations (RG 1.114 and senior reactor operator (SRO) oversight of refueling)
- Staffing Plan Validation (SPV) Trials
- Revised Staffing Plan Validation (RSPV) Trials

Key Referenced Documents

- Previously submitted documents
 - Human Factors Engineering Task Analysis Results Summary Report (no change)
 - Human Factors Engineering Staffing and Qualifications Results Summary Report (no change)
 - Control Room Staffing Plan Validation Methodology (no change)
 - Control Room Staffing Plan Validation Results (no change)
 - Concept of Operations (revised)
- New document for this topical report
 - Revised Staffing Plant Validation Test Report

HFE Timeline



DCA Control Room Staffing

- In 2016 NuScale completed a Staffing Plan Validation (SPV) to support the DCA
 - Performance-based evaluation of personnel using two crews of licensed operators
 - Verifies that a crew of 3 SROs and 3 ROs could safely operate the facility
 - NRC audited SPV activities, no significant open items identified
 - Demonstrated that the operator staffing validation methodology was sound



Regulatory Basis of Staffing Methodology

This validation was performed using the NuScale control room staffing plan validation methodology. This methodology was developed and conducted in accordance with the applicable NRC and other guidance contained in:

- NUREG-0800 Chapter 18 - Human Factors Engineering
- NUREG-0711 - Human Factors Engineering Program Review Model
- NUREG-1791 - Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)
- SECY-11-0098 - Operator Staffing for Small or Multi-module Nuclear Power Plant Facilities
- NUREG/CR-6838 - Technical Basis for Regulatory Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)
- Brookhaven National Laboratory Technical Report, “Methodology to Assess the Workload of Challenging Operational Conditions in Support of Minimum Staffing Level Reviews”

DCA Control Room Staffing

- DCA control room staffing requirements
 - DCA Part 7 proposes an alternative to 10 CFR 50.54(m) Control Room Staffing
 - Alternative staffing requirements to be codified in the design certification rule, applicable to applicants referencing the NuScale DC
 - Requirements implemented in Tech Spec 5.2.2

Number of Units Operating	Reactor Operator	Senior Reactor Operator
None	2	1
One to twelve	3	3

- Allowances for temporary deviations provided in Tech Specs

After Integrated System Validation (ISV)

Additional staffing analysis; trial scenarios on three-member crews

- Four of the most challenging and workload intensive ISV scenarios were tested on a three-member crew
- All ISV acceptance criteria were met in all cases
- Using a proven methodology it can be shown that nuclear safety can be assured with three licensed operators



Inception of Reduced Staffing Plan Validation

- Two SROs and an RO
- Elimination of the STA
- Utilized the same methodology as the original SPV



Revised Control Room Staffing

- The same methodology was used for the original Staffing Plan Validation (SPV) and the Revised Staffing Plan Validation (RSPV)
- Minor differences between the SPV and RSPV are described in the RSPV Test Report



Revised Control Room Staffing

- Revised Staffing Plan Validation
 - One (1) RO and two (2) SRO
 - Implemented in Tech Spec 5.2.2

Reactor Operator	Senior Reactor Operator
1	2

Roles and responsibilities of the crew are discussed later

Topical Report Conditions of Applicability

- The set of attributes that allow a license applicant to use the topical report staffing plan
- Two parts:
 - design features
 - license operator training program attributes
- Encompasses the staffing assumptions used by NuScale during validation activities
- Applicants will be required to show compliance by evaluation or demonstration

Topical Report Conditions of Applicability

- Design Features
 - No operator actions credited in design basis event (DBE)
 - Two, or less, important human actions (IHAs)
 - Easily recognizable
 - Can be completed from the main control room (MCR) by one operator
 - Human-system interface (HSI) design retaining the following features
 - Critical safety function and defense-in-depth monitoring and display, with direct links to response procedures
 - Tiered alarm scheme
 - Computer-based alarm response procedures directly linked to alarms
 - Twelve-module trend monitoring

Topical Report Conditions of Applicability

- License Operator Training Program Attributes
 - Developed using a systems approach to training (10 CFR 55)
 - Include math, physics, thermodynamics, and component design topics specifically relevant to operation of a nuclear power plant
 - Training for mitigating core damage
 - Plant specific training, including:
 - plant systems
 - plant specific reactor technology (including core physics data)
 - plant chemistry and corrosion control
 - reactor plant materials
 - reactor plant thermal cycle
 - transient/accident analysis
 - emergency procedures

Topical Report Conditions of Applicability

- Staffing assumptions used validation
 - Refueling operations and module assembly and disassembly not directed from the MCR
 - A work control center is available for work management
 - The crew compliment includes one non-licensed operator to act as a communicator during emergencies

Concept of Operations

- NuScale submitted a revised concept of operations to support the revised staffing plan of the topical report
- Minimum licensed operator staffing
 - Control Room Supervisor (CRS)
 - Reactor Operator 1 (RO1)
 - Additional Reactor Operator

Shift Technical Advisor

- STA requirement established after the TMI-2 accident as an interim measure
 - NUREG-0737 states that, “... 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.”
- The topical report presents how these two conditions have been met for the NuScale Power Plant

Shift Technical Advisor

- Upgrades to training of licensed operators
 - NUREG-0737 training requirements now incorporated:
 - developed using a systems approach to training (as required by 10 CFR Part 55)
 - Includes the (generic fundamental) math, physics, thermodynamics, and component design topics that are of specific relevance to the operation of a nuclear power plant
 - training for mitigating core damage
 - plant specific training, including:
 - » plant systems, plant specific reactor technology (including core physics data), plant chemistry and corrosion control, reactor plant materials, reactor plant thermal cycle, transient/accident analysis, emergency procedures
 - Completion of the training is required by NUREG-1021, and specifically delineated on “NRC Form 398, Personal Qualification Statement-Licensee”.

Shift Technical Advisor

- NuScale Control Room Upgrades
 - HSI features that provides 'at-a-glance' assessment of plant conditions and facilitates early detection of degrading conditions
 - condensed and easily viewable overview screens, safety function displays
 - ease of navigation
 - universal display of active processes
 - safety function monitoring integrated into the man-machine interface
 - emergency operating procedures are embedded into the interface and directly linked to the safety functions
 - active monitoring of emergency action levels in the emergency plan

STA – Additional Considerations

- Additional Considerations for NuScale Power Plants
 - advances in design features reduce the need for additional oversight
 - the use of passive safety features and lower operational complexity have resulted in no required operator actions for design basis events, as well as improvement in overall safety
 - the design only has two IHAs associated with beyond design basis events that have a very small probability of occurrence
 - both IHAs are simple, straight-forward actions that can be completed from the MCR by a single operator
 - these IHAs also have large time margins to complete tasks that historically would need to be performed without delay

Human System Interface



Questions?

Acronyms

CRS	Control Room Supervisor
DCA	Design Certification Application
HFE	Human Factors Engineering
HSI	Human System Interface
IHA	Important Human Actions
MCR	Main Control Room
NRC	Nuclear Regulatory Committee
RO	Reactor Operator
RSPV	Revised Staffing Plan Validation
SDA	Standard Design Application
SM	Shift Manager
SPV	Staffing Plan Validation
SRO	Senior Reactor Operator
STA	Shift Technical Advisor

Portland Office

6650 SW Redwood Lane,
Suite 210
Portland, OR 97224
971.371.1592

Corvallis Office

1100 NE Circle Blvd., Suite 200
Corvallis, OR 97330
541.360.0500

Rockville Office

11333 Woodglen Ave., Suite 205
Rockville, MD 20852
301.770.0472

Richland Office

1933 Jadwin Ave., Suite 130
Richland, WA 99354
541.360.0500

Charlotte Office

2815 Coliseum Centre Drive,
Suite 230
Charlotte, NC 28217
980.349.4804

<http://www.nuscalepower.com>

 [Twitter: @NuScale_Power](https://twitter.com/NuScale_Power)

