

September 15, 2015

Docket: PROJ0769

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 NuScale Preliminary Concept of Operations Summary and Response to NRC Questions on Control Room Activities (NRC Project No. 0769)

REFERENCES: 1. Email from Mark Tonacci (NRC) to Steven Mirsky (NuScale Power, LLC) entitled "Control Room Operation," dated June 3, 2015

NuScale Power, LLC (NuScale) hereby submits a summary of the preliminary concept of operations (Attachment 1), and a response to questions from the NRC to help clarify how the control room activities will be conducted (Attachment 2). The questions related to control room activities were contained in the referenced email. This letter makes no regulatory commitments and no revisions to any existing regulatory commitments.

This correspondence includes certain preliminary information which reflects the current stage of NuScale's analysis and may be subject to change.

Please feel free to contact Steven Mirsky at (301) 770-0472 or at smirsky@nuscalepower.com if you have any questions.

Sincerely,



Steven Mirsky
NuScale Power, LLC
Licensing Manager, Washington DC

Distribution: Frank Akstulewicz, NRC, TWFN-6C20
Greg Cranston, NRC, TWFN-6E7
Omid Tabatabai, NRC, TWFN-6E7
Mark Tonacci, NRC, TWFN-6E7

Attachment 1: "NuScale Preliminary Concept of Operations Summary"
Attachment 2: "Response to NRC Questions on Control Room Activities"

Attachment 1

NuScale Preliminary Concept of Operations Summary

NuScale has assumed an initial control room staffing of six licensed operators including at least three Senior Reactor Operators (SROs). The three SROs consist of a Shift Manager, Control Room Supervisor, and a Shift Technical Advisor with roles and responsibilities similar to those of existing commercial nuclear plants. The staffing levels presented in the design certification application (DCA) will be determined in the Staffing and Qualification element of NUREG-0711, which will be completed at DCA submittal. The final staffing levels are subject to change until the Human Factors Verification & Validation (V&V) element of NUREG-0711 is completed. The control room configuration and the licensed operator stations are shown in Figure 1.

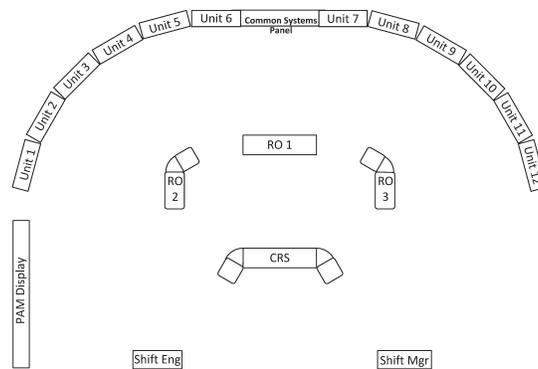
Licensed operators are trained and qualified in accordance with an INPO accredited training program which includes the NuScale design applicable portions of ACAD 10-001 Guidelines for Initial Training and Qualification of Licensed Operators, ACAD 07-001 Guidelines for Continuing Training of Licensed Personnel. Licensed operators are licensed by the NRC.

Management of Normal Operations:

During normal operations, each module is monitored and controlled to ensure safe operation. Shutdown modules are monitored to ensure they remain shutdown and any maintenance or refueling activities do not adversely impact operating units. Significant planned evolutions are not permitted to overwhelm a normal shift complement and may be conducted by augmenting the normal crew with additional licensed operators. Such evolutions may include unit startup, shutdown, refueling, major maintenance, or major modifications.

The initial concept to be evaluated is that a lead reactor operator (RO) will monitor all twelve units during steady state operations. The lead RO will acknowledge alarms and warnings, identify trends, and provide oversight to all units.

The other two ROs are tasked with supporting routine operations, maintenance, and administrative tasks which are normally activities that can quickly be stopped and put in a stable condition or discontinued so that the higher priority upset condition can be addressed.



Management of Off-normal Conditions and Emergencies:

During upset conditions the lead RO will diagnose the significance of the event and delegate responsibility of the module to one of the other two ROs. The assignment of a reactor to an operator is dedicated until relieved of that responsibility. Each reactor is specifically assigned to a specific licensed operator until responsibility is transferred to another licensed operator.

Management of Maintenance and Modifications:

Modifications are managed as a maintenance activity. Depending on the scope and nature of the modification or maintenance, supplemental licensed staffing may be required.

In defining the Concept of Operations (ConOps) of a NuScale 12-unit plant, NuScale is following the process promulgated via NUREG-0711, Human Factors Engineering Program Review Model (Rev 3), which describes a systematic review and human factors analysis of the plant design.

When the V&V element, including integrated system validation (ISV) is complete, then NuScale will have a final ConOps. The preliminary ConOps is a model that is developed using operating experience and existing regulatory guidance.

NuScale's design features reduce licensed operator workload such that a single control room, 12-unit plant is expected to require licensed operator staffing that is comparable to a large single unit light water reactor. Design features include:

- Simplicity
- natural circulation flow
- low reactor coolant system flowrates
- large reactor coolant volume-to-MW_{th} ratio
- reduced number of safety and non-safety systems per unit
- reduced number of pumps and valves in all systems
- digital control systems
- intelligent notification and alarm system
- computer based procedures
- extensive use of automation

Plant Goals (or Missions):

NuScale's plant goals are the same as existing commercial nuclear power plants: safely, reliably, and economically generate electricity and supply it to the grid. It is anticipated that NuScale will provide baseload electrical power, but will maintain the capability to support some degree of flexible power operation (i.e. load following).

Roles and Responsibilities:

Shift Manager: Consistent with the industry and as described in ACAD 97-004 Guidelines for Shift Manager Selection, Training and Qualification, and Professional Development, the shift manager is the senior management representative on shift with an active SRO license who is responsible for the day-to-day operations and maintenance of the nuclear power plant. The shift manager supervises and manages the activities of their crew to maintain reactor safety and the protection of plant personnel and equipment. The shift manager is also responsible for emergency declarations and the activation of the Emergency Response Organization including initial notifications of state, county, and NRC personnel.

Shift Technical Advisor (STA): Consistent with the industry and as described in INPO 90-003 Guidelines for the Training and Qualification of Shift Technical Advisors, the STA provides an independent assessment of plant conditions during abnormal and emergency plant conditions. During normal operations, the STA contributes to the safe and reliable operation of the plant through routine monitoring of equipment and system operation, detecting conditions that may be potential challenges to the critical safety functions, verifying Technical Specification compliance, and monitoring plant risk.

Control Room Supervisor (CRS): Consistent with the industry and trained and qualified per the NuScale design applicable portions of ACAD 10-001 Guidelines for Initial Training and Qualification of Licensed Operators and ACAD 07-001 Guidelines for Continuing Training of Licensed Personnel, the CRS directly supervises the licensed operators who operate the plant. The CRS is responsible for implementing the safe day-to-day operations and maintenance of the nuclear power plant.

SRO/RO: Licensed operators are responsible for the safe, reliable operation of the plant maintaining critical safety functions at all times. Duties include:

- adhere to the unit's technical specifications, plant operating procedures, and NRC regulations
- review operating data, monitoring notifications, warnings and alarms to ensure that the unit is operating safely
- recognize and respond correctly to off-normal conditions and mitigate the consequences of accidents
- manually initiate engineered safety features as required during transient and accident conditions
- maneuver the plant to meet generation needs

Attachment 2

Response to NRC Questions Related to Control Room Activities

1. How is control room staff monitoring the status of the reactors? Is one operator assigned to one or more reactors? Is the assignment this dedicated?

Initial staffing levels for a 12-unit NuScale plant will be six licensed operators: three Senior Reactor Operators (SROs) and three Reactor Operators (ROs). The SROs consist of a Shift Manager, Control Room Supervisor, and a Shift Technical Advisor all of whom will have roles similar to those in existing U.S. commercial nuclear power plants. The three ROs will provide oversight of the 12 units. Normally, one licensed operator, the lead RO, will be assigned responsibility for all twelve reactors. If a module is in an off-normal condition or involved in a complex evolution, then the module may be assigned to a separate licensed operator. The assignment of a reactor to an operator is dedicated until relieved of that responsibility. During significant planned evolutions, maintenance, and modifications, the normal control room complement will be augmented by additional licensed operators.

2. How are planned reactor outages and refueling handled with respect to changes in operator responsibilities?

As presented to the NRC during a video conference on 6/3/15, a module has the following refueling outage windows:

- 1) Shutdown/cooldown
- 2) Transition preparation and disconnection
- 3) Transition (to containment flange tool)
- 4) Disassembly
- 5) Upper module work window
- 6) Refueling
- 7) Lower containment vessel work window
- 8) Reassembly
- 9) Transition (to operating bay)
- 10) Reconnection
- 11) Module heat up
- 12) Reactor startup and ramp to full power

Once a module is disconnected (i.e. RXM systems mechanical and electrically disconnected from the operating bay which is identified as refueling outage window 2 above), the refueling crew assumes primary responsibility for the module. The refueling crew is led by a refueling SRO that is staff above the minimum control room complement of six licensed operators. This is the case regardless of the reason for disconnection (i.e. refueling outage, non-refueling maintenance outage).

The control room licensed operators will have increased workloads while completing the shutdown/cooldown and transition preparation and disconnection windows. The transition time from 100% power to disconnected is anticipated to be approximately 45 hours. It has not yet been determined, but supplemental licensed operator control room staffing may be required during this time to ensure acceptable workloads.

3. How are unplanned reactor trips handled with respect to assignment of reactor oversight responsibilities?

The initial concept is that the lead RO will delegate the module in an off-normal condition to another RO who will provide dedicated oversight until it is verified to be in a safe and stable condition. Passive safety systems and clear, concise display of critical safety function status for all units enable rapid verification of unit safety status.

4. How is emerging maintenance or off-normal situations with one or more reactors handled with respect to operator assignments?

Similar to the reactor trip, NuScale's initial concept is that the lead RO will delegate the module in an off-normal condition to another RO who will provide dedicated oversight until it is verified to be in a safe and stable condition.

5. How many abnormal and accident occurrences are planned for simultaneously?

NuScale is currently developing criteria that will be used to determine how many abnormal and accident conditions to include in a high workload, full scope simulator scenario that will be used for the integrated system validation portion of the verification and validation HFE element. It is anticipated that all ISV scenarios will impact at least three units with some combination of design basis and beyond design basis events. Some shared system anticipated operational occurrences, such as loss of circulating water, will impact up to six operating units. Some external events, such as loss of offsite power, may impact all 12 units. NuScale will develop a set of ISV scenarios that validates the human-system interface (HSI) design and ConOps in extremely challenging scenarios that are beyond what would be expected in an operating plant.

6. How do operator responsibilities change when abnormal or accidents occur while handling normal operations, normal planned maintenance, unplanned maintenance and planned outages for other reactors?

The lead RO monitors all normal/stable units and does not support maintenance, testing, or other burdensome or potentially distracting activities. If an abnormal or accident condition occurs, the lead RO would delegate the off-normal module to another RO, and the lead RO would continue monitoring the remaining stable units. If the assigned RO were handling normal evolutions, surveillances, planned or unplanned maintenance, the RO would stop the lower priority ongoing activity and put the module in a stable condition so that the higher priority off-normal condition can be addressed. The assigned RO's responsibility would shift to the off-normal module, while the lead RO would resume monitoring the stable modules including the module engaged in the evolution that has now been placed in a stable condition.

For planned maintenance and outages, additional resources will be brought in as necessary to prevent exceeding the control room staff workload capabilities.

For unplanned, abnormal, or accident conditions the plant will be placed in a safe and stable condition and additional resources called in as appropriate.

Detailed analysis of casualty situations has not yet been completed. It should be noted that any module can be quickly placed in a shutdown mode on decay heat removal (DHR), a passive heat removal state. Complex casualty situations can be resolved quickly by placing modules in this state.

7. How is plant status and configuration control managed in the control room?

Operators will utilize an integrated electronic logging, computer-based procedure, configuration control and electronic tagging system. A majority of the tasks currently completed manually in existing nuclear power plants will be automated. Although not yet completed, the HSI will include a 12-module overview screen that will allow operators to quickly understand each module's condition. In addition, an operator notification system will provide the operators notifications, warnings, and alarms that will alert the operator to any changes in plant status.

8. How is planned maintenance and post maintenance testing handled with respect to operator work assignments?

Planned maintenance and post maintenance testing is handled similar to existing commercial nuclear plants with a work control center coordinating the maintenance efforts outside the control room. NuScale has not yet analyzed this area, but our initial concept is that if the activity causes the assigned RO to exceed workload capabilities, then the responsible RO will delegate the module in question to another RO who will provide oversight until the module is in a safe and stable condition.

9. For each of these, define the qualification level: Shift Manager, Shift Technical Advisor, Senior Reactor Operator, Reactor Operator or other skill sets.

Licensed operators are trained and qualified in accordance with an INPO-accredited training program which includes the NuScale design applicable portions of ACAD 10-001 Guidelines for Initial Training and Qualification of Licensed Operators, ACAD 07-001 Guidelines for Continuing Training of Licensed Personnel. Licensed operators are licensed by the NRC.

Shift Manager: ACAD 97-004 Guidelines for Shift Manager Selection, Training and Qualification, and Professional Development

Shift Technical Advisor: INPO 90-003 Guidelines for the Training and Qualification of Shift Technical Advisors

SRO/RO: ACAD 10-001 Guidelines for Initial Training and Qualification of Licensed Operators, ACAD 07-001 Guidelines for Continuing Training of Licensed Personnel

10. For each position identify any additional responsibilities not addressed in the previous questions. For example, the fire brigade is sometimes led by a Sr. reactor operator; the shift supervisor is typically responsible for emergency plan implementation.

The Shift Manager will have initial responsibility for implementing the Emergency Plan. The fire brigade will not be manned by any of the six control room licensed operators. Other duties will be assigned in a manner not to interfere with the minimum six control room licensed operators.