NUSCALE
Power for all humankind

June 14, 2019 Docket No. 52-048

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 "Loss of Large Areas Due to Explosions and Fires Assessment," TR-0816-50796, Revision 1

REFERENCES:
1. Letter from NuScale Power, LLC to Nuclear Regulatory Commission, "NuScale Power, LLC Submittal of Technical Reports Supporting the NuScale Design Certification Application (NRC Project No. 0769)," dated December 30, 2016 (ML17005A112)
2. NuScale Technical Report, "Loss of Large Areas Due to Explosions and Fires Assessment," TR-0816-50796, Revision 0, dated December 2016 (ML17005A115)

NuScale Power, LLC (NuScale) hereby submits Revision 1 of the "Loss of Large Areas Due to Explosions and Fires Assessment" (TR-0816-50796).

NuScale requests that the security-related information in Enclosure 1 be withheld from public disclosure in accordance with the requirements of 10 CFR §2.390. Enclosure 2 contains the public version of the report.

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

If you have any questions, please contact Nadja Joergensen at 541-452-7338 or at njoergensen@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
NuScale Power, LLC

Distribution: Samuel Lee, NRC, OWFN-8H12
Gregory Cranston, NRC, OWFN-8H12
Omid Tabatabai, NRC, OWFN-8H12

Enclosure 1: "Loss of Large Areas Due to Explosions and Fires Assessment," TR-0816-50796, Revision 1, nonpublic version
Enclosure 2: "Loss of Large Areas Due to Explosions and Fires Assessment," TR-0816-50796, Revision 1, public version

Enclosure 1:

"Loss of Large Areas Due to Explosions and Fires Assessment," TR-0816-50796, Revision 1, nonpublic version
Security-Related Information - Withhold Under 10 CFR §2.390

NuScale Power, LLC
1100 NE Circle Blvd., Suite 200 Corvallis, Oregon 97330 Office 541.360-0500 Fax 541.207.3928
www.nuscalepower.com

Enclosure 2:

"Loss of Large Areas Due to Explosions and Fires Assessment," TR-0816-50796, Revision 1, public version

Licensing Technical Report

Loss of Large Areas Due to Explosions and Fires Assessment

June 2019

Revision 1

Docket: 52-048

NuScale Power, LLC

1100 NE Circle Blvd., Suite 200

Corvallis, Oregon 97330

www.nuscalepower.com

Licensing Technical Report

Department of Energy Acknowledgement and Disclaimer

This material is based upon work supported by the Department of Energy under Award Number DE-NE0008820 and DE-NE0000633.

Licensing Technical Report

TABLES

Abstract

This report assesses the requirements and associated guidance to meet 10 CFR 50.155(b)(2), extensive damage mitigation guidelines, for the design of the NuScale Power Plant. This report describes the NuScale Power Plant's response to loss of large areas (LOLA) of the plant due to an explosion and fire event. The report evaluates how the NuScale Power Plant maintains or restores core cooling, containment, and spent fuel pool cooling capabilities in accordance with the requirements in 10 CFR 50.155(b)(2) and applicable acceptance criteria in the Standard Review Plan, Section 19.4.

Executive Summary

10 CFR 50.155(b)(2), extensive damage mitigation guidelines, requires combined license (COL) applicants to develop and implement strategies and guidelines to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities under the circumstances associated with loss of large areas (LOLA) of the plant due to explosions or fire. Strategies and guidelines developed by a COL applicant must address each of the following areas:

(i) firefighting
(ii) operations to mitigate fuel damage
(iii) actions to minimize radiological release

This report evaluates the NuScale Power Plant's response to a LOLA event. This report also provides guidance for a COL applicant that references the NuScale Power Plant design certification to develop site-specific strategies prescribed by 10 CFR 50.155(b)(2). The guidance in Nuclear Energy Institute (NEI) 06-12, "B.5.b Phase 2 & 3 Submittal Guideline" (Reference 6.1) was used to determine the NuScale Power Plant design response to a LOLA event. The NEI 06-12 guidance describes a three-phase approach for performing an evaluation that meets 10 CFR 50.155(b)(2). The phases and associated guidance are:

- Phase 1 – Enhanced firefighting capabilities
- Phase 2 – Measures to mitigate damage to fuel in the SFP
- Phase 3 – Measures to mitigate damage to fuel in the reactor vessel and to minimize radiological release

<u>Phase 1</u>

The guidance in NEI 06-12 directs new plants to implement guidance in the NRC guidance document, "Developing Mitigating Strategies/Guidance for Nuclear Power Plants to Respond to Loss of Large Areas of the Plant in Accordance with B.5.b. of the February 25, 2002, Order," dated February 25, 2005. The Order is classified as Safeguards Information (SGI); this technical report addresses non-SGI portions of the Order. The firefighting response to a LOLA event includes operational aspects of responding to explosions or fire including prearranging for involvement of outside organizations, planning and preparation activities (e.g., pre-positioning equipment, personnel, and materials to be used for mitigating the event), and developing procedures and training for managing the event. The NuScale Power Plant features that address the firefighting capabilities for a LOLA event are included in the fire protection system (FPS) design. Section 9.5 of the Final Safety Analysis Report (FSAR) describes the FPS. The remaining firefighting requirements and guidance are the responsibility of the COL applicant that references the NuScale Power Plant design certification, as summarized in Section 4.1 of this report.

<u>Phase 2</u>

The SFP in the NuScale design, which is described in FSAR Section 9.2, is below grade. The SFP cannot be drained per the guidance of NEI 06-12 (Section 2.1), because the potential suction connections from the reactor pool, the containment flooding and drain system, are at elevation below the normal operating level and above the minimum pool level required for NuScale Power Modules and SFP radiation shielding and heat removal. This configuration prevents inadvertent lowering of the pool level to below safety limits. A siphon-break line with a manual valve is provided

near each reactor pool supply connection to prevent creation of a siphon effect. Therefore, no spent fuel cooling strategies are necessary to meet requirements. Section 4.2 of this report discusses Phase 2 requirements in more detail.

Phase 3

The generic pressurized water reactor (PWR) key safety functions identified in NEI 06-12 were developed based on a traditional PWR plant design. These key safety functions are applicable to the NuScale Power Plant design, and no new key safety functions were identified. The key safety functions evaluated for a LOLA event are:

- reactor coolant system (RCS) inventory control
- RCS heat removal
- containment isolation
- containment integrity
- release mitigation

The NuScale design (because of fail safe passive features) minimizes the need for initial response actions to stabilize the situation or delay event progression, including key mitigation strategies to help manage critical safety functions in the near term. The NuScale Power Plant is designed to maintain the RCS inventory, RCS heat removal, containment isolation, and containment integrity without additional strategies. The primary and alternate means to maintain these functions are spatially separated per the guidance in NEI 06-12.

The NuScale Power Plant design does not include installed systems to mitigate potential radioactive releases in a LOLA event. The remainder of the Phase 3 requirements and guidance are the responsibility of the COL applicant that references the NuScale Power Plant design certification, as identified in Section 4.3 of this report.

1.0 Introduction

1.1 Purpose

This report evaluates the NuScale Power Plant design for response to loss of large areas (LOLA) of the nuclear power plant due to fire or explosion, also known as extensive damage mitigation guidelines (EDMG). It evaluates NuScale design capability with regard to LOLA mitigation and defines expected combined license (COL) applicant requirements. As such, this report provides guidance for a COL applicant that references the NuScale design certification to meet EDMG requirements in Chapter 10 of the Code of Federal Regulations (CFR), Section 155(b)(2).

The EDMG require licensees to develop strategies and guidelines to address a LOLA of the plant due to explosions or fires from a beyond-design-basis event through the use of readily-available resources and by identifying potential practicable uses of beyond-readily-available resources.

1.2 Scope

This report describes how the NuScale Power Plant design satisfies 10 CFR 50.155(b)(2) and the applicable guidance in Standard Review Plan (SRP) Section 19.4 (Reference 6.4), and the NRC-endorsed guidance document, NEI 06-12. This report provides the basis and generic guidance for developing EDMG for a licensee. This report assesses the NuScale Power Plant design against criteria in the NRC's Interim Staff Guidance Compliance with 10 CFR 50.54(hh)(2) and 10 CFR 52.80(d) Loss of Large Areas of the Plant due to Explosions or Fires from a Beyond-Design-Basis Event, DC/COL-ISG-016, June 9, 2010 (Reference 6.3), and in Nuclear Energy Institute (NEI) 06-12 (Reference 6.1).

1.3 Abbreviations

Table 1-1 Abbreviations

Term	Definition
CFR	Code of Federal Regulations
CIV	containment isolation valve
CNTS	containment system
CNV	containment vessel
COL	combined license
CVCS	chemical and volume control system
DHRS	decay heat removal system
ECCS	emergency core cooling system
EDMG	extensive damage mitigation guidelines
ERO	Emergency Response Organization
FPS	fire protection system
GTG	NuScale Generic Technical Guideline
LOLA	loss of large areas
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association

Term	Definition
NPM	NuScale Power Module
NRC	Nuclear Regulatory Commission
PWR	pressurized water reactor
RCS	reactor coolant system
RPV	reactor pressure vessel
RRV	reactor recirulation valve
RVV	reactor vent valve
RXB	Reactor Building
SFP	spent fuel pool
SG	steam generator
SGI	Safeguards Information
SRP	Standard Review Plan
UHS	ultimate heat sink

2.0 Background

10 CFR 50.155(b)(2) requires that the nuclear power plant licensee will be able to develop, implement, and maintain effective mitigation measures for large fires and explosions. NEI 06-12 provides implementation guidance for complying with extensive damage mitigation guidelines. This report assesses the NuScale design against Section 4.0 of NEI 06-12, guidance for new plants.

- Phase 1 – Enhanced firefighting capabilities
  - NEI 06-12 Section 4.2.1 specifies that new plants should address Phase 1 by implementing guidance provided in Nuclear Regulatory Commission (NRC) guidance document "Developing Mitigating Strategies/Guidance for Nuclear Power Plants to Respond to Loss of Large Areas of the Plant in Accordance with B.5.b of the February 25, 2002, Order" (Reference 6.3)
- Phase 2 – Measures to mitigate damage to fuel in the spent fuel pool (SFP)
  - NEI 06-12 Section 4.2.2 approach
- Phase 3 – Measures to mitigate damage to fuel in the reactor vessel and to minimize radiological release
  - NEI 06-12 Section 4.2.3 approach

NEI 06-12, Revision 3 is the NRC-endorsed guidance for assessing nuclear power plants against LOLA requirements. The guidance was written for operating plants and traditional design plants. As such, the methodology is not always directly applicable or easily translated to the advanced technology NuScale Power Plant design. This report applies the NEI assessment guidance to the extent practicable. This methodology is intended for use by a COL applicant to develop applicable site-specific EDMG strategies and guidelines.

2.1 Regulatory Requirements

10 CFR 50.155(b)(2) is not applicable for design certification applicants; however, 10 CFR 52.80(d) requires current and future COL applications to include a description and plans for implementing the requirements of 10 CFR 50.155, including a schedule for achieving full compliance with the requirements.

3.0 Methodology

The methodology for performing the LOLA assessment is taken from NEI 06-12 (Reference 6.1). Specifically, Section 4 of NEI 06-12 includes guidance for new plant applications. The following sections address each of the three phases of the B.5.b requirements and their applicability to new plant designs.

3.1 Approach

3.1.1 Phase 1 - Enhanced Fire Fighting Capabilities

New plants should address Phase 1 by implementing the guidance in the NRC document, “Developing Mitigating Strategies/Guidance for Nuclear Power Plants to Respond to Loss of Large Areas of the Plant in Accordance with B.5.b of the February 25, 2002, Order” dated February 25, 2005 (Reference 6.3).

New plants should implement the guidance of DC/COL-ISG-016 (Reference 6.2).

3.1.2 Phase 2 - Measures to Mitigate Damage to Fuel in the Spent Fuel Pool

Section 2.0 of NEI 06-12 is used to determine strategies to mitigate damage to fuel in SFPs. Guidance for implementing the mitigation strategy shall be developed, documented, and available for NRC inspection to meet the requirements of 10 CFR 50.155(b)(2) by the COL applicant. Boundary conditions, objectives, performance attributes, response elements, submittal guidance, and additional considerations of NEI 06-12 Section 2.0 apply to the NuScale design except for the internal and external makeup source strategy provided in NEI 06-12 Sections 2.2 and 2.3. NEI 06-12 Sections 2.2 and 2.3 are not applicable to the NuScale design because the design cannot be drained and needs no internal makeup source. In addition, the NuScale design includes a permanently-installed Seismic Category I makeup line as part of the ultimate heat sink (UHS) system.

The Phase 2 SFP strategies are not required for sites that have SFPs that are below grade and cannot be drained. Phase 2 requirements are discussed in detail in Section 4.2 of this report.

3.1.3 Phase 3 - Measures to Mitigate Damage to Fuel in the Reactor Vessel and to Minimize Radiological Release

Several steps are taken to evaluate the need for employing the mitigative strategies of Phase 3. These steps are discussed in Section 4.2.3 of NEI 06-12. A key element identified in this section of NEI 06-12 is that new designs may use passive features that might be less susceptible to damage from the effects of large fires and explosions. This section also specifies that new plant designs may not need all of the mitigation strategies. This guidance applies to the NuScale Power Plant design; however, mitigation strategies are not needed because design features for installed plant systems eliminate the need for strategies for maintaining generic safety functions.

This report discusses how success criteria for meeting the key safety functions are satisfied by installed plant systems, and identifies mitigation strategies for key safety functions that are not satisfied with design features of installed systems. The mitigation strategies are site-specific. Guidance for implementing the mitigation strategy shall be developed, documented, and available for NRC inspection to meet the requirements of 10 CFR 50.155(b)(2) and 10 CFR 52.80(d) by the COL applicant.

3.2 Assumption

The following assumption applies to this report:

No damage is assumed to any equipment under the bioshield for internal and external threats. Section 4.3.2.2 provides a detailed discussion of this assumption. This assumption is consistent with the treatment of existing plant containments (pressurized water reactor (PWR) and boiling water reactor) for the following reasons:

- The bioshield provides a robust physical barrier to damage.
- Personnel access to the areas on top of the bioshield is restricted in a similar manner to a traditional containment.

4.0 Assessment

4.1 Phase 1 – Enhanced Fire Fighting Capabilities

New plant designs must address Phase 1 by implementing the guidance in NRC document, "Developing Mitigating Strategies/Guidance for Nuclear Power Plants to Respond to Loss of Large Areas of the Plant in Accordance with B.5.b of the February 25, 2002, Order" dated February 25, 2005 (Reference 6.3). This guidance document is classified as Safeguards Information (SGI). This section provides a non-SGI description of the NuScale Power Plant strategy for meeting this guidance.

4.1.1 Areas of Consideration

DC/COL-ISG-016 contains four areas of consideration, with each area containing several expectation elements. The areas of consideration are:

- Part 1 – Firefighting response strategies
  - coordinated response strategy
  - assessment of mutual aid
  - establishing staging
  - command and control
  - training
- Part 2 – Plant operations to mitigate fuel damage
  - personnel
  - communications
  - rapid spread of fire
  - procedures
  - equipment
  - training
  - SFP mitigating measures
- Part 3 – Actions to minimize release of radioactive materials
  - water spray scrubbing
  - emergency responders
- Part 4 – Industry best practices

Each area of consideration has expectation elements that must be addressed in the appropriate regulatory submittal (i.e., design certification applicant or COL applicant). Site-specific equipment, design features, procedures, and program documents are developed by a COL applicant.

4.1.2 Applicability

Part 1 (Firefighting) of the NRC guidance document is addressed in this section. Much of the Part 1 response to the NRC guidance document will be specified by the COL applicant. Parts 2, 3, and 4 are addressed by the COL applicant. The few areas in the NRC guidance document applicable to the design certification applicant are presented in this report in a non-SGI format.

4.1.3 Response to Expectation Elements

Table 4-1 addresses the NRC guidance's Part 1 (Firefighting) specific expectation elements, described in Reference 6.4. As indicated in the table, Expectation Element "m" is the only item that is dispositioned by the design certification; the remaining elements are COL applicant tasks.

Table 4-1 Part 1 Fire Fighting Strategies

Item No.	Expectation Element	Response
a	Establish a staging area for pre-positioned equipment and materials.	This expectation element will be addressed by the COL applicant.
b	Pre-event notification staging to maximize survivability.	This expectation element will be addressed by the COL applicant.
c	Identify airlifted resources for fire fighting.	This expectation element will be addressed by the COL applicant.
d	Evaluate command and control functions needed.	This expectation element will be addressed by the COL applicant.
e	Identify outside organizations to support response actions.	This expectation element will be addressed by the COL applicant.
f	Revisit and, if required, establish new Memorandums of Understandings.	This expectation element will be addressed by the COL applicant.
g	Use local offsite facilities as staging areas.	This expectation element will be addressed by the COL applicant.
h	Control of emergency response vehicles.	This expectation element will be addressed by the COL applicant.
i	Communication enhancements.	This expectation element will be addressed by the COL applicant.
j	Provisions for treatment of casualties.	This expectation element will be addressed by the COL applicant.
k	Establish an alternate site assembly area.	This expectation element will be addressed by the COL applicant.
l	Provide fire training.	This expectation element will be addressed by the COL applicant.

Item No.	Expectation Element	Response
m	Establish a means to supply the fire protection yard fire main loop using offsite resources and a staged onsite portable diesel-driven pump.	A portable pump can be connected to the underground yard fire main loop using portable hoses and connectors. There are several connections and several valves that can isolate any broken sections of the underground yard fire main loop. The site plan shows the underground yard fire main loop that has yard hydrants located on all four sides of the Reactor Building (RXB). Hydrants are provided on the yard fire main loop in accordance with National Fire Protection Association (NFPA) at intervals up to 250 ft and the lateral to each hydrant is controlled by an isolation valve. The NuScale Power Plant design, which also includes numerous underground yard fire main loop isolation valves, will support supplying the underground yard fire main loop using a portable diesel-driven onsite pump. There are several connections to the yard fire main loop that are located at least 100 yd from the RXB. The external water sources available for makeup to the yard fire main loop are the fire protection primary supply tank and fire protection alternative supply tank[5].

4.2 Phase 2 – Measures to Mitigate Damage to Fuel in the Spent Fuel Pool

Phase 2 consists of measures to mitigate damage to fuel in the SFP by using diverse internal and external SFP makeup and spray strategies. Phase 2 also includes additional SFP mitigation measures as referenced in NEI 06-12 Section 2.1 and Appendix D. These include actions such as

- strategically dispersing higher decay power fuel amongst the older low decay power fuel by symmetrically surrounding the highest decay power fuel (from the most recent offload) by four assemblies of low decay power.
- not locating highest decay power assemblies in rack cells positioned above the rack feet.
- maintaining an empty space area in the SFP (e.g., the shipping cask lay down area) to provide for a downcomer effect (size of empty space to be determined based upon conditions at each SFP).
- enhancing natural circulation air cooling of spent fuel in the pool by promoting passive ventilation of the bulk air space above the pool with the environs (e.g., opening doorways or blowout panels after an event).

[5] The demineralized water storage tank is located less than 100 yd from the RXB. Therefore, this water tank does not meet the definition of an “external water source” in the context of NEI 06-12

The NuScale SFP is located below grade and cannot be drained. As stated in NEI 06-12 Section 2.1, SFP mitigation strategies are not required for sites that have SFPs that are below grade and cannot be drained. The UHS pools do not have penetrations, drains, or piping that could drain the water level in these pools below the top of the weir. The water inventory in the SFP below the top of the weir provides 10 ft of water above the tops of the fuel storage racks for cooling and shielding spent fuel assemblies. Section 9.1.3 of the FSAR provides additional description of the SFP.

The bottom elevation of the SFP is located at RXB elevation of 25 ft, and SFP operating deck is located at RXB elevation of 100 ft. Grade elevation is RXB elevation, 100 ft. Therefore, the SFP is located below grade. Chapter 9.1 of the FSAR provides additional detail about SFP design.

Table 4-2 summarizes disposition of NEI 06-12 SFP mitigation strategies for the NuScale Power Plant design. As indicated in the table, there are no COL items for Phase 2.

Table 4-2 Phase 2 Spent Fuel Pool Strategies

NEI 06-12 Section	Description	Response
2.4	SFP makeup – internal strategy	Not required. SFP is located below grade and cannot be drained.
2.3	SFP makeup – external strategy	Not required. SFP is located below grade and cannot be drained.
2.3	SFP spray – external strategy	Not required. SFP is located below grade and cannot be drained.
2.4	Viable site-specific SFP mitigation strategies	Not required. SFP is located below grade and cannot be drained.
2.5	SFP leakage control strategies	Not required. SFP is located below grade and cannot be drained.

4.3 Phase 3 – Measures to Mitigate Damage to Fuel in the Reactor Vessel and to Minimize Radiological Release

Phase 3 consists of two parts: measures to enhance command and control, and a specific set of PWR mitigation strategies. The command and control measures are aimed at improving initial site operation response before the Emergency Response Organization (ERO) is fully activated. In addition, NEI 06-12 includes specific mitigation strategies for PWRs, based on diverse methods, to ensure PWR safety functions. Table 4-3 shows disposition of COL applicant actions for command and control reactor and containment strategies. Table 4-4 shows disposition of COL applicant actions for PWR-specific mitigation strategies.

4.3.1 Command and Control Enhancements

The command and control enhancements establish guidelines for initial site operational response in a beyond-design-basis event. Extensive damage mitigation guidelines is the generic term used by industry. Chapter 19.2 and Chapter 19.5 of the FSAR discuss equipment survivability and aircraft impacts, respectively. Table 4-3 summarizes COL applicant actions for the command and control enhancement strategies.

Table 4-3 Command and Control Enhancement Reactor and Containment Strategies

NEI 06-12 Section	Description	Response
3.2.2	Offsite and onsite communications	The COL applicant will develop guidelines for this strategy.
3.2.3	Notifications/ERO activation	The COL applicant will develop guidelines for this strategy.
3.2.4	Initial operational response actions	The COL applicant will develop guidelines for this strategy.
3.2.5	Initial damage assessment	The COL applicant will develop guidelines for this strategy.

Table 4-4 Phase 3 PWR-Specific Reactor and Containment Strategies

NEI 06-12 Section	Description	Response
3.3.1	Reactor water storage tank (or equivalent) makeup	Not required. The NuScale design does not require reactor coolant system makeup.
3.3.2	Manually depressurize steam generators to reduce inventory loss	Not required. The NuScale design does not depressurize steam generators in an accident. Adequate heat removal is achieved using passive systems.
3.3.3	Manual operation of turbine-driven auxiliary feedwater pump	Not required. The NuScale design does not include an auxiliary feedwater system. No turbine-driven safety-related pumps are included in the design. Adequate heat removal is achieved using passive systems.
3.3.4	Manually depressurize steam generators and use portable pump	Not required. The NuScale design does not depressurize steam generators in an accident. Adequate heat removal is achieved using passive systems.
3.3.5	Makeup to condensate storage tank/auxiliary feedwater storage tank	Not required. The NuScale design does not include a condensate storage tank or an auxiliary feedwater storage tank. Adequate heat removal is achieved using passive systems and does not require addition of water.

NEI 06-12 Section	Description	Response
3.3.6	Containment flooding with portable pump	Not required. The NuScale design does not require a containment spray system because the containment floods from emergency core cooling system actuation or lifting of safety-relief valves. The containment vessel is partially immersed in the ultimate heat sink (UHS). Inventory volume in the UHS and the inability of the UHS to be drained precludes the need for an additional mitigation strategy for this key safety function.
3.3.7	Portable sprays	The COL applicant will develop procedures and guidelines to support this mitigation strategy.

4.3.1.1 Offsite and Onsite Communications

This strategy improves the initial response of available plant operational resources and enhances the capability for those resources to communicate with offsite resources. The COL applicant should use the template provided in NEI 06-12 to document the capabilities.

4.3.1.2 Notifications/Emergency Response Organization Activation

This strategy provides an enhanced level of assurance that the proper notifications of the licensee ERO occur and the ERO callout is initiated in a timely manner, despite the postulated condition. The COL applicant should use the template provided in NEI 06-12 to document the capabilities in the COL application.

4.3.1.3 Initial Operational Response Actions

The purpose of this strategy is to enhance focus on key actions that may prevent or delay a release, and be reasonably accomplished in adverse conditions. The COL applicant should use the PWR extensive damage mitigation guidelines template from NEI 06-12 to meet these requirements. In addition, the COL applicant should use command and control enhancement guidance to comply with the requirement.

4.3.1.4 Initial Damage Assessment

The purpose of this aspect of the initial response EDMGs is to use available onsite resources to assess the plant and equipment conditions in order to assist arriving ERO personnel in decision-making and development of specific strategies. The COL applicant should use guidance in NEI 06-12 to meet this requirement.

4.3.2 PWR-Specific Mitigation Strategies

Table 4-4 provides NEI 06-12 Phase 3 guidance and disposition of PWR-specific mitigation strategies for the NuScale design. As indicated in the table, the only COL item relates to procedure development for the use of portable sprays.

4.3.2.1 Key Safety Functions

The generic PWR key safety functions identified in NEI 06-12 were developed based on a traditional PWR plant design. Although the NuScale Power Plant is a small modular reactor with numerous passive features, the key safety functions identified in NEI 06-12 apply to the NuScale Power Plant design, and no new key safety functions were identified. The key safety functions are:

- reactor coolant system (RCS) inventory control
- RCS heat removal
- containment isolation
- containment integrity
- release mitigation

The purpose of each key safety function is discussed in this report to demonstrate how the NuScale Power Plant performs that key safety function. Each of the key safety functions and an assessment of how the NuScale Power Plant is designed, as described in Section 4.3.2.2, to perform these safety functions is described in Section 4.3.2.3.

- RCS inventory control – The purpose of this key safety function is to ensure that the core is covered with water. If the core remains covered with water, core damage will be precluded.
- RCS heat removal – The purpose of this key safety function is to remove the decay heat from the core and transfer it to the ultimate heat sink (UHS).
- containment isolation – The purpose of this key safety function is to ensure no leakage paths exist that would allow gaseous and particulate radiation to escape containment.
- containment integrity – The purpose of this key safety function is to ensure the containment fission product barrier is maintained to minimize or prevent radiological release outside containment.
- release mitigation – The purpose of this key safety function is to minimize a radiological release assuming severe core damage has occurred and a radiological release is imminent or in progress.

4.3.2.2 NuScale Power Plant Design

The NuScale Power Plant design is a small modular reactor and has features that differentiate the design from a standard PWR. For example, safety systems are fail-safe on loss of power and external water sources are not required to maintain long-term cooling. The design, as it pertains to development of mitigation strategies for a LOLA event, is described in this section.

General Plant Configuration

Yard grade is RXB elevation of 100 ft. Therefore, elevations 24 ft, 35 ft-8 in., 50 ft, 62 ft, 75 ft, and 86 ft of the RXB are underground, with no potential for siphoning, and not subject to direct external impact threats.

Ultimate Heat Sink

The UHS is the combination of three contiguous pool areas (reactor pool, refueling pool, and SFP) located underground entirely within the RXB. Each NuScale Power Module (NPM) resides in a separate module bay and is partially immersed in the UHS. Up to 12 modules can be accommodated in the RXB.

Within the module bays, the UHS removes heat from the NPM via direct water contact with the containment vessel (CNV). The UHS will remove decay heat from the decay heat removal system (DHRS) via direct water contact with the DHRS passive condenser.

In the SFP area, the UHS removes decay heat from the spent fuel via direct water contact with the spent fuel assemblies. Chapter 9.2 of the FSAR describes the UHS in detail.

Bioshield

A reinforced concrete biological shield protects the top of each NPM. The bioshield and module bay walls provide robust protection for the top of the CNV. Access to the area on top of the bioshield is restricted in a similar manner to that of the containment building at a traditional PWR. There is no personnel access from the top of the bioshield to the area beneath the bioshield unless it is removed. Since damage in a LOLA scenario is not postulated inside a PWR containment based on industry precedent, it is reasonable to extrapolate that position to the area under the bioshield.

Exterior concrete walls and multiple interior walls greater than 18 in. in thickness provide protection from an external threat. The RXB exterior walls are designed to preclude aircraft perforation in the aircraft impact assessment and therefore would likely prevent significant damage to components inside the RXB from an external threat.

Personnel access restrictions, robust module bay walls, and biological shield design also provide adequate protection from an internal threat. The module walls are 5 ft thick, and the bioshield is 24 in. thick (23.5 in. of concrete, and encased in .25-in. stainless steel). The bioshield reinforced concrete slab encloses the top of the CNV. The module bay walls enclose the CNV on three sides. On the last side (facing the center of the UHS), the vertical face of the biological shield extends a minimum of 12 in. below the UHS nominal water level to prevent a reactor pool surface fire from entering under the biological shield. The vertical face is constructed of a steel member frame with radiation panels mounted on both the front and rear face of the frame. The radiation panels consist of 4 in. of high-density polyethylene sandwiched between two 1/4-in. steel plates with the perimeter wrapped with angle steel. The radiation panels are arranged in an overlapping pattern: the front face panel and rear face panel alternate to provide coverage such that air is vented from the operating bay both during normal operations and when there is a high energy line break in the bay. The overlap is staggered to provide a torturous path for fire and smoke, and to minimize potential projectiles entering the operating bay through the bioshield.

Access restriction to the bioshield and the robustness of the design of this portion of the bioshield represent a formidable barrier for internal threats. Therefore, the components under the bioshield (e.g., on the top of the NPM), the CNV itself, and the components located within (e.g., the reactor pressure vessel) are not subject to internal and external threats.

<u>Emergency Core Cooling System</u>
The emergency core cooling system (ECCS) is a safety-related system available to provide heat removal from the reactor pressure vessel (RPV). The ECCS can provide decay heat removal for at least 72 hours without modulation, automatic or manual, after the initiating event. All safety-related functions of ECCS are designed using passive operating principles and fail in an actuated configuration upon initiation signal or loss of DC power. No electrical power or support systems are required for successful operation of ECCS.

Natural circulation of reactor coolant transfers heat from the core to the CNV, where the heat is subsequently rejected to the UHS. The ECCS does not require a source of water for injection, as discussed in section 4.3.2.3 below.

The ECCS is designed to actuate on high CNV water level. Three reactor vent valves (RVVs) and two reactor recirculation valves (RRVs) will open to actuate ECCS when differential pressure between the RPV and CNV lowers sufficiently to release the inadvertent actuation block on the valves. The ECCS valves are welded to RPV nozzles inside the CNV. The ECCS function is successful if at least two RVVs and one RRV operates (any combination of two vent paths and one recirculation path). The ECCS valves will open 24 hours following loss of all AC power, as long as differential pressure has fallen below the required value.

<u>Decay Heat Removal System</u>
The DHRS is a passive core cooling safety system consisting of two independent and redundant trains. Each train alone has the capability to provide sufficient heat removal to satisfy the safety function. The DHRS functions by using the steam generators (SGs) to remove heat from primary coolant. Generated steam is condensed in the elevated DHRS passive condensers and returned to the SG as subcooled liquid. Flow is driven by natural circulation and heat is rejected to the UHS. The SGs are integral to the RPV.

Each DHRS train consists of one passive condenser immersed in the UHS, two redundant actuation valves configured in parallel above the condenser, and piping that connects the condenser to one of the SGs. Each train uses two separate closed loop natural circulation flowpaths. The first is the primary coolant, which removes heat from the core and transfers it to the SG tube walls by liquid convection. The second is the DHRS loop, where this heat is transferred through the SG tube walls and then through the tube walls of the passive condensers. The external surfaces of the passive condenser tube walls contact the UHS.

One DHRS train must be available for system success, which includes closure of the associated main steam isolation valve and feedwater isolation valve (which have no reliance on AC power or non-safety systems), and actuation of one of the two associated parallel DHRS actuation valves.

The DHRS actuation valves have no reliance on AC power or non-safety systems. After actuation, the valves do not require a subsequent change of state nor availability of power to maintain their intended functions.

The DHRS passive condensers are located on the outside of the CNV below the UHS water level. The DHRS actuation valves and associated piping are located above the UHS water level and under the bioshield. The main steam and feedwater containment isolation valves (CIVs) are located under the bioshield. The piping delivering steam to the passive condensers from the main steam line are located under the bioshield and outside of the CNV, with a portion above the UHS water level and a portion below. The piping delivering condensate from the passive condensers back to the feedwater inlet plenums are located outside of the CNV and below the UHS water level. Other piping and components required for operation are located within the CNV.

All safety-related functions of DHRS are designed using passive operating principles and fail in an actuated configuration upon an initiation signal or loss of DC power. Once the system is initiated, no automatic control or modulating components are active.

<u>Containment System</u>

The containment system (CNTS) includes the CNV, CIVs, instrumentation, and associated support structures. Containment heat removal is a function of the CNTS design. The CNV is a metal containment pressure vessel forming a barrier to prevent the release of radioactivity and radiological contaminants. The RCS, the control rod drive system, select DHRS components, select primary system piping and valves, and the ECCS are contained in the CNV. The CNV is partially immersed in the UHS during normal operation. CIVs isolate the CNV from the external environment in the event of an accident. The CIVs are located on the respective system lines that penetrate the CNV head; however, the CIVs are part of the CNTS.

Containment isolation is required for proper function of ECCS. Since the containment isolation components (i.e., isolation valves) are located under the bioshield, which is not affected by a LOLA, these components will perform their function in a LOLA scenario. Partial containment isolation, consisting of the associated main steam and feedwater isolation valves, is required for proper function of DHRS.

<u>Chemical and Volume Control System</u>

The chemical and volume control system (CVCS) is a means of RCS inventory control during normal operation, startup, and shutdown. Success of this system to perform this key function requires at least one CVCS makeup pump running. The CVCS helps in a LOLA event by being automatically isolated by the closure of safety-related CIVs, eliminating a potential leakage pathway outside of the CNV within the first minute of the event.

The CVCS makeup pumps are located in the north gallery space and in the south gallery space of the RXB, elevation 50 ft. The RXP elevation of 50 ft is underground and protected from external events.

Energy Conversion Systems
The energy conversion systems, which include condensate and feedwater, main steam, and turbine generator systems, are the means of heat removal during normal plant operations. Successful operation requires an open flow path with at least one of three condensate pumps and one of three feedwater pumps to be operating. An open flowpath means steam flows from the SGs to the condenser, and condensate flows from the condenser back to the SGs. A containment isolation signal will isolate this flowpath. Supporting systems include condenser air removal, instrument air, circulating water, and site cooling water systems.

{{

}}SRI

Reactor Safety Valves
Pilot-operated American Society of Mechanical Engineers Code safety valves are used to provide overpressure protection for the RCS and can also perform a heat removal function in a LOLA event. The valves open on high RPV pressure to vent steam into the CNV, and close as the pressure is reduced. The steam vented into the CNV condenses and allows heat to be conducted through the wall of the CNV to the UHS. Opening of at least one safety valve is adequate to perform this function. These valves are located within the CNV.

4.3.2.3 Assessment of Key Safety Functions

RCS Inventory Control
The purpose of this key safety function is to ensure that the core is covered with water. If the core remains covered with water, core damage will be precluded. Traditional PWR designs accomplish this function by injecting water into the RPV using systems such as safety injection. The NPM does not require water injection to keep the core covered during transient or accident scenarios. Containment isolation is the primary means for RCS inventory control. The CVCS is a non-safety alternate means to perform this function. When ECCS or DHRS are actuated, the core will remain covered.

During a loss of the, RCS inventory is maintained within the CNV if containment is isolated. The ECCS functions by recirculating coolant condensed in containment and returning it to the RPV using natural recirculation.

The NuScale Power Plant does not have reactor coolant pumps; therefore, there is no potential for loss of inventory through reactor coolant pumps seal leakage due to lack of seal cooling, as may occur in a station blackout event for traditional PWR designs. Leakage could occur through the CIVs, but the leakage rate is small and RCS makeup is not required.

During a LOLA scenario RCS inventory control is maintained by containment isolation. The ECCS passively removes heat from the CNV, and heat is conducted through the wall of the CNV to the UHS. Therefore, no mitigating strategies are required for RCS inventory control.

RCS Heat Removal
The purpose of this key safety function is to remove the decay heat from the core and transfer it to the UHS. The primary means for heat removal during steady state, startup and hot shutdown operations are the energy conversion systems. The alternate means for RCS heat removal is the DHRS, or by the ECCS when the ECCS valves open. During DHRS operations, external feedwater injection is not required. Therefore, no portable SG level measurement is required.

This function is accomplished by the DHRS and ECCS, passive systems located in the CNV, which is under the bioshield. The bioshield is not subject to damage during a LOLA event. Therefore, no mitigating strategies are required for RCS heat removal.

Containment Isolation
The purpose of this key safety function is to ensure no leakage paths exist that would allow gaseous and particulate radiation to escape containment. Traditional PWR designs accomplish this function by using CIVs. The NuScale Power Plant also relies on CIVs to accomplish this function. Containment design and isolation is discussed in FSAR Section 6.2.

The CIVs for interfacing systems, with the exception of feedwater and main steam, have dual valve, single body CIVs outside of the CNV. This isolation capability is located under the bioshield. This dual containment isolation capability is both the primary and alternate means of performing this function. A loss of DC power to those valves will result in their repositioning to their safe or accident response position.

This function is accomplished by passive systems located under the bioshield, which is not subject to damage during a LOLA event. Therefore, no mitigating strategies are required for containment isolation.

Containment Integrity
The purpose of this key safety function is to ensure the containment fission product barrier is maintained to minimize or prevent radiological release outside containment. Traditional PWR designs accomplish this function through the use of containment sprays to control containment pressure and temperature below applicable limits as well as quenching debris that has relocated outside of the RPV during a severe accident.

For the NuScale Power Plant, the CNV temperature and pressure are maintained due to the partial immersion of the CNV in the UHS, which is located below ground. Severe accident analyses have shown that even during a severe accident where the core relocates to the bottom of the RPV, the RPV will not be breached and the CNV remains intact due to the passive cooling capabilities of the RPV and CNV containing the inventory from ECCS initiation or safety relief actuation.

This function is accomplished passively by heat exchange between the RPV, CNV, and UHS. Therefore, no mitigating strategies are required to ensure containment integrity.

<u>Release Mitigation</u>

The purpose of this key safety function is to minimize a radiological release assuming severe core damage has occurred and a radiological release is imminent or in progress. Traditional PWRs perform this function by scrubbing the containment atmosphere using containment sprays. However, a release that is in progress may not be susceptible to the scrubbing effects, and a release from containment or the RXB may nonetheless occur.

For the NuScale Power Plant, this same phenomenon is applicable for a release from the CNV to the environment. The RPV is located within the CNV. The CNV is partially immersed in the UHS. The UHS is the primary means to perform this function. There is no means to scrub a radionuclide release into the RXB.

A release from the bottom of the CNV will be scrubbed by the UHS. There are penetrations below the water level and a release at such a location is bounded by a release above the water line. A more likely and more conservative release point that would require mitigation is on the top of the CNV, as there are numerous penetrations in the portion of the CNV that is located above the top of the UHS water level. These penetrations are located underneath the bioshield. If the release were to extend into the RXB, a release could occur through one of several RXB exterior openings.

A COL applicant that references the NuScale Power Plant design certification will develop and implement a mitigating strategy for this key function.

4.3.3 Key Safety Function Mitigation Strategies

The NuScale Power Plant ensures that key safety functions are successfully performed with installed plant systems when subjected to a LOLA event. The redundancy, passive nature, and separation of systems that perform the key safety functions during a LOLA event preclude the need for all but one of the mitigating strategies. The only mitigating strategy required for the NuScale Power Plant is portable spray, which is described below.

4.3.3.1 Portable Sprays

The objective of the PWR-specific release mitigation strategy is to spray a release coming from a damaged or failed containment or release location (e.g., RXB). The intent of the strategy is to spray a release point, which may be located internal or external to the RXB. Guidance for performing spray scrubbing of radiological releases and containing associated runoff will be developed by the COL applicant using the NuScale Generic Technical Guidelines, TR-1117-57216 (Reference 6.5). Ensuring the spray scrubbing equipment is located at least 100 yd from the RXB is a responsibility of the COL applicant.

Standpipes and hose connections are located in each stairway and exit corridor. Hydrants are located in yard areas at least 100 yd from the RXB. Portable external pump and supporting equipment should be located more than 100 yd from the RXB. The NuScale design will successfully support supplying the underground fire water ring main using a portable diesel-driven pump. External water sources available for makeup to the yard fire main loop are the fire protection supply tank and the fire protection alternative supply tank, which contain at least 300,000 gallons of water. The portable pump and supporting equipment (e.g., diesel fuel), as well as flexible hoses and supporting equipment, should be located at least 100 yd from the RXB. The COL applicant will determine the estimated flow rate of the portable equipment. If the yard fire main loop is intended to be used for reactor mitigation strategies, the capability to isolate other structures is included due to the several connections and valves that can ensure isolation of broken sections of the main.

4.3.4 Submittal Requirements

Appendix A of this report summarizes COL applicant requirements to meet LOLA requirements.

4.4 Maintenance and Testing

The COL applicant will describe how equipment relied upon to implement the mitigation strategies will be maintained and periodically tested to ensure it will operate when needed.

Equipment, such as fire pumps, hoses, or nozzles purchased for these strategies will be maintained by licensees. An adequate program for equipment requiring maintenance, at a minimum, should include periodic surveillance checks, start and run checks, and pump flow tests. Other tools, adaptors, wrenches, jumpers, and like equipment that does not require maintenance or testing should, at a minimum, be stored in an accessible location greater than 100 yd from the building of interest and periodically inventoried to ensure that the equipment is available when needed.

Equipment will be taken out of service for routine maintenance activities for varying periods of time. However, a program that allows equipment needed to implement the strategies required by 10 CFR 50.155(b)(2) to be out of service for an indefinite period of time is considered to be inconsistent with the requirement to implement strategies. COL applicants should ensure that reasonable controls on the availability of equipment needed to implement the strategies are included in their site-specific procedures and guidance.

4.5 Design Enhancements

No design enhancements are required for the NuScale Power Plant to comply with 10 CFR 50.155(b)(2) requirements.

5.0 Summary and Conclusions

This report identifies the regulatory requirements and guidance, and sufficiency criteria for meeting the regulation for LOLA for the NuScale Power Plant design. The guidance of NEI 06-12 and SRP Section 19.4 are addressed. Requirements for the COL applicant are specified based on the NuScale Power Plant design.

The features of the NuScale Power Plant design, as assessed for a LOLA event for the NuScale design certification application, combined with COL applicant items, meet regulatory requirements for 10 CFR 50.155(b)(2) for new plant licensing.

6.0 References

6.1 Nuclear Energy Institute, “B.5.b Phase 2 & 3 Submittal Guideline,” NEI 06-12, Revision 3, July 2009, Agencywide Document Access and Management System (ADAMS) Accession No. ML092890400.

6.2 U.S. Nuclear Regulatory Commission, “Interim Staff Guidance Compliance with 10 CFR 50.54(hh)(2) and 10 CFR 52.80(d) Loss of Large Areas of the Plant due to Explosions or Fires from a Beyond-Design Basis Event,” DC/COL-ISG-016, June 9, 2010.

6.3 U.S. Nuclear Regulatory Commission, “Developing Mitigating Strategies/Guidance for Nuclear Power Plants to Respond to Loss of Large Areas of the Plant in Accordance with B.5.b of the February 25, 2002, Order,” February 25, 2005.

6.4 U.S. Nuclear Regulatory Commission, “Strategies and Guidance to Address Loss of Large Areas of the Plant Due to Explosions and Fires,” NUREG-0800, Section 19.4, Revision 0, June 2015.

6.5 NuScale Power, LLC, "NuScale Generic Technical Guidelines," TR-1117-57216.

Appendix A. Action Items for the Combined License Applicant

Table A.1-1 is a rollup of operational enhancements that are action items for the COL applicant that references the NuScale design certification to comply with the SRP Section 19.4 (Reference 6.4). The SRP is not a substitute for NRC regulations, and compliance with it is not required. However, a design certification applicant is required per 10 CFR 52.47(a)(9) to identify differences between the design features, analytical techniques, and procedural measures proposed for its facility and the SRP acceptance criteria and evaluate how the proposed alternatives provide acceptable methods of compliance.

Table A.1-1 Additional COL applicant commitments

SRP Item Number*	Title	COL Applicant Commitment	Status/Comment	Report Section
1	License Conditions and Implementation Schedule	Include a license condition related to 10 CFR 50.155(b)(2) that addresses (1) implementation of specified programs and (2) submitting schedules to support planning for and conduct of NRC inspections.	This is a COL applicant item.	-
2	Licensee Commitments	Include a commitment to verify the adequacy of procedures, training and engineering bases for each mitigating strategy by performing a walkthrough or other type of exercise of the strategy.	This is a COL applicant item.	-
3	SG Level	For applicants using a nuclear power plant design similar to current operating PWRs that have adopted strategies in Section 3.3.2, 3.3.3, or 3.3.4 of NEI 06-12, Revision 3, or similar strategies, should determine whether or not a portable means of measuring SG level is necessary for the strategy to be successful.	NuScale SG control and use during accident scenarios is different than current operating PWRs. Portable means of measuring SG level is not required.	4.3.2.3
4	Staging of Fire Equipment	Stage fire equipment greater than 100 yd from target areas; or harden location; or credit present intervening structure(s); or store the necessary equipment in diverse locations.	The discussion of enhanced firefighting strategies states that fire equipment will be stored greater than 100 yd from all target areas.	4.1.3

SRP Item Number*	Title	COL Applicant Commitment	Status/Comment	Report Section
5	Dispersal of Personnel	Develop procedures to evacuate target building(s) or maximize survivability.	This is a COL applicant item.	4.1.3
		Stage fire brigade members greater than 100 yd from target areas, or hardened/intervening structure(s) is/are present.	This is a COL applicant item.	4.1.3
		Direct that operations and support staff will be relocated greater than 100 yd from target areas, with a minimum number in the control room.	This is a COL applicant item.	4.1.3
6	Airlifted Resources	Ensure airlifted resources will arrive in less than two hours door-to-door.	This is a COL applicant item.	4.1.3
7	Command and Control	Develop protocols for command of LOLA events, including organizational references.	This is a COL applicant item.	4.3.1
8	Evaluating Capabilities of Offsite Resources	Evaluate the ability of local and regional "specialized capabilities" (cranes, fire and hazmat teams, etc.).	This is a COL applicant item.	4.1.3
9	Evaluation of MOUs for Offsite Resources	Establish appropriate MOUs with offsite response organization to ensure support in a LOLA scenario.	This is a COL applicant item.	4.1.3

SRP Item Number*	Title	COL Applicant Commitment	Status/Comment	Report Section
10	Coordination with Regional Resources	Ensure ground-based regional support will arrive in less than two hours door-to-door. Agreements with supporting organizations should be formally documented, preferably with MOUs.	This is a COL applicant item.	4.1.3
11	Controlling Emergency Response Vehicles and Dosimetry for Responders	Establish security provisions to stage many response vehicles easily onsite.	This is a COL applicant item.	4.1.3
		Prepare guidelines to distribute sufficient dosimetry to the appropriate responders.	This is a COL applicant item.	4.1.3
12	Communications Equipment	Provide enough compatible radio sets for fire fighters, stored greater than 100 yd from target areas.	This is a COL applicant item.	4.1.3
		Establish a radio scheme for plant operations to minimize confusion. The required equipment must be separate from that used for firefighting and distributed greater than 100 yd from the nuclear island and structures.	This is a COL applicant item.	4.1.3
13	Mass Casualties	Prepare guidelines for mass casualty events, including expected aid from offsite medical responders.	This is a COL applicant item.	4.1.3
14	Triage Areas	Define appropriate triage area(s) greater than 100 yd from target areas.	This is a COL applicant item.	4.1.3

SRP Item Number*	Title	COL Applicant Commitment	Status/Comment	Report Section
15	Firefighting Training and Exercises	Provide training on accelerant-fed fires and onsite/offsite coordination to the fire brigade. Familiarize local offsite responders with the site and provide information on LOLA events, if possible.	This is a COL applicant item.	4.1.3
16	Means for Feeding the Yard Fire Main Loop	Establish a means to feed the yard fire main loop using alternate water supplies.	The discussion of enhanced firefighting strategies identifies the means to meet this requirement.	4.1.3
17	Boiling Water Reactor: Containment Venting and Vessel Flooding	Prepare guidance to vent primary containment to secondary (or atmosphere) in a no-power condition.	This item is not applicable to NuScale.	N/A
		Prepare condensate pumps to provide cooling water to RPV.	This item is not applicable to NuScale.	N/A
18	Use of Plant Equipment During Loss of Power Situations	Establish a procedure to start emergency diesel generators and non-AC pumps without DC power.	This item is not applicable to NuScale.	N/A
		Prepare guidelines for fire pumper to supply cooling water to RPV and SFP.	The SFP makeup and refueling water storage tank makeup and spray strategies are not required for NuScale.	4.2 4.3.3

SRP Item Number*	Title	COL Applicant Commitment	Status/Comment	Report Section
19	Compartmentalization	Document possible improvements to contain accelerant flow (i.e. jet fuel) in fire areas.	The Authorized Inspection Agency identified design improvements to minimize accelerant propagation in fire areas. Design improvements have been incorporated accordingly. External walls of the RXB are designed to preclude aircraft perforation.	Design Certification Application Part 2, Tier 2, Section 19.5
20	SFP Mitigative Measures	Require direct placement of hot fuel into a 1x4 dispersed pattern in SFP.	The SFP enhanced cooling strategies are not required for NuScale.	4.2
		Prevent hot fuel from being placed over SFP rack feet. This requirement may be waived with an appropriate analysis.	The SFP enhanced cooling strategies are not required for NuScale.	4.2
		Establish the maximum possible contiguous area for the downcomer effect to support natural circulation in the SFP	The SFP enhanced cooling strategies are not required for NuScale.	4.2

SRP Item Number*	Title	COL Applicant Commitment	Status/Comment	Report Section
21	Training	Include LOLA event training for initial and re-qualified operator licensing. This should be directed at least as often as severe accident management guideline training.	Will be covered in the training requirements for the GTGs.	-
		Analyze LOLA training needs for emergency and non-licensed personnel.	Will be covered in the training requirements for the GTGs.	-
22	Water Spray Scrubbing and Runoff	Prepare guidance for performing spray scrubbing of radiological releases and containing associated runoff.	The need for a portable spray strategy has been identified. GTGs cover portable spray - specifically emergency fill of UHS and reactor building spray. Procedures for implementation and runoff containment will be addressed by the COL applicant.	4.3.3
		Ensure water spray scrubbing equipment is stored greater than 100 yd from target areas. This requirement does not apply if only offsite equipment is used.	This is a COL applicant item.	4.3.3

SRP Item Number*	Title	COL Applicant Commitment	Status/Comment	Report Section
23	Maintenance and Testing	Describe how equipment relied upon to implement the strategies required by 10 CFR 50.155(b) will be maintained and periodically tested to ensure it will operate when called upon.	This is a COL applicant item.	4.4
24	Extensive Damage Mitigation Guidelines	Develop EDMGs.	NuScale has developed generic technical guidelines which covers extensive damage mitigation.	4.3.1

*Note to Table A.1-1:
Item numbers refer to Section II, SRP Acceptance Criteria, of Reference 6.4.