Enclosure 1:

"Human Factors Engineering Operating Experience Review Implementation Plan," RP-0914-8535-NP, Revision 1, Nonproprietary version

Human Factors Engineering

Operating Experience Review Implementation Plan

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Revision 1

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NuScale Nonproprietary

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1.0 Introduction

1.1 Purpose

The purpose of conducting a NuScale operating experience review (OER) is to identify and document safety issues and lessons learned from the applicable operating experience of multiple industries. The applicable lessons learned are then addressed in the design of NuScale systems in order to reduce human errors and their impact on risk and reliability of plant operation. In addition, the lessons learned are applied to NuScale plant operations, operational procedures and training of NuScale plant operators. Therefore, NuScale design avoids negative features in previous designs while retaining positive features.

The NuScale design implements a modern, computer-based, automated human-system interface (HSI) technology including a computer-based procedure system. The NuScale OER supports the development of this design by review of operating experience with the proposed technology.

The unique NuScale modular design includes an additional OER focus to provide documented lessons learned for the following plant operations:

- monitoring and control of multiple units in one control room
- construction and construction testing of one or more units coincident with operating units
- initial plant testing (preoperational and start-up testing) coincident with operating units
- refueling of a unit coincident with operating units
- incident and accident management of a unit coincident with operating units

In other words, the NuScale design allows multiple units at power while additional units are in construction, initial module testing, or refueling.

1.2 Scope

1.2.1 Predecessor and Related Plants and Systems

The NuScale reactor is a new and innovative modular passive pressurized water (PWR) reactor design. Due to the uniqueness of the NuScale design, there is no commercial nuclear reactor that can be considered its direct predecessor. Nonetheless, the operating experience review of operating commercial nuclear power plants is essential to the development of the NuScale design because many of the NuScale systems and components are also found in previous designs.

Due to the limited use and experience of the proposed NuScale HSI technology in the current operating commercial nuclear power plants, NuScale must extend the OER

boundaries for this technology beyond the experience of these existing plants. Section 1.2.3 discusses the NuScale plan for OER of the new HSI technology in other industries.

An initial screening is performed on each OER source to determine if further evaluation is necessary to identify potential HFE issues related to NuScale design. If there is no correlation between the operating experience related to these eliminated systems and components and the NuScale design, the OER document is closed as nonapplicable. Section 7.1, Appendix A provides a cross reference between systems contained in operating commercial nuclear power plants and NuScale systems. Table 1-1 provides examples of systems and components eliminated in NuScale design and the design features that allowed their elimination.

Table 1-1. Examples of systems and components eliminated in NuScale design

NuScale Design Feature	System or Component Eliminated in NuScale Design
buoyancy forces drive natural circulation of the primary coolant	reactor coolant pumps
reactor core, steam generator, and pressurizer contained within the reactor pressure vessel	reactor coolant system piping pressurizer surge line
reactor pressure vessel housed in a steel containment submerged in water that provides an effective passive heat sink for long-term emergency cooling	residual heat removal system pumps with associated piping and heat exchangers auxiliary feed water (AFW) system safety injection system

The elimination of plant systems and components similar to those used in other PWR designs in the NuScale plant design reduces the likelihood that the associated operating experiences for these systems will apply to the NuScale design. The following are examples of systems and components with recognized HFE issues that do not apply to NuScale

- reactor coolant pump seal failures and leakage
- reactor coolant pump vibration monitoring
- AFW pump overspeed trip
- AFW turbine trip valve reset/trip status
- loss of suction to emergency feedwater pumps
- residual heat removal suction valve testing
- throttling of high pressure safety injection during emergency operation

1.2.2 Recognized Industry HFE Issues

Table 1-2 provides summary details of NUREG/CR-6400 contents by NUREG section number. The number of HFE items and number of documents in the table are approximate, but are provided to show the relative magnitude of the review scope.

Table 1-2. NUREG/CR-6400 details

Section Number	Section Title	Approximate Number of NUREG/CR-6400 HFE Items/Events To Be Analyzed	Source Document(s)	Approximate Number of Documents
2	Unresolved Safety Issues/Generic Safety Issues	20	NUREG-0933 Revision 20, Table II (Reference 6.1.3)	1
3	Three Mile Island Issues	31	NUREG-0933 Revision 20, Table II (Reference 6.1.3)	1
4	NRC Generic Letters and Information Notices	3 2	NRC generic letters NRC information notices	3 2
5	Office for Analysis and Evaluation of Operational Data (AEOD) Issues	28	NUREG-1275 Volume 8 (Reference 6.1.4)	1
6	Low Power and Shutdown Operations	6	largely taken from NUREG-1449 (Reference 6.1.5)	1
7	Operating Plant Event Reports	58	NUREGs	10
			licensing event reports	38
			NRC generic letters	5
			NRC IE bulletins	2
			NRC information notices	10
			specialized reports	8

Sections 2 and 3 of NUREG/CR-6400 (Reference 6.1.2) state that the issues are described in NUREG-0933, but do not specify if the issues are summarized in NUREG-0933 Table II or Appendix B. For clarity, the following discussion explains why Table II is used in the NuScale OER process instead of Appendix B. The discussion references the latest version of NUREG-0933 (Revision 34) (Reference 6.1.3).

NUREG-0933 Appendix B contains a list of USI/GSIs that are applicable to operating future reactor plants. In order to satisfy 10 CFR 52.47(a)(21) (Reference 6.1.7), all applications for design certification must contain proposed technical resolutions for all of the generic safety issues listed in NUREG-0933 Appendix B.

The issues listed in NUREG-0933 Appendix B are derived from the NRC's analysis of the issues listed in NUREG-0933 Table II. Therefore, the issues in NUREG-0933 Appendix B are a subset of the items in Table II. All issues described in NUREG/CR-6400 Sections 2 and 3 are summarized in NUREG-0933 Table II. However, many of these same issues do not meet the criteria of NUREG-0933 Appendix B and are not listed therein.

In the category of unresolved safety issues/generic safety issues, there have been additional items added to New Generic Issues since NUREG-0933, supplement 20, was issued. New generic issue numbers 174.A, 174.B, 175,176, and 177 through 203 contained in NUREG-0933, Revision 34, are reviewed for HFE issues. Issue 182 was identified in February 1996 and Issue 203 was identified in June 2007; both Issue 182 and Issue 203 are unresolved safety issues.

From the mid-1980s through 2000 the NRC's Office for Analysis and Evaluation of Operational Data (AEOD) conducted a program to identify human factors and human performance issues associated with operating events at nuclear power plants. The results of the program were published in NUREG-1275 in 14 volumes whose titles are provided in Table 3 3 (Reference 6.1.4).

Table 1-3. NUREG-1275 Human Performance Studies

NUREG-1275 Volume #	NUREG Operating Experience Feedback Report Title	Publication Date
1	Operating Experience Feedback Report - New Plants	July 1987
2	Air Systems Problems	December 1987
3	Service Water System Failures and Degradations	November 1988
4	Technical Specifications	March 1989
5	Progress in Scram Reduction	March 1989
6	Operated Valve Problems	February 1991
7	Experience with Pump Seals Installed in Reactor Coolant Pumps Manufactured by Byron Jackson	September 1992
8	Human Performance in Operating Events	December 1992
9	Pressure Locking and Thermal Binding of Gate Valves	March 1993
10	Reliability of Safety-Related Steam Turbine-Driven Standby Pumps	October 1994
11	Turbine-Generator Overspeed Protection Systems	April 1995
12	Assessment of Spent Fuel Cooling	February 1997
13	Evaluation of Air-Operated Valves at U.S. Light-Water Reactors	February 2000
14	Causes and Significance of Design-Based Issues at U.S. Nuclear Power Plants	November 2000

NuScale conducts an OER of NUREG-1275 items contained in Volumes 1 through 14 listed in Table 1-2. Because the content of each volume is extensive and detailed, NuScale experience from the initial reviews of NUREG-1275 volumes determine the best

method of summarizing the information in the reports into discrete portions in order to enter the evaluation information into the OER database. The potential issues identified from initial screening of NUREG-1275 Volumes 1 through 14 are entered into the NuScale OER database and evaluated using the method described in Section 2.0.

1.2.3 Related HSI Technology

The NuScale design uses a modern HSI design to control from 1 up to 12 nuclear reactors in one control room. This multi-unit operation from a single control room is outside of the operating experience of the currently operating nuclear power plants. Therefore, it is necessary for NuScale to obtain operating experience information on the use of HSI technology to control multiple processes in one control room from other facilities and industries including nuclear installations that do not produce power, nonnuclear power plants, the United States military, and the petrochemical industry.

The operating experience research of HSI technology focuses on

- highly automated, digitally-controlled process systems
- computerized procedures systems
- use of flat panel displays
- use of touch screens
- multi-unit control rooms

NuScale visits sites of selected installations, conducts personnel interviews, and performs literature reviews on HSI technology. The installations visited and a summary of the information collected are listed and described in the OER results summary report (RSR). Any potential issues discovered during this research are documented in accordance with the NuScale HFE OER procedure.

1.2.4 Issues Identified by Plant Personnel

NuScale conducts interviews with plant personnel (nuclear and nonnuclear industries) based on experience with systems or technology applicable to the new design. Each interview is conducted in accordance with the applicable NuScale procedure. Interview topics are tailored to the job description of the individual being interviewed. The following topics are included in the overall interview process:

- plant operations
  - normal plant evolutions (start-up, full-power, and shutdown)
  - instrument and control system degraded conditions and failures
  - HSI equipment failures and processing failures
  - transients
  - accidents

  - reactor shutdown and cool down using remote shutdown system
- HFE design topics
  - alarm and annunciation
  - display
  - control and automation
  - information processing and job aids
  - real-time communications with plant personnel, real time communications with other organizations
  - procedures, training, staffing qualifications and job design
  - multi-unit control room design effect on plant operation
  - highly automated control systems

The data obtained from each interview is reviewed for positive or negative aspects that are further evaluated for incorporation into the NuScale design. Each potential issue identified in an interview is entered into the OER database and evaluated in a manner similar to the process outlined in Section 2.1.

1.2.5 Important Human Actions

A probabilistic risk assessment/human reliability analysis (PRA/HRA) process is used to determine important human actions (IHA) from plant systems and components similar to those used in other PWR designs. As discussed in Section 1.2.1, the NuScale design does not have a predecessor plant. However, NuScale uses an alternate approach to ensure that prior operating experience is applied to improving the execution of IHAs. Using preliminary PRA results, NuScale identifies IHAs for the NuScale design early in the design process. This early list of IHAs is recorded in the OER database to make the information available while analyzing operating experience. The OER database is updated as necessary with revised IHAs as the PRA matures during design. The OER RSR includes a description of IHAs discovered during OER. The TIHA RSR (described in Reference 6.1.11) describes how IHAs are dealt with in the NuScale HSI design.

Each item analyzed and entered into the OER database is evaluated against the list of NuScale important human actions to determine if the operating experience had either a positive or negative impact on the human action. If the operating experience did have an impact, the important human action is cross-referenced to the item analyzed in the OER database. This allows the database to be queried for all operating experiences (both positive and negative) associated with an important human action.

1.3 Abbreviations

Table 1-4. Abbreviations

Term	Definition
AEOD	NRC's Office for Analysis and Evaluation of Operational Data
AFW	auxiliary feedwater water
CFR	U.S. Code of Federal Regulations
USI/GSIs	unresolved safety issues/generic safety issues (GSIs)
HFE	human factors engineering
HFEITS	Human Factors Engineering Issues Tracking System
HRA	human reliability analysis
HSI	human-system interface
IHA	important human actions
MUX	multiplexer
NRC	Nuclear Regulatory Commission
NUREG	technical report of the United States Nuclear Regulatory Commission
OER	operating experience review
PRA	probabilistic risk assessment
PWR	pressurized water reactor
RSR	results summary report
TIHA	treatment of important human actions

2.0 Issue Analysis, Tracking, and Review

2.1 OER Process

The HFE team is responsible for conducting the operating experience review. The qualifications of the HFE team members supporting this HFE program element are stipulated in the current NuScale HFE PMP, Tables 4-1 and 4-2 (Reference 6.1.8).

The OER process is detailed in the HFE OER Procedure. The HFE OER Procedure (Reference 6.1.9) also contains administrative instructions to control the NuScale OER process.

An OER team and OER team lead are selected by the HFE supervisor from available HFE team members to conduct OER. The OER team lead is responsible for

- organizing the OER team
- directing the development of the OER database
- assigning team member responsibilities
- managing resources and review schedule
- ensuring that OER issues are completed with supporting documentation and entered into HFEITS as necessary
- production of the OER database reports and the OER RSR

The OER database coordinator manages the information put into, screened, reviewed, and dispositioned in the OER database.

OER team members conduct the reviews and disposition the individual review items. Their responsibilities include

- reviewing OER issues for identification of
  - human performance issues
  - sources of human error
  - design elements which would support or enhance human performance
- screening of OER issues for applicability to the NuScale design using criteria established in the HFE OER Procedure
- summarizing/documenting screening results with an explanation of the applicability to NuScale design
- identification of further sources and topics for OER
- collection, preparation, and documentation of new sources of OE applicable to the NuScale design

- conducting operator interviews using the questionnaire template in the HFE OER Procedure
- identifying need for NuScale design action on OER issues
- entering actions resulting from OER into HFEITS (for a description of HFEITS, see HFE PMP Section 6.0)

The scope of OER issues to be reviewed is described in Section 1.2. Individual issues from NUREG/CR-6400 (Reference 6.1.2), searches of data from other industries in which similar technology is used, operator interviews, site visits, literature reviews, and search of nuclear industry websites and databases (NRC, INPO, EPRI, WANO, IAEA, etc.), and from the IHA findings are added as records to the OER database.

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}}3(a)-(c)

Figure 2-1. OER methodology

Screening and disposition of OER issues is described in a flowchart of the process (Figure 2-1). The OER team is involved in decisions regarding disposition of OER issues. In the event that an OER issue is determined to be relevant and applicable to NuScale HFE scope, but the current design documents do not address the issue, the OER issue becomes an HFE issue for tracking in the HFEITS database. HFEITS-tracked OER issues are categorized to show which HFE elements they affect. This categorization facilitates future searches of the OER database by HFE element.

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}}3(a)-(c)

2.2 Analysis Content

Screened-in OER issues that are identified as potential human performance issues or sources of human error or identified as design elements that might support or enhance human performance are captured in HFEITS. HFEITS issues are evaluated during later stages of analyses or design for incorporation as described in the implementation plans for those HFE program elements.

2.3 Documentation

Each OER issue screened is documented in the OER database.

OER issues from sources other than NUREG/CR-6400 (Reference 6.1.2) are reviewed for potential human performance issues or sources of human error or identified as design elements that might support or enhance human performance. If an OER issue is not related to human performance, a justification is written and reviewed by the OER team. If the OER team approves that justification, the OER issue is closed, but retained in the OER database.

If an OER issue is determined to be not applicable to the NuScale design, a justification is written and reviewed by the OER team. If the OER team approves that justification, the OER issue is closed, but retained in the OER database.

If an OER issue has been determined to be applicable to the NuScale design but is not applicable to the HFE program scope as defined in Reference 6.1.8, a justification is written and reviewed by the OER team. If the OER team approves that justification, the OER issue is transferred to the appropriate engineering discipline by means of the engineering tracking database. The OER issue is then closed, but retained, in the OER database.

If an OER issue has been determined to be applicable to the NuScale HFE program scope, but is resolved by the current design, documentation of that resolution is captured in the OER database. Documentation includes reference to appropriate approved design documents. The OER team reviews the resolved-by-design documentation and closes and retains the OER issue in the OER database.

An OER issue that has been determined to be applicable and not resolved by the current design within the HFE program scope is documented as such in the OER database. The OER team member proposes a design modification to incorporate the OER issue. The OER team reviews the OER database documentation and proposed design modification. If approved, the OER issue is closed and retained in the OER database and the associated documentation and proposed modification are captured in the HFEITS database. HFEITS issues are evaluated during later stages of analyses or design for incorporation as described in the implementation plans for those HFE program elements.

Any time the OER team rejects a justification or set of documentation for closure of an OER issue, the OER team and HFE supervisor have discretion to either reassign the OER issue to another team member or resolve the item as a team.

2.4 Incorporation into HFEITS

Only an OER issue that is in-scope for the HFE program but not incorporated by the current design is captured in HFEITS. HFEITS issues are evaluated during later stages of analyses or design for incorporation as described in the implementation plans for those HFE program elements.

3.0 Additional Consideration for Plant Modifications

As the NuScale HFE program applies to the design of a new plant prior to design certification application submittal, there are no additional considerations for reviewing the HFE aspects of plant modifications during OER. The NuScale Human Performance Monitoring IP (Reference 6.1.10) has provision for and describes appropriate processes for design changes occurring after turnover to the licensee.

4.0 Operating Experience Review Results Summary Report

An OER RSR is submitted at the completion of the OER effort. The report contains, at a minimum

- a description of the methodology used to screen, review, document findings and results, and make decisions regarding OER issues
- a list of the OE documents reviewed
- a description of how human factors issues or highly similar features from plant systems and components similar to those used in other PWR designs are
  - used as design basis for the NuScale design based on OER
  - relevant to the design features of the NuScale design based on OER
  - identified and analyzed by NuScale and how the NuScale design avoids the problems
  - identified, evaluated and incorporated if considered positive features
  - related to systems and features of the NuScale design
  - reviewed and incorporated as beneficial to the NuScale design when considered new technology
- a description of how issues identified in NUREG/CR-6400 and since its publication in 1996 are screened, reviewed, evaluated, and incorporated or not included in the NuScale design:
  - unresolved safety issues/generic safety issues
  - TMI issues
  - NRC generic letter and information notices
  - operating experience reports in the NUREG-1275 series
  - low power and shut down operations
  - operating plant event reports
- a description of how issues identified during the OER of related HSI technology are screened, reviewed, evaluated, and incorporated or not included in the NuScale design
- a description of how issues identified by plant personnel during interviews are screened, reviewed, evaluated, and incorporated or not included in the NuScale design.
- a description of how issues identified as related to important human actions are screened, reviewed, evaluated, and incorporated or not included in the NuScale design:
  - listing of OER-identified human performance issues incorporated into the design

- enumeration of open issues still being tracked in the HFEITS

5.0 NUREG-0711 Conformance Evaluation

Table 5-1 indicates where each NUREG-0711, Revision 3 (Reference 6.1.1) criterion is met in this IP.

Table 5-1. Conformance with NUREG-0711

Review Criteria	OER IP Section No. and paragraph
3.4.1 Scope *(1) Predecessor/Related Plants and Systems* – The applicant's OER should include information about human factors issues in the predecessor plant(s) or highly similar plants, systems, and HSIs, including the following: • The OER should identify previous or predecessor design(s)/plant(s) used as part of the design basis of the plant being reviewed. • The OER should define the relevance of each predecessor plant/design to the new design, when there is more than one predecessor. • The OER should detail how the applicant identified and analyzed any HFE-related problems in the previous plants/designs, and how these issues are avoided in the new design. • The OER should address how the applicant identified, evaluated, and incorporated or retained any positive features of previous plants/designs. • The OER should describe the predecessor plant(s) and systems, explaining the relationship of each to the new design. • For applicants proposing to use new technology or systems that were not used in the predecessor plants, the OER should review and describe the operating experience of any other facilities that already use that technology.	Section 3.1, All
(2) Recognized Industry HFE Issues – The applicant should address the HFE issues identified in NUREG/CR-6400. The issues are organized into the following categories: • unresolved safety issues/generic safety issues (See 10 CFR 52.47(a)(21) and NUREG-0933) • TMI issues • NRC generic letters and information notices • operating experience reports in the NUREG-1275 series, Vol. 1 through 14 • low power and shut down operations • operating plant event reports Additionally, the applicant should review and discuss all operating experience in the preceding categories that was published since NUREG/CR-6400 was published in 1996.	Section 3.2, All

Review Criteria	OER IP Section No. and paragraph
(3) Related HSI Technology – The applicant's OER should cover operating experience with the proposed HSI technology in the applicant's design. *Additional Information*: For example, if a computer operated support system, a computerized procedures system, or advanced automation are planned to be used, the OER should describe the HFE issues associated with using them.	Section 3.3, All
(4) Issues Identified by Plant Personnel – The applicant's OER should discuss issues identified through interviews with plant personnel based on their operating experience with plants or systems applicable to the new design. As a minimum, the interviews should include the following topics: • Plant Operations - normal plant evolutions (e.g., start-up, full-power, and shutdown) - failure modes and degraded conditions of the I&C systems, including, but not limited to, the sensor, monitoring, automation and control, and communications subsystems. These include, for example, the safety-related system logic and control unit, fault tolerant controller (nuclear steam supply system), the local "field unit" for the multiplexer (MUX) system, the MUX controller (balance-of-plant), and a break in the MUX line failure modes - degraded conditions of the HSI resources (e.g., losses of video display units, of data processing, and of large overview display) - transients (e.g., turbine trip, loss of offsite power, station blackout, loss of all feedwater, loss of service water, loss of power to selected buses or MCR power supplies, and safety/relief valve transients) - accidents (e.g., main steam line break, positive reactivity addition, control rod insertion at power, control rod ejection, anticipated transients without scram, and various-sized loss-of-coolant accidents) - reactor shutdown and cooldown using the remote shutdown system • HFE Design Topics - alarms and annunciation - displays - controls and automation - information processing and job aids - real-time communications with plant personnel and other organizations - procedures, training, staffing/qualifications, and job design	Section 3.4, All

Review Criteria	OER IP Section No. and paragraph
(5) Important Human Actions – The applicant's OER should identify important HAs in the predecessor plants or systems (Section 7 defines important HAs), and determine whether they remain important in the applicant's design. Additional considerations cover the following: • For the important HAs, the OER should identify the scenarios wherein actions are needed, and state whether they were needed and successfully completed. Those aspects of the design that helped ensure success should be identified. • If errors occurred in the execution of the HAs, the applicant should identify insights to the needed improvements in human performance. • When important HAs for the new plant are determined to differ from those of the predecessor plant, the OER should specify whether there is any operational experience with these different HAs.	Section 3.5, All
3.4.2 Issue Analysis, Tracking, and Review *(1) OER Process* – The applicant should discuss the administrative procedures for evaluating the operating, design, and construction experience, and for ensuring that applicable important industry experiences will be provided in a timely manner to those designing and constructing the plant. *Additional Information*: 10 CFR 50.34(f)(3)(i) requires these administrative procedures.	Section 4.1, All
(2) Analysis Content – The applicant should analyze issues to identify: • human performance issues and sources of human error • design elements supporting and enhancing human performance	Section 4.2, All
(3) Documentation – The applicant should document the analysis of operating experience.	Section 4.3, All Section 6.0, All
(4) Incorporation Into the Tracking System – The applicant should document each issue determined to be relevant to the design, but yet to be addressed, in the issue-tracking system.	Section 4.4, All

Review Criteria	OER IP Section No. and paragraph
3.4.3 Plant Modifications *(1) Additional Considerations for Reviewing the HFE Aspects of Plant Modifications* – In addition to any of the criteria above that relate to the modification being reviewed, the applicant should address the following considerations: • The focus of the scope of the applicant's OER should provide information on the plant's systems, HSIs, procedures, or training that are being modified. • The applicant's OER should account for the operating experience of the plant that will be modified, including experiences with the systems that will be changed, and with technologies similar to those being considered. *Additional Information*: Useful information may be found in the plant's corrective action program.	Section 5.0, All

6.0 References

6.1 Referenced Documents

6.1.1 U.S. Nuclear Regulatory Commission, "Human Factors Engineering Program Review Model," NUREG-0711, Revision 3, November 2012.

6.1.2 U.S. Nuclear Regulatory Commission, "Human Factors Engineering (HFE) Insights for Advanced Reactors Based Upon Operating Experience," NUREG/CR-6400, 1996.

6.1.3 U.S. Nuclear Regulatory Commission, "A Prioritization of Generic Safety Issues," NUREG-0933, Supplement 20, June 1996.

6.1.4 U.S. Nuclear Regulatory Commission, "Operating Experience Feedback Report – Human Performance in Operating Events," NUREG-1275, Volumes 1-14.

6.1.5 U.S. Nuclear Regulatory Commission, "Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States," NUREG-1449, September 1993.

6.1.6 U.S. Nuclear Regulatory Commission, "Resolution of Generic Safety Issues," NUREG-0933, Supplement 34, September 2011.

6.1.7 *U.S. Code of Federal Regulations*, "Contents of Applications; Technical Information," Section 52.47, Part 52, Chapter 1, Title 10 "Energy," (10 CFR Part 52.47).

6.1.8 NuScale Human Factors Engineering Program Management Plan, RP-0914-8534.

6.1.9 HFE Operating Experience Review (OER) Procedure, EP-0303-1297.

6.1.10 NuScale Human Factors Engineering Human Performance Monitoring Implementation Plan, RP-0914-8545.

6.1.11 NuScale Human Factors Engineering Treatment of Important Human Actions Implementation Plan, RP-0914-8539.

6.1.12 NuScale Human Factors Engineering Functional Requirements Analysis and Function Allocation Implementation Plan, RP-0914-8536.

6.1.13 NuScale Human Factors Task Analysis Implementation Plan, RP-0914-8537.

7.0 Appendices

7.1 Appendix A—Comparison of Commercial Pressurized Water Reactor (PWR) Systems to NuScale Systems

Commercial Pressurized Water Reactors (PWR) Systems	Corresponding NuScale System
Primary System	
containment system	{{
chemical and volume control system	
reactor coolant system	
steam generator system	
Control Systems	
reactor protection system	
engineered safety actuation system	
diverse actuation system	
plant control	
rod control	
control rod drive system	
Monitoring Systems	
neutron monitoring system	
Main Power Cycle and Auxiliaries	
main steam system	
main turbine system	
condensate system	
feedwater system	
demineralized water transfer and storage system	
Cooling Systems	
passive containment cooling system	
passive core cooling system	
normal residual heat removal system	
spent fuel pool cooling system	
AC and DC Power Systems	
On-site standby power system	
AC power system	
Fire Protection Systems	
fire protection system	
HVAC Systems	
normal control room HVAC	
containment recirculation cooling system	}}3(a)-(c)

Commercial Pressurized Water Reactors (PWR) Systems	**Corresponding NuScale System**
control room habitability system	{{
containment air filtration system	
containment hydrogen control system	
Fuel Handling Systems	
fuel handling and refueling system	}}3(a)-(c)