July 28, 2025 Docket No. 99902078

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Submittal of Topical Report Entitled "Emergency Response Organization for a NuScale Power Plant," TR-183101, Revision 0

NuScale Power, LLC (NuScale) hereby submits Revision 0 of the licensing topical report entitled "Emergency Response Organization for a NuScale Power Plant," TR-183101, Revision 0. The purpose of this submittal is to request NRC review and approval of the implementation and methodology in the *Emergency Response Organization for a NuScale Power Plant* topical report by August 2026. NuScale respectfully requests that the acceptance review be completed in 45 days from the date of transmittal.

Enclosure 1 contains the nonproprietary report entitled "Emergency Response Organization for a NuScale Power Plant," TR-183101, Revision 0.

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

If you have any questions, please contact Elisa Fairbanks at 541-452-7872 or at efairbanks@nuscalepower.com.

Sincerely,

Mark W. Shaver
Director, Regulatory Affairs
NuScale Power, LLC

Distribution: Mahmoud Jardaneh, Chief New Reactor Licensing Branch, NRC
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Enclosure 1: "Emergency Response Organization for a NuScale Power Plant," TR-183101-NP, Revision 0, Nonproprietary

Enclosure 1:

"Emergency Response Organization for a NuScale Power Plant," TR-183101-NP, Revision 0, Nonproprietary

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Licensing Topical Report

Emergency Response Organization for a NuScale Power Plant

July 2025

Revision 0

Docket: 99902078

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Licensing Topical Report

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Abstract

NuScale Power, LLC (NuScale) has developed a small module reactor that supports operation of multiple NuScale Power Modules (NPMs) at a specific site. A NuScale Power Plant (NPP), consisting of multiple NPMs includes advanced and passive safety features compared to the existing fleet of large light water reactors. The passively-safe design does not require operator intervention nor electric power during design-basis events, and the passive safety is reflected in the overall risk of an NPP, which exceeds Commission safety goals.

This licensing topical report (LTR) establishes staffing assumptions and a baseline on-site emergency response organization (ERO) for future NPP applicants and licensees with an assumed site boundary plume exposure emergency planning zone (EPZ). The established staffing and roles and responsibilities satisfy 10 CFR 50.160(b)(1)(iii)(E) and satisfy provisions of 10 CFR 50.160(b)(1)(iii)(D) pertaining roles and responsibilities. NuScale requests approval of this licensing topical report as a standard approach for performing ERO staffing analysis, as well as approval of the baseline ERO staffing plan for future NPP applicants and licensees.

An optimized ERO staffing plan is provided in Section 5.0, which reflects a modified version of Table B-1 from NUREG-0654/FEMA-REP-1, Revision 2, “Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness” (Reference 7.4). The LTR and its appendices establish an approach for analyzing the on-shift staff’s ability to perform the required emergency response functions and tasks to respond to a declared emergency, which demonstrates that a licensee's staffing adequately meets 10 CFR 50.160(b)(iii)(E). The LTR also considers the timing of augmentation and staff needed to relieve the on-shift staff of specific emergency plan functions.

Executive Summary

The purpose of this licensing topical report (LTR) is to provide an optimized baseline on-site emergency response organization (ERO) for a NuScale Power Plant (NPP) with a site boundary plume exposure emergency planning zone. An applicant or licensee using this LTR approach will implement the roles and responsibilities within 10 CFR 50.160(b)(1)(iii), thereby satisfying 10 CFR 50.160(b)(1)(iii)(E) and provisions of 10 CFR 50.160(b)(1)(iii)(D) pertaining roles and responsibilities. The approach presented in this LTR conforms with relevant guidance in Regulatory Guide 1.242 (Reference 7.1), and considers current industry guidance.

Specifically, this LTR establishes the following:

1. The assumptions and inputs for performing on-shift staffing analysis applicable to an optimized ERO for an NPP.
2. The utilization of regulatory and industry guidance in performing staffing analysis and establishing an ERO.
3. The approach for performing staffing analysis and event selection for the staffing analysis relevant to an ERO.
4. An optimized baseline ERO for potential NPP applicants and licensees.
5. An ERO augmentation time period of 240 minutes.

A key component in this LTR is performance of on-shift staffing analysis (OSA), consisting of establishing initial on-shift staffing levels, selecting events for OSA, and performing OSA. The event selection approach ultimately selects NPP design-basis events resulting in an emergency action level (EAL) classification. The NPP does not contain an EAL classification of general emergency. The approach aligns with current guidance by also selecting hostile action and aircraft probable threat events. Because this LTR does not include EAL classification within its scope, assumptions are made for those events that result in an EAL classification.

The OSA approach considers relevant guidance (e.g., Nuclear Energy Institute (NEI) 10-05 (Reference 7.3) in performing OSA, and the LTR utilizes NEI 10-05 guidance insofar as it is applicable to an NPP. The OSA utilizes the previously approved NuScale control room staffing plan (Reference 7.5) and future programs within the scope of downstream users (e.g., an operations training program). Similar to NEI 10-05, the OSA is performed by completing successive tables in functional areas (e.g., operations and safe shutdown). However, there are several differences in the OSA of this LTR as compared to a traditional large light water reactor employing NEI 10-05. For example, the NPP includes one operations crew for up to 12 NuScale Power Modules. Additionally, the NPP includes passive safety features, long coping times, and does not necessitate operator action nor electric power for design-basis events. As such, the OSA approach accommodates the key differences in the design.

Through the assumptions, inputs, and sections that discuss the NPP, this LTR establishes the long coping times of an NPP. Accordingly, this LTR establishes the framework and basis by which an augmentation time period of 240 minutes is selected.

Finally, this LTR establishes an optimized augmenting staff, including their functions and roles. The OSA and discussions of the NPP establish the framework for an optimized baseline ERO.

1.0 Introduction

1.1 Purpose

This licensing topical report (LTR) establishes a standard approach for an on-site emergency response organization (ERO) for future NuScale Power Plant (NPP) applicants and licensees (herein referred to as “downstream users”) with an NPP consisting of up to 12 NuScale Power Modules (NPMs). An NPM is a collection of systems, sub-systems, and components that together constitute a modularized, movable, nuclear steam supply system with a passively-safe, light water reactor (LWR) module. Each NPM comprises a reactor core, pressurizer, two steam generators integral within a reactor pressure vessel (RPV), housed within a compact steel containment vessel (CNV).

The documented ERO approach implements the performance-based emergency preparedness (EP) requirements of 10 CFR 50.160 and satisfies relevant provisions of 10 CFR 50.160(b)(1) pertaining the ERO. This report assumes the NPP has a site boundary plume exposure emergency planning zone (EPZ), herein referred to as a site boundary EPZ. Specifically, the purpose of this LTR is to:

- Establish the necessary assumptions, staffing analysis approach, and conditions applicable to an optimized baseline ERO for downstream users.
- Establish an optimized baseline ERO that incorporates current performance-based EP regulations and guidance generically applicable to downstream users.
- Establish the roles and responsibilities of an optimized baseline ERO specific to an NPP.

This LTR establishes a baseline ERO that is optimized for an NPP compared to the traditional fleet of large LWRs. The optimized approach and staffing are in accordance with recent rulemaking efforts (i.e., 10 CFR 50.160) and regulatory guidance (e.g., Regulatory Guide 1.242). Final safety analysis report (FSAR) content regulations (e.g., 10 CFR 52.79) require applications to include emergency plans containing the ERO in the application. NuScale’s proposed approach to an ERO, staffing assumptions, methodology (e.g., on-shift staffing analysis), and optimized baseline ERO provide a generic approach applicable to downstream users, warranting an NRC safety finding.

The intent is that a downstream user referencing this LTR would use the identified approach to determine their plant-specific ERO. The subsequent NRC review of the plant-specific ERO would only require assessment of the differences (if any) from the baseline ERO identified in this LTR.

1.2 Scope

This LTR establishes staffing assumptions for the on-site ERO for an NPP with an assumed site boundary EPZ. The approach provides guidelines for performing analyses of the on-shift staff's ability to perform required emergency response functions and tasks to respond to an emergency. The approach describes staffing specific to an NPP, response commitments, augmentation time, and technology factors consistent with NRC regulatory requirements.

This approach is informed by the guidance on emergency planning presented in NSIR/DPR-ISG-01, "Emergency Planning for Nuclear Power Plants," (Reference 7.2) and ERO staffing presented in Nuclear Energy Institute (NEI) 10-05, "Assessment of On-shift Emergency Response Organization Staffing and Capabilities," (Reference 7.3). The approach is modified to implement the performance-based framework of 10 CFR 50.160 and recognize the unique characteristics and safety profile of an NPP. The staffing analysis describes staffing specific to an NPP, response commitments, augmentation time, and technology factors consistent with NRC regulatory requirements.

The staffing analysis address the specific accidents outlined in NSIR/DPR-ISG-01 (Reference 7.2) and NEI 10-05 (Reference 7.3), as applicable to the NPP, and is tailored to the operator actions modeled in the probabilistic risk assessment (PRA) for the NPP. The staffing analysis methodology in NEI 10-05 assumes the availability of an existing emergency plan, procedures, and job performance measures (JPMs) at an existing plant. The on-site ERO staffing assumptions include control room staffing information from the "NuScale Control Room Staffing Plan," TR-0420-69456 (Reference 7.5), as an initial baseline. The on-shift staffing analysis (OSA) is performed and described in Section 4.0, and the associated appendices.

The optimized baseline ERO staffing plan for an NPP is provided in Section 5.0, which includes a modified version of Table B-1 from NUREG-0654/FEMA-REP-1, Revision 2, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness," (Reference 7.4).

The elements of this LTR requested for NRC approval are:

- The approach and methodology for performing OSA (including the event selection and analysis approach) for an NPP.
- The optimized on-site ERO presented in Table 5-1, Minimum On-Site ERO Staff for a NuScale Power Plant, as a baseline staffing level for downstream users.
- An augmentation timeframe of at least 240 minutes from declaration of an emergency action level (EAL).

This LTR does not include the following within its scope:

- This LTR does not include off-site response organizations (OROs) within its scope. For sites with EPZs that do not extend beyond the site boundary under 10 CFR 50.160, there are no requirements for OROs, including state, local, and tribal entities, to provide predetermined, prompt protective measures, or take specialized actions in response to an event.
- The approach for determining EAL classification of specific events.
- The methodology and implementation of establishing a site boundary EPZ. NuScale has previously received NRC approval of "Methodology for Establishing the Technical Basis for Plume Exposure Emergency Planning Zones at NuScale Small Modular Reactor Plant Sites," TR-0915-17772 (Reference 7.7), for establishing the technical basis for plume exposure EPZs at NPPs.

1.3 Abbreviations

Table 1-1 Acronyms

Term	Definition
AOO	Anticipated Operational Occurrence
AOP	Abnormal Operating Procedure
ATWS	Anticipated Transient Without Scram
BDBE	Beyond-Design-Basis Event
CFDS	Containment Flooding and Drain System
CFR	Code of Federal Regulations
CNV	Containment Vessel
CRS/SM	Control Room Supervisor/Shift Manager
CVCS	Chemical and Volume Control System
DBE	Design-Basis Event
DBT	Design-Basis Threat
EAL	Emergency Action Level
ECCS	Emergency Core Cooling System
ECL	Emergency Classification Level
ED	Emergency Director
EOF	Emergency Operations Facility
EOP	Emergency Operating Procedure
EP	Emergency Preparedness
EPA	Environmental Protection Agency
EPZ	Emergency Planning Zone
ERDS	Emergency Response Data System
ERO	Emergency Response Organization
FEMA	Federal Emergency Management Agency
FSAR	Final Safety Analysis Report
GTG	General Technical Guideline
HSI	Human-System Interface
IE	Infrequent Event

Table 1-1 Acronyms (Continued)

Term	Definition
ISG	Interim Staff Guidance
IT	Information Technology
JIC	Joint Information Center
JPM	Job Performance Measures
LTR	Licensing Topical Report
LWR	Light Water Reactor
MCR	Main Control Room
NEI	Nuclear Energy Institute
NLO	Non-Licensed Operator
NOUE	Notice of Unusual Event
NPM	NuScale Power Module
NPP	NuScale Power Plant
NRC	U.S. Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
ORO	Off-site Response Organization
OSA	On-Shift Staffing Analysis
OSC	Operations Support Center
PA	Postulated Accident
PAG	Protective Action Guide
PAR	Protective Action Recommendation
PRA	Probabilistic Risk Assessment
RCA	Radiologically Controlled Area
RG	Regulatory Guide
RO	Reactor Operator
RP	Radiation Protection
RPT	Radiation Protection Technician
RPV	Reactor Pressure Vessel
RSPVT	Revised Staffing Plan Validation Test
RXB	Reactor Building
SBO	Station Blackout
SMR	Small Modular Reactor
SRO	Senior Reactor Operator
SSC	Structures, Systems, and Components
STA	Shift Technical Advisor
TMS	Time-Motion Study
TSC	Technical Support Center
UHS	Ultimate Heat Sink

Table 1-2 Definitions

Term	Definition
Alarm Station(s)	Alarm stations refer to the on-site security alarm station(s).
Incipient stage fire	A fire in the initial or beginning stage and which can be controlled or extinguished with portable fire extinguishers, Class II standpipe, or small hose systems without the need for protective clothing and breathing apparatus.
Protective Action Guide	The protective action guides referenced in this LTR refer to the Environmental Protection Agency's Protective Action Guide.

2.0 Background

The successful function of organizations involved in emergency response is inherent to adequate emergency response, and accordingly organizational requirements are included in EP regulations (e.g., 10 CFR 50.160). This LTR provides an optimized baseline ERO applicable to a future NPP. The optimized ERO approach aligns with the recent rulemaking efforts that include a performance-based emergency planning framework applicable to small modular reactor (SMR) designs (i.e., 10 CFR 50.160) and assumes that an NPP includes a site boundary EPZ. The optimized ERO approach conforms with guidance applicable to meeting the rulemaking efforts for 10 CFR 50.160.

As previously discussed, an NPP includes passive safety features. The NPP has minimal (or no) credited operator actions for design-basis events (DBEs). Because of the passively-safe design, a site boundary EPZ, and minimal credited operator actions, an optimized ERO is applicable to an NPP and, as demonstrated in this LTR, satisfies the applicable requirements of 10 CFR 50.160.

2.1 Applicable Regulatory Requirements

The ERO (including roles and responsibilities) described in this topical report satisfies relevant regulatory requirements. Both 10 CFR Part 50 and 10 CFR Part 52 have reference requirements that enable the use of 10 CFR 50.160, Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities, as opposed to the traditional requirements of 10 CFR 50.47 and 10 CFR 50, Appendix E that are similarly referenced in various Part 50 and Part 52 regulations (e.g., 10 CFR 50.54). The approach proposed in this LTR is intended to apply to NPP applicants and licensees implementing an emergency plan in accordance with 10 CFR 50.160.

2.1.1 10 CFR 50.160, “Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities”

The recent EP rule 10 CFR 50.160 provides a performance-based EP framework for advanced and SMR designs based upon inherit safety enhancements within those designs. 10 CFR 50.160 includes the following elements:

- Credits safety enhancements in evolutionary and passive systems.
- Credits transient response benefits of advanced and SMR designs, including slower transient response times and relatively small and slow release of fission products.
- Includes a scalable approach for determining the size of the EPZ.

- Credits local, state, and federal agencies' ability to sample, assess, and implement an embargo on food and water to prevent contamination from entering the ingestion pathway.
- Establishes a performance-based nature for performance of emergency drills and exercises, including frequency.
- Allows low-consequence designs with a site boundary EPZ to not require OROs to participate in radiological drills and exercises. Additionally, state, local, and tribal entities do not need to provide for predetermined, prompt protective measures, or take specialized actions in response to an event, other than provide on-site firefighting, law enforcement, and medical services.

The 10 CFR 50.160 Statements of Consideration (88 FR 80050) state:

> There needs to be sufficient on-shift staff to perform all necessary [emergency response] tasks until augmenting staff arrive to provide assistance. This is of particular interest to the NRC because of the potential for reduced staffing levels at SMRs and [other new technologies], as compared to large LWRs.

The following requirements of 10 CFR 50.160(b)(1) are applicable for ERO staffing:

> *(iii) Emergency response performance. The emergency response team must have sufficient capability to demonstrate the following emergency response functions using drills or exercises:*
>
> *(A) Event classification and mitigation. Assess, classify, monitor, and repair facility malfunctions in accordance with the emergency plan to return the facility to safe conditions.*
>
> *(B) Protective actions. Implement and maintain protective actions for onsite personnel for emergency conditions, and recommend protective actions to offsite authorities as conditions warrant.*
>
> *(C) Communications. Establish and maintain effective communications with the emergency response organization, and make notifications to response personnel and organizations who may have responsibilities for responding during emergencies.*
>
> *(D) Command and control. Establish and maintain effective command and control for emergencies by using a supporting organizational structure with defined roles, responsibilities, and authorities for directing and performing emergency response functions as described in paragraph (b) of this section.*

(E) Staffing and operations. Establish staffing for the facility necessary to implement the roles and responsibilities in paragraph (b)(1)(iii) of this section.

(F) Radiological assessment. Assess radiological conditions in and around the facility during emergencies, including:

(1) Radiological conditions. Assess, monitor, and report radiological conditions to the applicable response personnel using installed or portable equipment.

(2) Protective equipment. Issue and use protective equipment necessary to continue and expand mitigation and protective action strategies.

(3) Core or vessel damage. Assess, monitor, and report to the applicable response personnel the extent and magnitude of damage to the core or other vessel containing irradiated special nuclear material, such as fuel or targets, as applicable.

(4) Releases. Assess, monitor, and report to the applicable response personnel the extent and magnitude of all radiological releases, including releases of hazardous chemicals produced from licensed material.

2.1.2 10 CFR 50.47, "Emergency Plans," and 10 CFR 50, Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities"

The traditional requirements of 10 CFR 50.47 and 10 CFR 50, Appendix E are not directly applicable to the approach described, however, traditional regulatory framework and associated guidance are considered in the implementation of an optimized and performance-based staffing plan.

10 CFR 50.47(b)(2) states, in part, "On-shift facility licensee responsibilities for emergency response are unambiguously defined, adequate staffing to provide initial facility accident response in key functional areas is maintained at all times."

Additionally, 10 CFR 50, Appendix E, Section IV.A, requires a description of the organization for coping with radiological emergencies, including individuals assigned to the ERO with a description of emergency assignments. Organizations must have enough on-shift staff to perform specified tasks in various functional areas of emergency response. Each shift must have the capability to perform the emergency functions 24 hours a day, 7 days a week, to minimize the impact of radiological emergencies and to provide protection of public health and safety.

2.2 Relevant NRC Guidance

2.2.1 Regulatory Guide 1.242, Revision 0, "Performance-Based Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities"

Regulatory Guide (RG) 1.242 (Reference 7.1) identifies methods and procedures the NRC staff considers acceptable for use by SMR applicants and licensees to demonstrate compliance with 10 CFR 50.160. It provides general guidance on the content of emergency plans, including guidance on the content necessary to satisfy 10 CFR 50.160(b)(1)(iii) program elements. Appendix A of RG 1.242 discusses an acceptable methodology to determine the EPZ, while Appendix B of RG 1.242 describes an acceptable method to determine source term.

Staff Position C.6.g.1 of RG 1.242 states that the emergency plan should describe the following:

> *The capabilities to adequately staff the emergency response functions within an appropriate timeframe, to include the methods, processes, equipment, facilities, and personnel.*
>
> *(a) The emergency plan should describe the staffing of the response centers and the training for the personnel. It may reference facility training procedures or other documents as needed. A complete roster of trained and qualified individuals should be maintained and updated on a set frequency and as personnel are added or removed from positional assignments.*
>
> *(b) The plan should describe the on-shift emergency response staff augmentation process, including maintenance of staffing and succession of leadership for the duration of the emergency response or expansion of the response as needed.*
>
> *(c) The plan should describe the analysis used to determine the minimum positions and the corresponding responsibilities to perform the emergency response functions described in the emergency plan, including consideration of the emergency response team leader; authorization for emergency declaration, termination, and transition to recovery; recovery operations; authorization for emergency radiation worker exposure; and authorization for media and news releases.*

The approach described in this LTR conforms with and satisfies relevant guidance of RG 1.242.

2.2.2 NSIR/DPR-ISG-01, "Interim Staff Guidance, Emergency Planning for Nuclear Power Plants"

After emergency planning regulations in 10 CFR 50.47 and 10 CFR 50 Appendix E were revised in 2011, interim staff guidance (ISG) (Reference 7.2) was issued to provide guidance on addressing EP requirements. The ISG provides information pertinent to required on-site EP programs, as well as an acceptable method for integrating ORO event response with on-site EP programs. The ISG is applicable for the traditional EP requirements, and it was not written in consideration of 10 CFR 50.160. As such, this guidance is considered in development of the approach described in this LTR, particularly regarding OSA. Additional background on NSIR/DPR-ISG-01 is described below.

Specific sections of the ISG address various topics. Relevant to this topical report, Section IV.C describes on-shift staffing analysis. The 2011 EP rulemaking removed ambiguity from previous NRC regulations that stated on-shift staffing levels should be "adequate" without a clear definition of what "adequate" required. 10 CFR 50, Appendix E was amended to address concerns regarding assignment of tasks or responsibilities to on-shift ERO personnel that would potentially overburden them and prevent timely performance of their emergency plan functions. Organizations must have enough on-shift staff to perform specified tasks in various functional areas of emergency response and must have the capability to perform these emergency functions 24 hours a day, 7 days a week.

The ISG staffing analysis guidance states that on-shift personnel should provide adequate staffing for the initial facility response for specific beyond-design-basis events (BDBEs). These events include aircraft impacts, station blackout (SBO), and control room fires that lead to main control room (MCR) evacuation and remote shutdown. Regarding aircraft impacts, the NRC requires the development, implementation, and maintenance of procedures that describe the response to a potential aircraft threat in accordance with 10 CFR 50.54(hh)(1). NUREG-0654 guidance (Reference 7.4) stipulates augmentation personnel to respond at 30-minute and 60-minute timelines, therefore the on-shift staff cope with a potential aircraft threat, design-basis threat (DBT), and design-basis accidents for the first 30 minutes of an emergency event. Regarding SBO, for an NPP, the blackout coping time is at least 72 hours. As it relates to MCR evacuation, a dedicated remote shutdown room is not included in the NPP. Before a potential MCR evacuation, the operators place the NPP in a safe condition by tripping the reactors, initiating decay heat removal, and initiating containment isolation. These actions result in passive cooling that achieves safe shutdown of each NPM without additional operator actions.

The ISG outlines specific events that should be analyzed. Design-basis accidents include postulated, unanticipated occurrences that challenge the:

- integrity of the reactor coolant pressure boundary
- capability to shut down the reactor and maintain it in a safe shutdown condition
- capability to prevent or mitigate the consequences of accidents that could result in potential off-site exposures

These accidents are typically outlined as “Condition IV events” or “limiting faults” in an FSAR.

Regarding DBT analysis, the ISG states that licensees may assume the hostile threat is neutralized with no adverse consequences to plant safety. However, it also states licensees should ensure sufficient resources are on-shift to support implementing the emergency plan and the security plan simultaneously. This assumption is included for the purpose of this LTR.

2.2.3 NUREG-0654/FEMA-REP-1, “Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness”

NUREG-0654/FEMA-REP-1, Revision 2 (Reference 7.4) was released in December 2019. It reflects changes to both NRC and FEMA regulations, guidance, policies, doctrines, and advances in technology and best practices that occurred since the original document revision. Revision 2 incorporates the aforementioned changes and also includes supplements and addendum issued since the release of earlier revisions.

NUREG-0654/FEMA-REP-1, Revision 1 was published in November of 1980. The guidance document was jointly developed by the NRC and the Federal Emergency Management Agency (FEMA) with the stated purpose of providing a basis for NRC licensees, state and local governments to develop radiological emergency plans and improve emergency preparedness. The guidance clarifies the intent and accommodation of unique situations that arise in interfaces among state, local, and utility entities during emergency events. The NRC and FEMA use NUREG-0654 to evaluate the adequacy of emergency plans and preparedness of state, local, and tribal governments within the emergency planning zones surrounding commercial nuclear power plants.

Reference 7.4 includes several planning standards with associated evaluation criteria. The planning standard of interest to this LTR is Table B-1, “Minimum Staffing Requirements for NRC Licensees for Nuclear Power Plant Emergencies,” from Reference 7.4. This LTR describes an approach for an NPP-specific ERO staffing that deviates from Table B-1.

In Table B-1 of Revision 2, one Chemistry technician was removed from the list of required individuals. The regulatory justification was that a chemistry technician was no longer required on-shift for the sole purpose of sampling to determine the presence of core damage, as there were several other methods available to make this determination and the sample would not need to be taken before augmentation personnel would arrive. An NPP typically supports an exemption from 10 CFR 50.34(f)(2)(viii), Post Accident Sampling.

Both revisions of NUREG-0654/FEMA-REP-1 assume a plume exposure EPZ and ingestion pathway EPZ beyond the site boundary (typically 10 miles and 50 miles, respectively). For the traditional LWR fleet for which NUREG-0654 was written, an emergency declaration could require an active response by OROs to protect the health and safety of the public. Because an NPP has an assumed site-boundary EPZ, only Table B-1 is used from NUREG-0654/FEMA-REP-1, Revision 2.

2.3 Relevant Industry Guidance

2.3.1 NEI 10-05, "Assessment of On-shift Emergency Response Organization Staffing and Capabilities"

NEI 10-05 (Reference 7.3) provides a methodology to meet 10 CFR 50.47(b) and 10 CFR 50, Appendix E. NSIR/DPR-ISG-01 (Reference 7.2) states:

> *NEI developed the document NEI 10-05, "Assessment of On-Shift Emergency Response Organization Staffing and Capabilities," Revision 0, dated June 2011 (ADAMS Accession No. ML111751698), to establish a standard methodology for a licensee to perform the required staffing analysis. The NRC has reviewed NEI 10-05 and found it to be an acceptable methodology for this purpose.*

NEI 10-05 is used as a model, and the OSA presented in this LTR includes a similar method of completing successive tables regarding staffing analysis. The NEI 10-05 methodology for developing the emergency plan on-shift staffing analysis includes the several elements. The elements are identified as follows, along with information regarding where those elements are addressed in the LTR:

- Define the on-shift ERO staffing and response time requirements. The on-shift staffing is described in Section 3.1. The augmented staffing response time is described in Section 3.3 and Section 5.0.
- Define the site-specific event scenarios described in the ISG. The analyzed events are described in Section 3.2.

- Perform an OSA for each event scenario. The OSA is described in Section 4.0 and the associated appendices.
- Perform a time-motion study (TMS) to analyze the results of the OSA, if necessary. The OSA described in this topical report does not include TMS.

3.0 On-Shift Staffing Analysis Methodology

The OSA approach for an NPP includes three steps:

1. Select Events: Event selection is informed by the guidance in NSIR/DPR-ISG-01 as described in Section 3.2. As described, the LTR approach modifies the event selection approach from the ISG to better align with an NPP, including reduced potential risk and reduced potential consequences to the public health and safety.
2. Perform OSA: For each selected event type, an OSA is performed to determine if the on-shift staffing is adequate. The ISG endorses NEI 10-05 (Reference 7.3) for performing staffing analysis, which is used to determine if staffing is sufficient to perform necessary actions and emergency preparedness functions as listed in NUREG-0654/FEMA-REP-1 (Reference 7.4), Table B-1. However, in several cases the NEI 10-05 OSA approach is optimized to align with the NPP. The NEI 10-05 staffing analysis methodology is written to be performed for an operational plant, so assumptions are made in this LTR to account for the lack of developed procedures and established training programs for future NPPs. These modifications and assumptions are discussed in the sections below.
3. Assess Results: The results of the OSA are used to determine if the on-shift staffing is adequate to perform necessary actions and emergency preparedness functions as listed in NUREG-0654/FEMA-REP-1 Table B-1.

3.1 Assumptions and Inputs

This report is written generically for an NPP with assumed characteristics and features discussed in Section 3.1.1 below.

Regarding event selection for OSA, performance of OSA, and initial staffing assumptions for the OSA, the following are significant inputs for the OSA described herein:

- DBE analysis (FSAR Chapter 15, Transient and Accident Analyses)
- Severe accident evaluation (FSAR Chapter 19, Probabilistic Risk Assessment)
- Staffing plan validation
- Assumed on-shift staffing

These inputs are described in the subsequent sections. Several of the inputs include assumptions.

3.1.1 NuScale Power Plant Features

The term “NuScale Power Plant” refers to the entire nuclear power plant facility. The facility includes up to 12 NPMs.

The NPM is a pressurized water reactor nuclear steam supply system (NSSS) that includes an integral RPV, steam generators, and pressurizer, eliminating the need for external piping to connect the steam generators and pressurizer to the RPV. The integral RPV is housed within a steel CNV that is partially immersed in the ultimate heat sink (UHS), which is a large pool located within a Seismic Category I reactor building (RXB). The primary coolant loop utilizes natural circulation and does not include the use of pumps.

The NPM includes passive safety features. For example, in the event of the need for emergency core cooling, the design includes a fail-safe emergency core cooling system (ECCS) and a fail-safe containment system. The ECCS includes valves that fail to the open position, allowing reactor coolant to vent through the top of the RPV, condense on the CNV wall, and eventually recirculate back into the RPV. The containment system includes containment isolation valves that fail to the closed position. No operator actions nor electrical power are needed to achieve a safe state.

Specific technical details of the NPP and the NPM are not implicit to this methodology nor its application. The features of the NPP that are implicit to this report include the following:

- The NPP includes a site boundary EPZ.
- There are no credited operator actions for DBE analysis (discussed further below).
- The design includes passive safety features (e.g., fail-safe ECCS and natural circulation), long coping times, and transient progressions that do not require human action.
- The design does not require a dedicated remote shutdown station. Before evacuating the MCR, operators place the NPP in a safe condition by tripping the reactors, initiating decay heat removal, and initiating containment isolation.
- The design achieves safe and stable shutdown automatically for at least 72 hours for SBO.

Other relevant details of the NPP are discussed throughout this LTR, where applicable.

3.1.2 Chapter 15, Transient and Accident Analyses

The FSAR Chapter 15 of an NPP presents potential plant events considered in the design basis, which is an input to on-shift staffing event selection and OSA. The definition of a “design-basis event” includes a complex and lengthy background. To summarize, 10 CFR 50.49 defines design-basis events as “conditions of normal operation, including anticipated operational occurrences, design basis accidents,

external events, and natural phenomena for which the plant must be designed to ensure functions (b)(1)(i) (A) through (C) of this section," where b(1)(i)(A) through (C) are structures, systems, and components (SSC) necessary to ensure the "integrity of the reactor coolant pressure boundary," the "capability to shut down the reactor and maintain it in a safe shutdown condition," and "the capability to prevent or mitigate consequences accidents that could result in potential offsite exposures comparable to the guidelines in § 50.34(a)(1), § 50.67(b)(2), or § 100.11."

FSAR Chapter 15 describes the evaluation and analysis of DBEs. The DBEs are classified by the expected frequency of occurrence, and include anticipated operational occurrences (AOOs), infrequent events (IEs), and postulated accidents (PAs). In general, Chapter 15 does not include BDBEs; however, specific BDBEs are included within the scope of Chapter 15 (e.g., an anticipated transient without scram (ATWS)).

For DBEs, AOOs have an expected frequency of one or more times during an NPM lifetime. Events expected to occur less than once during the NPM lifetime are classified as IEs, PAs, or conservatively classified as AOOs. "One or more times during the NPM lifetime" is conservatively assumed as greater than or equal to 1E-2 events per year.

The ERO methodology assumes Chapter 15 evaluates the following categories of events:

- increase in heat removal by the secondary system
- decrease in heat removal by the secondary system
- decrease in reactor coolant system flow rate
- reactivity and power distribution anomalies
- increase in reactor coolant inventory
- decrease in reactor coolant inventory
- radioactive release from a subsystem or component

Because an NPP includes the following characteristics, the ERO has a less significant role for DBEs at an NPP compared to DBEs at a traditional large LWR:

- The Chapter 15 DBE analyses do not credit operator actions. After a DBE, automatic actions place the NPM in a safe state, and it remains in the safe-state condition for at least 72 hours without operator action despite assumed single failures and conservatisms inherent to Chapter 15 analysis.
- The design features a site boundary EPZ.

The DBE analyses for the NPP demonstrates passive plant safety, long coping times, low consequences, and no required operator actions.

Existing FSARs for an NPP are used to inform the OSA results and optimized ERO shown in this LTR. The future FSAR (i.e., the plant-specific FSAR of the downstream user) is used for application of this LTR to a specific NPP.

3.1.3 Chapter 19, Probabilistic Risk Assessment

The FSAR Chapter 19 of an NPP discusses the probabilistic risk assessment (PRA), including how it is performed and used in the evaluation of severe accidents postulated for the NPP. As it relates to the ERO and staffing analysis, the PRA is one input to identifying risk-significant human actions. An NPP includes minimal (or zero) risk-significant human actions.

The PRA evaluates the risk associated with operation of a single NPM at full power, low power, and shutdown modes of operation, for both internal and external initiating events. The PRA also assesses the risk associated with multi-module operation using a systematic approach that includes both a qualitative evaluation of the potential impact of shared systems and a quantitative assessment based on the single-module, full-power, internal-events PRA to identify potential multi-module risk contributors.

Chapter 19 summarizes the Level 1 and Level 2 PRA, which evaluates the risk associated with every mode of operation for both internal and external initiating events, addresses the design features to prevent and mitigate potential severe accidents, addresses the consideration of nonsafety-related SSC that perform risk significant functions, addresses mitigation of BDBEs in accordance with 10 CFR 50.155, and addresses the capability to respond to potential aircraft impact events. However, as it pertains to ERO, Chapter 19 discusses human actions that are modeled in the PRA. These human actions are addressed in the control room staffing validation, which is described in Section 3.1.4.

Existing FSARs for an NPP are used to inform the OSA results and optimized ERO shown in this LTR. The future FSAR (i.e., plant-specific FSAR of the downstream user) is used for application of this LTR to a specific NPP.

3.1.4 Control Room Staffing Validation

The OSA approach utilizes the “NuScale Revised Staffing Plan Validation Test (RSPVT) Report,” RP-0419-65209 (Reference 7.6), as an input. The RSPVT was previously submitted for NRC staff review and is a key reference source in the approved “NuScale Control Room Staffing Plan,” TR-0420-69456 (Reference 7.5), which presents the MCR staffing plan for an NPP. The RSPVT documents the results of revised staffing plan validation testing performed to evaluate licensed operator

workload in challenging, high-workload situations within an NPP with a 12-module MCR environment. The analysis confirms that a minimum MCR staff of one reactor operator (RO) and two senior reactor operators (SROs) can safely operate up to 12 NPMs (including associated facilities) during high workload conditions.

The RSPVT discusses the specific scenarios and operator actions that are evaluated. As it relates to this LTR, the RSPVT provides validation testing that demonstrates the operators can safely operate 12 NPMs during challenging scenarios that are highly unlikely. The RSPVT includes PRA-modeled actions for BDBEs. The RSPVT is credited in this report as a task analysis controlling method.

3.1.5 Assumed On-Shift Staffing

The assumed on-shift staffing for an NPP is shown in Table 3-1, which includes the required on-shift positions. The personnel required to be on-shift are credited in the OSA.

Table 3-1 Assumed On-Shift Staffing

Title	Minimum Shift Staffing	Notes
Control Room Supervisor / Shift Manager (CRS/SM)	1	Combined Role
Licensed Reactor Operator (RO)	2	
Non-Licensed Operator (NLO)	3	
Radiation Protection Technician (RPT)	1	

The assumed NPP supports an exemption from 10 CFR 50.34(f)(2)(viii). As a result, the post-accident sampling staffing contingency plans per 10 CFR 50.34(f)(2)(viii) and NUREG-0737 are not required to be demonstrated. As opposed to sampling, installed plant equipment is used to monitor and evaluate accident conditions. Post-accident sampling is not required during the DBE period of 72 hours. Accordingly, NPP personnel perform post-accident sampling following augmentation and planning.

Throughout this LTR, security is referenced generically because security functions are assigned in the applicable security staffing plan, as such, security personnel are not included in Table 3-1. Additionally, maintenance positions are not listed in Table 3-1 because there are no required actions to be performed by maintenance personnel within the 240-minute augmentation time period.

3.2 Event Selection

This section discusses the approach to selecting events for OSA. NSIR/DPG-ISG-01 (Reference 7.2) provides guidance on selecting events and accidents to analyze for OSA. It states:

> *Define the events that will be used in the staffing analysis. These events should include the following:*
>
> *(1) Postulated DBAs (Condition IV events) presented in the FSAR, as updated, and which would result in an emergency declaration. At least one DBA should result in the declaration of a General Emergency and radiological doses to the public that exceed the EPA PAGs and necessitate licensee PARs;*
>
> *(2) Station DBT;*
>
> *(3) Response actions for an "aircraft probable threat" in accordance with 10 CFR 50.54(hh)(1) and as discussed in RG 1.214; and*
>
> *(4) Control room fire leading to evacuation and remote shutdown, as referenced in IN 95-48.*

The event selection approach for an NPP is limited to events that have a declared EAL classification. The passively-safe NPP has a limited number of DBEs with the potential for an EAL classification. Additionally, the OSA includes security and control room evacuation events, as described below.

3.2.1 Analyzed Events

The purpose of this section is to state which events are selected for OSA, including the basis for selection. As discussed in Section 3.1, FSAR Chapter 15 includes analyses of DBEs, including their event categorization (e.g., AOO). Of the Chapter 15 event types described in Section 3.1 (e.g., increase in secondary side heat removal), the following are assumed to include an EAL classification and are therefore selected for OSA:

- Decrease in reactor coolant inventory:
  - Inadvertent opening of reactor safety valve
  - Failure of small lines carrying primary coolant outside containment
  - Steam generator tube failure
  - Loss-of-coolant accidents resulting from a spectrum of postulated piping breaks within the reactor coolant pressure boundary

  - Inadvertent operation of ECCS
- Radioactive release from a subsystem or component:
  - Fuel handling accident
  - Spent fuel cask drop accident or NPM drop accident
- Anticipated transient without scram

In addition to these Chapter 15 events, the following other event types are selected for OSA:

- Land and/or waterborne hostile action directed against the protected area by a hostile force (hereafter referred to as the hostile action event). Assumed adversary characteristics are defined by the DBT
- Response actions for “Aircraft Probable Threat” as defined in 10 CFR 50.150 and as discussed in RG 1.214 (hereafter referred to as the aircraft probable threat event)
- Control room fire leading to evacuation and remote shutdown (hereafter referred to as the control room fire leading to evacuation event)

The approach described herein considers (1) NSIR/DPR-ISG-01 guidance on event selection, (2) the performance-based nature of 10 CFR 50.160, and (3) 10 CFR 50.160 implementing guidance of RG 1.242 in determining the basis for selecting events for OSA. Table 3-2 lists the event types selected and, implicit to this approach, the basis for selecting those events. Additionally, Table 3-2 lists the assumed EAL classification.

Table 3-2 Selected Events for On-Shift Staffing Analysis

Event Type	Assumed EAL Classification	Basis for Selection
Decrease in reactor coolant inventory	Alert	The decrease in reactor coolant inventory event type is a Chapter 15 DBE that has potential to result in an EAL classification for an NPP.
Radioactive release from a subsystem or component	Site Area Emergency	The radioactive release from a subsystem or component event type is a Chapter 15 DBE that has potential to result in an EAL classification for an NPP.
Hostile action	Site Area Emergency	NSIR/DPG-ISG-01 recommends a DBT event.
Aircraft probable threat	Alert	NSIR/DPG-ISG-01 recommends an aircraft probable threat event per 10 CFR 50.150.
Control room fire leading to evacuation	Unusual Event	NSIR/DPG-ISG-01 recommends a control room fire leading to evacuation event.
ATWS	Unusual Event	An ATWS is a Chapter 15 event that has potential to result in an EAL classification for an NPP. Due to the diversity and reliability within the module protection system, an ATWS event is very unlikely within an NPP.

The downstream user seeking to apply this OSA approach for an NPP demonstrates a site boundary EPZ and confirms no credited human actions in DBE analysis. If these conditions are met, the downstream user applying this approach then:

1. Demonstrates that the Table 3-2 event selection is applicable to their application.

OR

2. Demonstrates that their event selection includes Chapter 15 DBE event types that potentially result in an EAL classification, and includes the other event types (e.g., security, aircraft impact) from Table 3-2.

OR

3. Provides an alternate event selection by justification of EAL classification (e.g., demonstrated analysis that there are no DBEs that result in an EAL classification)

The results from the staffing analysis are in Section 4.0.

3.3 On-Shift Staffing Analysis Approach

The following steps summarize the NEI 10-05 (Reference 7.3) OSA process:

1. Select/define the events to be analyzed.
2. Define the on-shift ERO positions.
3. Perform the OSA plant operations and safe shutdown step (NEI 10-05 Step 3.2.2.3).
4. Perform the OSA firefighting step (NEI 10-05 Step 3.2.2.4).
5. Perform the OSA RP and chemistry step (NEI 10-05 Step 3.2.2.5).
6. Perform the OSA emergency plan implementation step (NEI 10-05 Step 3.2.2.6).
7. Evaluate the OSA results (NEI 10-05 Step 3.2.3).
8. Determine if a position requires further analysis:
    1. If yes: continue the process in accordance with NEI 10-05.
    2. If no: OSA is complete.

The ERO methodology incorporates the NEI 10-05 process steps (as referenced above). The steps are referenced in parentheses below. For example, Step 1 is shown as (1).

- Both (1) and (2) are demonstrated in Section 3.1 and Section 3.2 of this topical report.
- Steps (3) through (6) perform the OSA. Effectively, the NEI 10-05 methodology for OSA is to complete tables of information in an iterative process. The LTR approach to (3) through (6) is similar; first, a modified version of Table 1 from NEI 10-05, On-Shift Positions, is completed, as described in Section 3.3.1.
- Completion of successive tables comes next to evaluate the necessary functions, including plant operations and safe shutdown functions similar to (3), firefighting functions similar to (4), RP functions similar to (5), and emergency plan implementation functions similar to (6). As the successive tables are completed, the OSA tables are updated in an iterative manner. The successive tables evaluating OSA for differing functions are described in Section 3.3.2.

3.3.1 Modified NEI 10-05 On-Shift Positions Table

The OSA analysis modifies the NEI 10-05 Table 1. The changes made to the template table are described in this section.

- The following columns are unchanged: Column 1 (Line), Column 2 (On-Shift Position), Column 4 (Augmentation Elapsed Time), Column 5 (Role in Table #/Line #), and Column 6 (Unanalyzed Task).

- Column 3 (Emergency Plan Reference) is changed to “Emergency Plan Function,” in accordance with the functions listed in Table B-1 of NUREG-0654/FEMA-REP-1. The augmentation time is assumed to be 240 minutes for augmented staff to take over required functions. Justification for the 240-minute period is described in Section 5.0.
- Column 7 (Time Motion Study Required) is removed. During the development of on-site programs (e.g., operations and training programs), a task analysis is performed to determine responsibilities and required actions. This analysis takes the place of other analyses, such as TMS.

Table 3-3 shows a sample of the modified table format used in the OSA analysis results presented in Section 4.0.

Table 3-3 NuScale On-Shift Staffing Analysis Template

Line	On-Shift Position	Emergency Plan Function	Augmentation Elapsed Time (min)	Role in Table#/Line#	Unanalyzed Task
1					
2					
3					

Notes:

3.3.2 Successive Tables Evaluating On-Shift Staffing Analysis for Functional Areas

The successive OSA tables for evaluating plant operations and safe shutdown functions, firefighting functions, RP functions, and emergency plan implementation functions follow the template provided in the respective NEI 10-05 tables (e.g., the NEI 10-05, Table 2 format is utilized herein for evaluating the plant operations and safe shutdown functions). Minor modifications are made to the NEI 10-05 approach to completing OSA tables to accommodate the NPP. For example, the operators of the NPP operate up to 12 NPMs. Thus, the OSA tables do not need to be completed for separate staff on separate units.

4.0 On-Shift Staffing Analysis

This section discusses performance of the on-shift staffing analysis in accordance with the approach described in Section 3.0, including analysis of the selected events. The tables presented in this section use the format of Table 3-3. The tables presented in this section point to appendix tables and specific rows of those tables. For example, “A-1/1” refers to Table A-1 and specifically the row that includes Line #1. Similarly, “A-1/2” refers to Table A-1 Line #2.

4.1 Overview of On-Shift Staffing Analysis

Each of the following subsections describe the analysis results for each event and necessary positions needed to fulfill required tasks. Section 4.1 provides an overview of the results of the analysis for each event, including the necessary positions needed to fulfill required tasks.

4.1.1 Decrease in Reactor Coolant Inventory Event

Table 4-1 describes the on-shift positions needed to perform the actions required to effectively mitigate this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two reactor operators (ROs)
- Two non-licensed operators (NLOs)
- One RPT

Because of NPP design features, including no operator actions required for DBEs, the combined CRS/SM position adequately performs the functions listed in Table A-1 and Table D-1. The RSPVT demonstrates these functions are performed with successful outcomes.

There are no credited actions for the ROs to perform for the decrease in reactor coolant inventory event. Each RO performs post-reactor trip actions to place systems in a shutdown or startup lineup in accordance with procedures.

One NLO assists the ROs in performing post-reactor trip actions, as necessary. The other NLO reports to the MCR to assume the role of MCR Communicator once the CRS/SM has declared an EAL.

The RPT performs functions including in-plant monitoring, on-site monitoring, and personnel monitoring (i.e., frisking and dosimetry). The NPP includes installed area radiation monitors and continuous air monitors that provide indication of in-plant

radiation and airborne radiation prior to dispatching personnel within the plant. The use of technology (e.g., drone-based monitoring) is considered for on-site surveying, and potentially in-plant surveying. Personnel entering radiologically controlled areas (RCAs) use radiation work permits or emergency radiation work permits. These personnel are trained to perform self-contamination frisking and use portal contamination monitors.

Scenario #1 in the RSPVT (Reference 7.6) evaluates a failed steam generator tube with failure of the main steam isolation valves to close. The EAL for “Loss or Potential Loss of Any Two Barriers” was properly declared in 13 minutes or less in testing trials. In response to the decreasing reactor coolant inventory, the ROs aligned make-up reactor coolant system injection water through the chemical and volume control system (CVCS), and then aligned makeup water to the CNV through the containment flooding and drain system (CFDS).

Table 4-1 Decrease in Reactor Coolant Inventory Event On-Shift Staffing Analysis

Line	On-Shift Position	Emergency Plan Function	Augmentation Elapsed Time (min)	Role in Table#/Line#	Unanalyzed Task
1	CRS/SM	Emergency Director (ED); supervision of RP staff and site RP; emergency classifications	240	A-1/1	No
				D-1/1	No
				D-1/3(2)	No
				D-1/4	No
				D-1/5	No
				D-1/6	No
				D-1/8(2)	No
				D-1/10	No
				D-1/11	No
				D-1/12	No
2	RO #1	Post-reactor trip actions(1)	N/A	A-1/2	No
3	RO #2	Post-reactor trip actions(1)	N/A	A-1/3	No
4	NLO #1	MCR Communicator	240	A-1/4	No
				D-1/9(2)	No
				D-1/13	No
				D-1/14(2)	No
5	NLO #2	Post-reactor trip actions(1)	N/A	A-1/5	No
6	RPT #1	RP	240	A-1/6	No
				C-1/1	No
				C-1/2	No

Notes:

(1) Actions taken to place systems in a shutdown/startup condition, but actions are not required for safe shutdown.

(2) As required by site-specific emergency plan.

4.1.2 Radioactive Release from a Subsystem or Component Event

Table 4-2 describes the on-shift positions that are needed to perform the actions required to effectively mitigate this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Two NLOs
- One RPT

There are no credited actions for the ROs to perform for the radioactive release from a subsystem or component event. Each RO performs post-reactor trip actions to place systems in a shutdown or startup lineup in accordance with procedures.

One NLO assists the ROs in performing post-reactor trip actions, as necessary. The other NLO reports to the MCR to assume the role of MCR Communicator once the CRS/SM has declared an EAL.

The RPT performs functions including in-plant monitoring, on-site monitoring, and personnel monitoring (i.e., frisking and dosimetry). The NPP includes installed area radiation monitors and continuous air monitors that provide indication of in-plant radiation and airborne radiation prior to dispatching personnel within the plant. The use of technology (e.g., drone-based monitoring) is considered for on-site surveying, and potentially in-plant surveying. Personnel entering RCAs use radiation work permits or emergency radiation work permits. These personnel are trained to perform self-contamination frisking and use portal contamination monitors.

The analysis looks at the following events for a radioactive release from a subsystem or component:

- Fuel handling accidents
- Spent fuel cask drop accidents or NPM drop accidents

Scenario #2 in the RSPVT (Reference 7.6) evaluates an NPM drop accident. The EAL declaration for “ANY Loss or ANY Potential Loss of EITHER Fuel Clad OR Containment” was properly declared in 14 minutes or less in testing trials.

Table 4-2 Radioactive Release from a Subsystem or Component Event On-Shift Staffing Analysis

Line	On-Shift Position	Emergency Plan Function	Augmentation Elapsed Time (min)	Role in Table#/Line#	Unanalyzed Task
1	CRS/SM	ED; supervision of RP staff and site RP; emergency classifications	240	A-2/1	No
				D-2/1	No
				D-2/3(2)	No
				D-2/4	No
				D-2/5	No
				D-2/6	No
				D-2/8(2)	No
				D-2/10	No
				D-2/11	No
				D-2/12	No
				D-2/15(3)	No
2	RO #1	Post-reactor trip actions(1)	N/A	A-2/2	No
3	RO #2	Post-reactor trip actions(1)	N/A	A-2/3	No
4	NLO #1	MCR Communicator	240	A-2/4	No
				D-2/9(2)	No
				D-2/13	No
				D-2/14(2)	No
5	NLO #2	Post-reactor trip actions(1)	N/A	A-2/5	No
6	RPT #1	RP	240	A-2/6	No
				C-2/1	No
				C-2/2	No

Notes:
(1) Actions taken to place systems in a shutdown/startup condition, but actions are not required for safe shutdown.
(2) As required by site-specific emergency plan.
(3) For areas that are evacuated based on the specific event.

4.1.3 Hostile Action Event

Table 4-3 describes the on-shift positions that are needed to perform the actions required to effectively mitigate this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Three NLOs

There are no credited actions for the ROs to perform during the hostile action event. Each RO performs post-reactor trip actions to place systems in a shutdown or startup lineup in accordance with procedures. Once security has signaled the hostile threat is cleared, the hostile action event is over.

One NLO assists the ROs in performing post-reactor trip actions once security has signaled the hostile threat is cleared. One NLO reports to the MCR to assume the role of MCR Communicator when the hostile action event is declared if it is safe to do so, or once security has given the “all clear” signal. The CRS/SM performs this role prior to the NLO. The third NLO is assigned to the firefighting function. During a hostile action, firefighting actions will not occur, as this may place plant personnel in danger. The local fire department will likely handle the firefighting once security has given the “all clear” signal.

During a hostile action, radiation protection (RP) actions will not occur, as this may place plant personnel in danger. Once security has given the “all clear” signal, RP activities can commence. Site-specific consideration should be given to maintaining a set of dosimeters with responding law enforcement, to eliminate the need for issuing dosimeters prior to law enforcement entering the protected area.

The analysis evaluates a security hostile action event within the protected area. Crew response for this security event was not tested during the RSPVT. A downstream user will develop site-specific procedures to address this situation, and the operations team will be tested using JPMs to verify proper performance. For this event, the operations crew takes immediate actions when notified by the security personnel that there is an event in progress. Other than security force personnel, plant personnel take cover, and an EAL classification is declared by the ED.

Table 4-3 Hostile Action Event On-Shift Staffing Analysis

Line	On-Shift Position	Emergency Plan Function	Augmentation Elapsed Time (min)	Role in Table#/Line#	Unanalyzed Task
1	CRS/SM	ED; supervision of RP staff and site RP; emergency classifications	240	A-3/1 D-3/1 D-3/3(5) D-3/5 D-3/6 D-3/7 D-3/8(5) D-3/9(5) D-3/10 D-3/11 D-3/13	No No No No No No No No No No No
2	RO #1	Post-reactor trip actions(1)	N/A	A-3/2	No
3	RO #2	Post-reactor trip actions(1)	N/A	A-3/3	No
4	NLO #1	MCR Communicator	240	A-3/4 D-3/14(5)	No No
5	NLO #2	Post-reactor trip actions(2)	N/A	A-3/5	No
6	NLO #3	Firefighting (Incident Commander)(3)	Local fire department(4)	A-3/6 B-3/1	No No

Notes:
(1) Actions taken to place systems in a shutdown/startup condition, but actions are not required for safe shutdown.
(2) Actions are delayed until security has advised the hostile action event no longer exists.
(3) During the active hostile action event, no firefighting may occur for the safety of on-shift personnel.
(4) Once the “all clear” signal is given by security, the off-site fire department response takes over firefighting duties.
(5) As required by site-specific emergency plan.

4.1.4 Aircraft Probable Threat Event

Table 4-4 describes the on-shift positions that are needed to perform the actions required to effectively mitigate this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Three NLOs
- One RPT

There are no credited actions for the ROs to perform for the aircraft probable threat event. Both ROs perform actions as directed by site procedures for a potential aircraft

impact. As necessary, the ROs perform post-reactor trip actions in accordance with procedures to place systems in a shutdown or startup lineup.

One NLO assists the ROs in performing actions as directed by site procedures, including post-reactor trip actions as necessary. One NLO reports to the MCR to assume the role of MCR Communicator when the EAL is declared. The third NLO is assigned to the firefighting function if an actual aircraft impact occurs. The local fire department will handle firefighting following an actual aircraft impact.

The RPT performs functions including in-plant monitoring and supporting expediting personnel out of the RCA.

The analysis evaluates the operations crew response to a credible report of an aircraft threat. Crew response for this beyond-design-basis security event was not tested during RSPVT. A downstream user will develop site-specific procedures to address this situation, and the operations team will be tested using JPMs to verify proper performance. An EAL classification is declared by the ED.

Table 4-4 Aircraft Probable Threat Event On-Shift Staffing Analysis

Line	On-Shift Position	Emergency Plan Function	Augmentation Elapsed Time (min)	Role in Table#/Line#	Unanalyzed Task
1	CRS/SM	ED; supervision of RP staff and site RP; emergency classifications	240	A-4/1 D-4/1 D-4/3(2) D-4/5 D-4/6 D-4/8(2) D-4/10 D-4/11 D-4/15(3)	No No No No No No No No No
2	RO #1	As directed by site procedures	N/A	A-4/2	No
3	RO #2	As directed by site procedures	N/A	A-4/3	No
4	NLO #1	MCR Communicator	240	A-4/4 D-4/9(2) D-4/13 D-4/14(2)	No No No No
5	NLO #2	As directed by site procedures	N/A	A-4/5	No
6	RPT #1	RP	240	A-4/6 C-4/1	No No
7	NLO #3	Firefighting (Incident Commander)	Local fire department(1)	A-4/7 B-4/1	No No

Notes:
(1) The on-site Fire Brigade Incident Commander is relieved by the off-site fire department response.
(2) As required by site-specific emergency plan.
(3) If a site evacuation is ordered.

4.1.5 Control Room Fire Leading to Evacuation Event

Table 4-5 describes the on-shift positions that are needed to perform the actions required to effectively mitigate this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Three NLOs

The ROs perform remote shutdown actions for the control room fire and evacuation event, as necessary. Both ROs perform post-reactor trip actions in accordance with procedure. These actions result in the applicable systems being placed in a shutdown or startup lineup.

One NLO assists the ROs in performing post-reactor trip actions. One NLO reports to the designated alternate location to assume the role of MCR Communicator when the EAL is declared. For this event, off-site firefighting support is requested. The third NLO is assigned to the firefighting function to support the responding local fire department. There are no RP functions required to mitigate this event.

The analysis evaluates the operations crew response to a control room fire that leads to evacuation. The crew response to this event was not tested during RSPVT. A downstream user will develop site-specific procedures to address this situation, and the operations team will be tested using JPMs to verify proper performance. The NPP does not include a traditional remote shutdown room. Remote actions are carried out at designated locations in the plant. However, prior to evacuating the control room, operators trip the reactors, initiate decay heat removal, and initiate containment isolation, placing the NPMs in a safe condition.

Table 4-5 Control Room Fire Leading to Evacuation On-Shift Staffing Analysis

Line	On-Shift Position	Emergency Plan Function	Augmentation Elapsed Time (min)	Role in Table#/Line#	Unanalyzed Task
1	CRS/SM	ED; supervision of RP staff and site RP; emergency classifications	240	A-5/1 D-5/1 D-5/3(4) D-5/5 D-5/6 D-5/8(4) D-5/10 D-5/15	No No No No No No No No
2	RO #1	Remote shutdown actions(1)	N/A	A-5/2	No
3	RO #2	Remote shutdown actions(1)	N/A	A-5/3	No
4	NLO #1	MCR Communicator(2)	240	A-5/4 D-5/9(4) D-5/13 D-5/14(4)	No No No No
5	NLO #2	Remote shutdown actions(1)	N/A	A-5/5	No
6	NLO #3	Firefighting (Incident Commander)	Local fire department(3)	A-5/6 B-5/1	No No

Notes:
(1) Actions will be prescribed by site-specific procedures.
(2) Location of the MCR communicator will be prescribed by site-specific procedures.
(3) The Fire Brigade Incident Commander will guide the off-site fire department response.
(4) As required by site-specific emergency plan.

4.1.6 Anticipated Transient Without Scram Event

Table 4-6 describes the on-shift positions that are needed to perform the actions required to effectively mitigate this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Two NLOs
- One RPT

There are no credited actions for the ROs to perform for the ATWS event. Each RO performs post-reactor trip actions in accordance with procedures to place systems in a shutdown or startup lineup.

One NLO assists the ROs in performing post-reactor trip actions, as necessary. The other NLO reports to the MCR to assume the role of MCR Communicator when the EAL is declared.

The RPT performs in-plant monitoring. The NPP includes installed area radiation monitors and continuous air monitors that provide indication of in-plant radiation and airborne radiation prior to dispatching personnel within the plant. The use of technology (e.g., drone-based monitoring) is considered for on-site surveying, and potentially in-plant surveying. Personnel entering RCAs use radiation work permits or emergency radiation work permits. These personnel are trained to perform self-contamination frisking and use portal contamination monitors.

The analysis looks at the operations crew response to an ATWS event. The ATWS event has less significance in the NPP compared to the large LWRs.

Table 4-6 ATWS Event On-Shift Staffing Analysis

Line	On-Shift Position	Emergency Plan Function	Augmentation Elapsed Time (min)	Role in Table#/Line#	Unanalyzed Task
1	CRS/SM	ED; supervision of RP staff and site RP; emergency classifications	240	A-6/1 D-6/1 D-6/3(1) D-6/4 D-6/5 D-6/6 D-6/8(1) D-6/10	No No No No No No No No
2	RO #1	Post-reactor trip actions	N/A	A-6/2	No
3	RO #2	Post-reactor trip actions	N/A	A-6/3	No
4	NLO #1	MCR Communicator	240	A-6/4 D-6/9(1) D-6/13 D-6/14(1)	No No No No
5	NLO #2	Post-reactor trip actions	N/A	A-6/5	No
6	RPT #1	RP	240	A-6/6 C-6/1	No No

Notes:
(1) As required by site-specific emergency plan.

4.2 Plant Operations and Safe Shutdown Analysis

This section covers plant operations and safe shutdown function analysis for each event. Appendix A tables evaluate the functions performed in abnormal procedures, emergency procedures, emergency operating procedures, and general technical guidelines (GTG; traditionally referred to as severe accident management guidelines) before the arrival of augmenting staff. For each of the events selected for OSA, a table is completed evaluating the role and position filling that role in this functional area. The final column for the Appendix A tables include the “Task Analysis Controlling Method,” which is the procedure or JPM that provides the guidance for performing that role within the emergency plan. For the “Task Analysis Controlling Method,” credit is taken for completed work (e.g., MCR staffing validation testing) and future work that is required to be completed prior to plant operation (e.g., the operations training program).

4.2.1 Plant Operations and Safe Shutdown for the Decrease in Reactor Coolant Inventory Event

Table A-1 describes the on-shift positions that are needed to perform the emergency plan actions needed for plant operations and safe shutdown for this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Two NLOs
- One RPT

For the combined CRS/SM and ROs, credit is taken for the testing previously performed (Reference 7.6), as well as the future Operations Training Program. For the NLOs, credit is taken for the future Operations Training Program to perform task analysis for development of the training program and JPMs. For the RPT, credit is taken for the future Radiation Protection Training Program.

4.2.2 Plant Operations and Safe Shutdown for the Radioactive Release from a Subsystem or Component Event

Table A-2 describes the on-shift positions that are needed to perform the emergency plan actions needed for plant operations and safe shutdown for this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Two NLOs
- One RPT

For the combined CRS/SM and ROs, credit is taken for the testing previously performed (Reference 7.6), as well as the future Operations Training Program. For the NLOs, credit is taken for the future Operations Training Program to perform task analysis for development of the training program and JPMs. For the RPT, credit is taken for the future Radiation Protection Training Program.

4.2.3 Plant Operations and Safe Shutdown for the Hostile Action Event

Table A-3 describes the on-shift positions that are needed to perform the emergency plan actions needed for plant operations and safe shutdown for this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Three NLOs

For the combined CRS/SM and ROs, credit is taken for the future Operations Training Program. For the NLOs, credit is taken for the future Operations Training Program and Fire Brigade Training Program to perform task analysis for development of the training program and JPMs.

4.2.4 Plant Operations and Safe Shutdown for the Aircraft Probable Threat Event

Table A-4 describes the on-shift positions that are needed to perform the emergency plan actions needed for plant operations and safe shutdown for this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Three NLOs
- One RPT

For the combined CRS/SM and ROs, credit is taken for the testing previously performed (Reference 7.6), as well as the future Operations Training Program. For the NLOs, credit is taken for the future Operations Training Program and Fire Brigade Training Program to perform task analysis for development of the training program and JPMs. For the RPT, credit is taken for the future Radiation Protection Training Program.

4.2.5 Plant Operations and Safe Shutdown for the Control Room Fire Leading to Evacuation Event

Table A-5 describes the on-shift positions that are needed to perform the emergency plan actions needed for plant operations and safe shutdown for this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Three NLOs

For the combined CRS/SM and ROs, credit is taken for the future Operations Training Program. For the NLOs, credit is taken for the future Operations Training Program and the Fire Brigade Training Program to perform task analysis for development of the training program and JPMs.

4.2.6 Plant Operations and Safe Shutdown for the Anticipated Transient Without Scram Event

Table A-6 describes the on-shift positions that are needed to perform the emergency plan actions needed for plant operations and safe shutdown for this event. The following on-shift positions fulfill the mitigating actions:

- The combined CRS/SM
- Two ROs
- Two NLOs
- One RPT

For the combined CRS/SM and ROs, credit is taken for the testing previously performed (Reference 7.6), as well as the future Operations Training Program. For the NLOs, credit is taken for the future Operations Training Program to perform task analysis for development of the training program and JPMs. For the RPT, credit is taken for the future Radiation Protection Training Program.

4.3 Firefighting Analysis

This section covers the firefighting function analysis for each event. Appendix B tables show the need for fire brigade coverage for each of the events selected for OSA. For each event, a separate table is used to document the on-shift staffing position(s) used to cover fire brigade functions. If an event or accident does not include a fire, the table lists N/A.

The NPP includes a Fire Protection Program that includes a sufficient number of plant staff trained as members of the incipient fire brigade. One on-shift member (NLO) is designated as the Incident Commander (or comparable role) for that shift.

Table B-1 through Table B-6 contain additional details.

4.3.1 Firefighting for the Decrease in Reactor Coolant Inventory Event

There is no fire associated with this event.

4.3.2 Firefighting for the Radioactive Release from a Subsystem or Component Event

There is no fire associated with this event.

4.3.3 Firefighting for the Hostile Action Event

There is a potential for a fire to occur during this event, and an NLO is designated for performing a firefighting role. However, firefighting activities are not carried out during an active hostile action event. Firefighting activities commence once the hostile action is declared over by security. By that time, off-site fire department resources are available for fire suppression activities.

4.3.4 Firefighting for the Aircraft Probable Threat Event

There is a potential for a fire to occur during this event, and an NLO will assume the role of Incident Commander for an industrial incipient fire brigade. If an aircraft were to impact a site, the resulting fires would likely exceed the incipient stage. Off-site fire department resources are available for fire suppression activities if an aircraft impact occurs.

4.3.5 Firefighting for the Control Room Fire Leading to Evacuation Event

The NLO assigned as fire brigade member assumes the role of Incident Commander of the industrial incipient fire brigade until the order is given to evacuate the MCR. The Incident Commander guides the local fire department response once they arrive on site.

4.3.6 Firefighting for the Anticipated Transient Without Scram Event

There is no fire associated with this event.

4.4 Radiation Protection

This section covers the RP function analysis. No off-site radiological assessment is required for a site boundary EPZ. Additionally, in accordance with 10 CFR 50.160 requirements and the site boundary EPZ, no protective action recommendations (PARs) are issued to OROs. Accordingly, RP actions are taken for protecting on-site personnel.

The following assumptions are made for the RP function:

- Installed plant area radiation and airborne activity monitors provide indications of in-plant radiation and radioactive airborne levels.
- Other technologies (e.g., drones) may be utilized for performing on-site radiological assessments, including checking dose rates around structures and within the protected area, and owner-controlled areas. It is also possible to use such technology for in-plant surveying. These technologies are outside the scope of the generic NPP design and are instead within the scope of the site-specific emergency plan.
- If installed, perimeter radiation monitors may be utilized for surveying.
- For each of the analyses described below that require in-plant surveys, a time period of 30 minutes is assumed for the RPT to complete in-plant surveying.
- For each of the analyses described below that require on-site surveys, a time period of 90 minutes is assumed for the RPT to complete on-site surveying.
- On-site surveys are only required for events with a potential radiological release.
- Personnel entering RCAs utilize radiation work permits or emergency radiation work permits, and obtain electronic dosimetry. The electronic dosimetry provides preset alarms to ensure personnel protection. These personnel are trained to perform personal contamination frisking, and they are trained to utilize the use of portal contamination monitors. Other personnel may also be qualified to use portable radiation monitoring equipment.

An augmented RPT will perform personnel monitoring, when necessary.

Table C-1 through Table C-6 contain additional details.

4.4.1 Radiation Protection for the Decrease in Reactor Coolant Inventory Event

A 30-minute period is given for in-plant surveys to be performed. A 90-minute period is given for on-site surveys to be performed. In either case, technology such as drones can facilitate faster survey performance. RPT #1 is assigned to in-plant and on-site surveys. Table C-1 contains additional details.

4.4.2 Radiation Protection for the Radioactive Release from a Subsystem or Component Event

A 30-minute period is given for in-plant surveys to be performed. A 90-minute period is given for on-site surveys to be performed. In either case, technology such as drones can facilitate faster survey performance. RPT #1 is assigned to in-plant and on-site surveys. Table C-2 contains additional details.

4.4.3 Radiation Protection for the Hostile Action Event

There are no RP functions for this event as identified in Table C-3.

4.4.4 Radiation Protection for Response Actions for the Aircraft Probable Threat Event

For this event, the aircraft does not impact the site. Accordingly, there are no required RP surveys. RPT #1 is assigned to in-plant surveys, but this function will facilitate expediting personnel exit from the RCA. Table C-4 contains additional details.

4.4.5 Radiation Protection for the Control Room Fire Leading to Evacuation Event

There are no RP functions for this event as identified in Table C-5.

4.4.6 Radiation Protection for the Anticipated Transient Without Scram Event

A 30-minute period is given for in-plant surveys to be performed, and technology such as drones can facilitate faster survey performance. RPT #1 is assigned to in-plant surveys. Table C-6 contains additional details.

4.5 Emergency Plan Implementation

This section covers the emergency plan implementation function analysis for events. Appendix D tables evaluate the tasks that must be performed during the various events to successfully implement the emergency plan. If a certain task is not required for a specific event, that task is marked as N/A. Because the NPP has a site boundary EPZ, tasks that refer to off-site activities are marked as N/A, which is consistent with 10 CFR 50.160 and Reference 7.1.

Similar to Appendix A, Appendix D tables also include a column for the “Task Analysis Controlling Method.” As described in Section 3.1, credit is taken for completed work (e.g., MCR staffing validation testing) and future work that is required to be completed prior to plant operation (e.g., the operations training program).

Table D-1 through Table D-6 contain additional details.

4.5.1 Emergency Plan Implementation for the Decrease in Reactor Coolant Inventory Event

Table D-1 describes the emergency plan functions necessary for this event. The key position in this analysis is the combined CRS/SM. The emergency plan functions required during this event include:

- Declare the emergency classification level (ECL)
- Approve extension to allowable dose limits
- Provide notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)
- ERO notification
- Complete NRC event notification form
- Activate the emergency response data system (ERDS) (based on the site, ERDS may always be operational)
- Perform NRC notifications
- Complete state/local notification form (if required by site-specific emergency plan)
- Approve content of state/local notifications (if required by site-specific emergency plan)
- Perform state/local notification (if required by site-specific emergency plan)
- Perform other site-specific event notifications (if required by site-specific emergency plan)
- Off-site radiological assessment

The following emergency plan functions outlined in NEI 10-05 are unnecessary for a site boundary EPZ with no ORO response for the decrease in reactor coolant inventory event:

- Approve off-site PARs
- Abbreviated NRC notification for DBT event
- Personnel accountability
- Other: specify other functions that apply

4.5.2 Emergency Plan Implementation for the Radioactive Release from a Subsystem or Component Event

Table D-2 describes the emergency plan functions necessary for this event. The key position in this analysis is the combined CRS/SM. The emergency plan functions required during this event include:

- Declare the ECL
- Approve extension to allowable dose limits
- Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)
- ERO notification
- Complete NRC event notification form
- Activate ERDS (based on the site, ERDS may always be operational)
- Perform NRC notifications
- Complete state/local notification form (if required by site-specific emergency plan)
- Approve content of state/local notifications (if required by site-specific emergency plan)
- Perform state/local notifications (if required by site-specific emergency plan)
- Perform other site-specific event notifications (if required by site-specific emergency plan)
- Off-site radiological assessment
- Personnel accountability (for any area evacuated due to the event)

The following emergency plan functions outlined in NEI 10-05 are unnecessary for a site boundary EPZ with no ORO response for the radioactive release from a subsystem or component event:

- Approve off-site PARs
- Abbreviated NRC notification for DBT event
- Other: specify other functions that apply

4.5.3 Emergency Plan Implementation for the Hostile Action Event

Table D-3 describes the emergency plan functions necessary for this event. The key position in this analysis is the combined CRS/SM. The emergency plan functions required during this event include:

- Declare the ECL
- Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)
- ERO notification
- Abbreviated NRC notification for DBT event
- Complete NRC event notification form
- Activate ERDS (bases on the site, ERDS may always be operational)
- Perform NRC notifications
- Complete state/local notification form (if required by site-specific emergency plan)
- Approve content of state/local notifications (if required by site-specific emergency plan)
- Perform state/local notifications (if required by site-specific emergency plan)
- Perform other site-specific event notifications (if required by site-specific emergency plan)
- Personnel accountability does not occur until after security gives the “all clear” signal
- Other: the Alarm Station(s) is responsible for requesting off-site resources

The following emergency plan functions outlined in NEI 10-05 are unnecessary for a site boundary EPZ with no ORO response beyond law enforcement and the local fire department for the hostile action event:

- Approve off-site PARs
- Approve extension to allowable dose limits
- Off-site radiological assessment

4.5.4 Emergency Plan Implementation for the Aircraft Probable Threat Event

Table D-4 describes the emergency plan functions necessary for this event. The key position in this analysis is the combined CRS/SM. The emergency plan functions required during this event include:

- Declare the ECL
- Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)
- ERO notification
- Complete NRC event notification form
- Activate ERDS (based on the site, ERDS may always be operational)
- Perform NRC notifications
- Complete state/local notification form (if required by site-specific emergency plan)
- Approve content of state/local notifications (if required by site-specific emergency plan)
- Perform state/local notifications (if required by site-specific emergency plan)
- Perform other site-specific event notifications (if required by site-specific emergency plan)
- Personnel accountability (if site evacuation is ordered)
- Other: the Alarm Station(s) is responsible for requesting off-site resources

The following emergency plan functions outlined in NEI 10-05 are unnecessary for a site boundary EPZ with no ORO response beyond law enforcement and the local fire department for the aircraft probable threat event:

- Approve off-site PARs
- Approve extension to allowable dose limits
- Abbreviated NRC notification for DBT event
- Off-site radiological assessment

4.5.5 Emergency Plan Implementation for the Control Room Fire Leading to Evacuation Event

Table D-5 describes the emergency plan functions necessary for this event. The key position in this analysis is the combined CRS/SM. The emergency plan functions required during this event include:

- Declare the ECL
- Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)
- ERO notification
- Complete NRC event notification form
- Perform NRC notifications
- Personnel accountability
- Complete state/local notification form (if required by site-specific emergency plan)
- Approve content of state/local notifications (if required by site-specific emergency plan)
- Perform state/local notifications (if required by site-specific emergency plan)
- Perform other site-specific event notifications (if required by site-specific emergency plan)
- Other: the Alarm Station(s) will notify off-site resources. Normally, the MCR is responsible for requesting a fire department response.

The following emergency plan functions outlined in NEI 10-05 are unnecessary for a site boundary EPZ with no ORO response beyond law enforcement and the local fire department for the control room fire leading to evacuation event:

- Approve off-site PARs
- Approve extension to allowable dose limits
- Abbreviated NRC notification for DBT event
- Activate ERDS
- Off-site radiological assessment

4.5.6 Emergency Plan Implementation for the Anticipated Transient Without Scram Event

Table D-6 describes the emergency plan functions necessary for this event. The key position in this analysis is the combined CRS/SM. The emergency plan functions required during this event include:

- Declare the ECL
- Approve extension to allowable dose limits
- Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)
- ERO notification
- Complete NRC event notification form
- Perform NRC notifications
- Complete state/local notification form (if required by site-specific emergency plan)
- Approve content of state/local notifications (if required by site-specific emergency plan)
- Perform state/local notifications (if required by site-specific emergency plan)
- Perform other site-specific event notifications (if required by site-specific emergency plan)

The following emergency plan functions outlined in NEI 10-05 are unnecessary for a site boundary EPZ with no ORO response for the ATWS event:

- Approve off-site PARs
- Abbreviated NRC notification for DBT event
- Activate ERDS
- Off-site radiological assessment
- Personnel accountability
- Other: specify other functions that apply

4.6 Summary of On-Shift Staffing Analysis

Section 4.0 and the associated appendices include the OSA. As demonstrated, the required on-shift staff listed in Section 3.1 perform the functions required to cope with the spectrum of events analyzed for OSA.

5.0 NuScale Optimized On-Site Emergency Response Organization

This section provides the optimized baseline ERO for an NPP. The proposed ERO staffing and augmentation plan deviates from NUREG-0654/FEMA-REP-1 (Reference 7.4) in that it does not include emergency plan functions unnecessary to an NPP. The specific deviations include off-site field monitoring teams, information technology (IT), an emergency operations facility (EOF), and a joint information center (JIC).

The NPP is assumed to have a site boundary EPZ, which is implicit to the methodology and approach described in this LTR. Accident sequences have an extremely low likelihood as well as have a low consequence to the public health and safety. Additionally, accident sequences include a transient progression that allows time for potential off-site emergency response agencies to initiate an appropriate protective response, if necessary.

The NPP does not include a dedicated EOF due to the features previously described (e.g., site boundary EPZ, passive safety, etc.). No ORO support is necessary beyond potential response from a local law enforcement, ambulance, or fire department. During a hostile action event, an alternate facility may be established, but a dedicated EOF is not required.

As described in Section 3.1, FSAR Chapter 15 describes the long coping times of accident scenarios. During and following transient progression, automatic actions (e.g., ECCS actuation) place the NPM in a safe condition, and the NPM remains in a safe condition without need for operator actions for at least the duration of the 72-hour DBE period with assumed single failures considered. Thus, there are no operator actions credited in the evaluation of DBEs. Accordingly, the ERO augmentation time for an NPP can be greater than that employed in traditional LWR fleet emergency plans. Specifically, this approach utilizes an ERO augmentation period of 240 minutes. Relief of the on-shift ERO is assumed to occur no sooner than 240 minutes from the time of the EAL declaration. This augmentation time period is the period from initial declaration of an EAL until the time of turnover for specifics functions or responsibilities.

As demonstrated in the OSA, on-shift personnel are capable of performing event detection, mitigation, classification, and notification functions required in the early phases of an emergency. Table 5-1 lists the ERO positions required to meet staffing and augmentation for an NPP with an EAL classification of an Alert (or greater). The subsequent sections outline the major tasks assigned to each position.

Table 5-1 Minimum On-Site ERO Staff for a NuScale Power Plant

EP Functions	On-Shift Role	Technical Support Center/ Operations Support Center Role[1]
Command and Control • Provide overall ERO command and control, until relieved • Approve EAL, until relieved • Authorize personnel dose extensions, until relieved	Combined CRS/SM	Emergency Director
Communications • Communicate EAL to NRC, until relieved	MCR Communicator[2]	ORO/Emergency Notification System Communicator
Radiation Protection • Provide qualified RP coverage for responders accessing potentially unknown radiological environments during emergency conditions • Provide in-plant surveys • Control dosimetry and radiologically controlled area access	RPT[3]	Two additional RPTs
Supervision of RP Staff and Site RP • Evaluate and assess plant radiological data in the development of on-site protective actions, until relieved • Recommend on-site protective actions to the applicable decision-maker, until relieved • Direct RP activities, until relieved • Provide relevant information to applicable communicators who are communicating to the NRC, until relieved	Combined CRS/SM	RP Coordinator
Dose Assessment and Projections • Assess dose and make projections from radiological releases	Combined CRS/SM	RP Coordinator
Emergency Classifications • Evaluate plant conditions and recommend emergency classifications, until relieved.	Combined CRS/SM[2]	Emergency Director[2]
Engineering • Provide engineering coverage related to the discipline of the assigned engineer, until relieved	N/A	N/A
Security • Coordinate security-related activities and information	Security staffing per the site-specific security plan	Security Liaison
Repair Team Activities	N/A	N/A
Supervision of Repair Team Activities • Direct operation support center (OSC) repair teams to specific locations and activities	N/A	Maintenance Supervisor
Media Information • Manage and coordinate media information related to the event.	N/A	Communications Staff[4]

Table 5-1 Minimum On-Site ERO Staff for a NuScale Power Plant (Continued)

EP Functions	On-Shift Role	Technical Support Center/ Operations Support Center Role[1]
Information Technology • If emergency plan functions rely on computer-based equipment, provide IT support	N/A	N/A

Notes:

1. Augmentation occurs for events with an Alert (or greater) classification. There is a 240-minute augmentation period.
2. Other personnel may be assigned this function, if no other collateral duties are assigned to an individual that are beyond the capability of that individual to perform at a given time. For augmented ERO positions, a performance-based approach is acceptable for evaluating whether augmented personnel can adequately perform collateral functions without having competing priorities.
3. One RPT for the entire site (independent of the number of NPMs).
4. The Communications staff have one representative in the Technical Support Center (TSC) with the remainder remote.

5.1 Command and Control

Command and control tasks include:

- Provide overall ERO command and control, until relieved.
- Approve EAL classifications and PARs, until relieved.
- Authorize personnel dose extensions, until relieved.

In accordance with 10 CFR 50.160(b)(1)(iii)(D), these functions support the ability to "establish and maintain effective command and control for emergencies." Initially, the combined CRS/SM assumes the role of ED to provide command and control. The ED is responsible for approving escalation, downgrade, or termination of the event. With a site boundary EPZ, there are no predetermined, prompt PARs required for off-site. Other PARs may be required by the site-specific emergency plan. The ED authorizes personnel dose extensions, if required.

After arriving on-site for augmentation, a Technical Support Center ED relieves the CRS/SM of command and control, EAL classifications, downgrades or terminations, and authorizing personnel exposure extensions. The Technical Support Center ED fills their augmented role within 240 minutes of an Alert (or greater) classification.

5.2 Communications

Communication functions include the following task:

- Communicate EAL classifications and PAR classifications to OROs and the NRC, until relieved.

Staffing to perform these tasks supports the ability to “establish and maintain effective communications” in accordance with 10 CFR 50.160(b)(1)(iii)(C). The ED will approve notifications to OROs as required by the site-specific emergency plan. With a site boundary EPZ, there are no predetermined, prompt PARs required for off-site. Other PARs may be required by the site-specific emergency plan. During a declared EAL, an NLO reports to the MCR to perform communication tasks. The MCR Communicator communicates information to OROs and the NRC, as required by the site-specific emergency plan and procedures. The MCR Communicator would also perform event notifications to the NRC.

For emergencies declared as an Alert (or greater) classification, an augmented TSC Communicator is a part of the ERO augmentation staff, and relieves the MCR Communicator. The ED approves the information provided to OROs, if applicable and as required by the site-specific emergency plan. Once the augmented TSC Radiation Protection Supervisor fills their role, they can provide radiological information to the NRC, as requested.

5.3 Radiation Protection

Radiation protection functions include the following tasks:

- Provide qualified RP coverage for responders accessing potentially unknown radiological environments during emergency conditions.
- Provide in-plant surveys and on-site surveys.
- Control dosimetry and radiologically controlled area access.

Staffing to perform these tasks supports the ability to “assess radiological conditions in and around the facility during emergencies,” in accordance with 10 CFR 50.160(b)(1)(iii)(F).

During an event, NLOs are potentially dispatched into the plant to perform tasks in accordance with AOPs and EOPs. Maintenance-related actions are anticipated to be minimal during the initial period of an event. Installed area radiation monitors are used to determine in-plant radiation levels prior to dispatching personnel into the plant, and personnel are assigned appropriate dose and dose rate alarms for their electronic dosimetry prior to being dispatched.

The on-shift RPT performs the necessary RP functions, including in-plant monitoring, on-site monitoring, and personnel monitoring (i.e., frisking and dosimetry). The RPT utilizes available equipment to indicate in-plant radiation and airborne activity levels prior to dispatching personnel, including the use of installed area radiation monitors and airborne activity monitors. Other technology (e.g., drones) may be employed on a site-specific basis that may drastically reduce survey times. Personnel entering an RCA

use Radiation Work Permits or Emergency Radiation Work Permits, which provide the required preset alarms to electronic dosimetry. Personnel entering the RCA have previous training on performing personal contamination frisking and utilizing portal contamination monitors.

As previously mentioned, augmented staffing is only required for events with a classification of Alert (or greater). For an NPP, the Notice of Unusual Event (NOUE) classification does not have a radioactive release. For an Alert, a release is possible or has been detected. Accordingly, for an Alert (or greater), two RPTs augment within 240 minutes of declaration to support the on-shift RPT, perform support and coverage, support decontamination, or perform more detailed in-plant or on-site surveys. Two RPTs augment within 240 minutes of an Alert or greater classification. They support the on-shift RPT for potential re-entry team coverage, maintenance support and coverage, decontamination, or more detailed in-plant or on-site surveys.

5.4 Supervision of Radiation Protection Staff and Site Radiation Protection

Supervision of RP staff and site RP includes the following tasks:

- Evaluate and assess plant and off-site radiological data in the development of on-site protective actions and off-site PARs, until relieved.
- Recommend on-site protective actions and off-site PARs to the applicable decision-maker, until relieved.
- Direct RP activities, including on-site field monitoring team direction, until relieved.
- Provide relevant information to applicable communicators who are communicating off-site PARs to OROs and radiological information to the NRC, until relieved.

Staffing to perform these tasks supports the ability “to implement and maintain protective actions,” in accordance with 10 CFR 50.160(b)(1)(iii)(B). The RP staffing supports the ability to “assess radiological conditions in and around the facility during emergencies,” in accordance with 10 CFR 50.160(b)(1)(iii)(F). During the early phase of an event, the ED satisfies these functions by assessing plant conditions and making protective actions for on-site personnel. For a site boundary EPZ, there are no off-site PARs. Additionally, no off-site field monitoring teams are required. The ED also provides relevant information to the MCR Communicator to communicate to OROs.

Maintenance personnel are not expected to perform repair activities during the early phase of an event, so there would be no RP-related tasks for those activities. As directed, non-licensed operators are dispatched in the plant to perform AOP or EOP actions. As discussed in Section 5.3, the RPT provides personnel protection measures (e.g., surveying), and the ED provides direction for the RPT. As with the Technical

Support Center ED, a Technical Support Center RP Coordinator fills the augmented role within 240 minutes of an Alert (or greater) classification to provide overall RP supervision.

5.5 Dose Assessment and Projections

Dose assessment and projection functions include the following task:

- Perform dose assessments and projections.

Staffing to perform this task supports the ability to "assess radiological conditions in and around the facility during emergencies," in accordance with 10 CFR 50.160(b)(1)(iii)(F). Off-site PARs are not required for a site boundary EPZ.

The operators monitor installed effluent radiation monitors and in-plant radiation monitors in the MCR, providing the capability to quickly and accurately detect a release. The MCR human-system interface (HSI) provides alarms and annunciation, and effluent monitors include predetermined values that correspond with EALs, allowing MCR staff to know when releases are greater than one percent of the Protective Action Guide and 10 percent of the Protective Action Guide.

The on-shift RPT is capable of verifying a radioactive release and estimating its magnitude by performing on-site surveys. Additionally, site perimeter radiation monitors support this function, if installed. The other technologies (e.g., drones) support this function, if available.

A Technical Support Center RP Coordinator fills the augmented role within 240 minutes of an Alert (or greater) classification, providing overall RP supervision. This position also assesses potential radioactive releases.

5.6 Emergency Classification

Emergency classification functions include the following task:

- Evaluate plant conditions and recommend emergency classifications, until relieved.

Staffing to perform these tasks supports the ability to perform event classification and mitigation, in accordance with 10 CFR 50.160(b)(1)(iii)(A). In the traditional large LWR fleet, this function is performed by the shift technical advisor (STA). However, the NPP control room staff requirement excludes the STA position (Reference 7.5). The HSI provides definitive indication of plant-indicated EALs. The combined CRS/SM evaluates plant conditions and makes emergency classifications, as required.

The Technical Support Center ED fills the augmented role within 240 minutes of an Alert (or greater) classification. Once augmented, the Technical Support Center ED interacts with the CRS/SM to determine the need for escalations, downgrades, and terminations of

the event. The MCR staff evaluate plant conditions, and the TSC includes the ability to monitor plant indications as well.

5.7 Engineering

Engineering functions include the following task:

- Provide engineering coverage related to the specific discipline of the assigned engineer, until relieved.

As previously discussed, the STA function is eliminated in the NPP (Reference 7.5). For traditional LWRs, the STA performs the function of assessing core damage, and this function was augmented by a core or thermal hydraulics engineer. However, as discussed in Section 3.1, DBEs do not result in core damage for an NPP. For postulated severe accidents and BDBEs, the HSI provides indication that allows operators to assess core damage. For example, the NPP includes under-the-bioshield radiation monitors that can be utilized to assess core damage.

The NPP does not require engineering disciplines to support repair activities during the early phase of an event. As such, the engineering function is considered supplemental and is not listed in Table 5-1.

5.8 Repair Team Activities

As previously discussed, the NPP and its NPMs include passive safety features, redundancy (e.g., single failure proof features), low operational complexity, etc. The design is simplified and includes inherent passive safety features such that maintenance personnel are not required to support repair activities during the early phase of an event.

For potential tasks needed to perform AOP or EOP actions, NLOs are dispatched to support the MCR.

The TSC augmented personnel, in consultation with the CRS/SM, determine needed maintenance resources. This function is handled as a supplemental function as needed based on the event and damage to the plant.

5.9 Supervision of Repair Team Activities

As discussed in Section 5.8, maintenance personnel are not necessary. Dispatched NLOs support the MCR to perform AOP and EOP actions in the plant. However, a Maintenance Supervisor is included as an augmented TSC position in Table 5-1. The TSC Maintenance Supervisor works with TSC personnel to determine the need for repairs, maintenance resources and resources such as tools and parts availability. The

Maintenance Supervisor fills their augmented role within 240 minutes of an Alert (or greater) declaration.

5.10 Field Monitoring Activities

Field monitoring activities include the following tasks:

- Perform on-site field monitoring
- Perform off-site field monitoring

Off-site field monitoring radiological assessments are not required with a site boundary EPZ. Technology (e.g., drones, perimeter monitors, etc.) is potentially employed to determine dose rates within the protected area, security owner-controlled area, and owner-controlled area. On-site survey activities are included in the RP function within Table 5-1. Two additional RPTs augment the on-shift RPT at Alert (or greater) classification, perform additional on-site field monitoring or support plant activities.

5.11 Security

Security functions include the following task:

- Coordinate security-related activities and information with the Emergency Director

On-shift security staffing is in accordance with the site-specific security plan. Site access controls and personnel accountability are maintained in accordance with the security plan and associated procedural requirements.

The Security Shift Supervisor interfaces with the ED. For an Alert (or greater) classification, the TSC Security Liaison fills their augmented role within 240 minutes of classification. Once augmented, the TSC Security Liaison interfaces with the ED pertaining to security issues, site access controls, and personnel accountability. For a potential hostile action event, access to the site is restricted. In this circumstance, the TSC Security Liaison responds to the incident command post to support local law enforcement agencies and provide interface with site security.

5.12 Media Information

Media functions include the following task:

- Manage and coordinate media information related to the event.

For an Alert (or greater) classification, a single TSC Communicator provides approved event information to corporate communications personnel. The corporate communications personnel ultimately disseminate the information in accordance with their processes and procedures, including press releases, social media, or other venues.

A 240-minute augmentation time is sufficient to support a Joint Information System for disseminating information.

Events below an Alert classification are not expected to require media information or inquiry. Additionally, due to the slow nature of transients associated with the NPP, media support is not needed during the early phase of an event.

5.13 Information Technology

There are no specific IT functions required to be performed by the ERO. The IT function is only required if an EP digital asset falls under the cyber security rule. However, the scope of this equipment is site-specific. The NPP design ensures there are diverse methods for performing EP functions, with no single cyber-attack preventing the performance of a required EP function. This assumption makes the IT function for Table 5-1 not applicable. Other IT support needs are met in accordance with the normal site process. Assuming no EP equipment falls under this scope, the IT function is not applicable and is accordingly identified as not applicable in Table 5-1.

6.0 Summary and Conclusions

An optimized baseline ERO, including reduced staffing levels from the traditional fleet, is applicable to an NPP. The methodology and analysis described in this LTR can be summarized as follows:

- A modified approach to OSA is applicable to the NPP and aligns with RG 1.242 guidance and 10 CFR 50.160 rulemaking.
- The OSA in Section 4.0 and the corresponding appendices demonstrate the on-shift staff described in Table 3-1 are capable of coping "with expected DBAs, the DBT, and the response actions for a potential aircraft threat in accordance with 10 CFR 50.54(hh)(1)," as described in NSIR/DPR-ISG-01 (Reference 7.2). The on-shift staff are capable of coping with emergencies until the augmenting staff arrive.
- An NPP facilitates an augmented staffing period significantly greater than the traditional large LWR fleet due to unique design features, passive safety, and long coping times.
- The optimized baseline ERO staffing level described in Table 5-1 is capable of adequately coping with emergencies.
- The roles and responsibilities of the optimized ERO are sufficient to adequately cope with emergencies.

7.0 References

7.1 U.S. Nuclear Regulatory Commission, “Performance-Based Emergency Preparedness for Small Modular Reactors, Non-Light-Water Reactors, and Non-Power Production or Utilization Facilities,” Regulatory Guide 1.242, Revision 0, November 2023 (ML23226A036).

7.2 U.S. Nuclear Regulatory Commission, “Interim Staff Guidance, Emergency Planning for Nuclear Power Plants,” NSIR/DPR-ISG-01, Revision 0, November 2011 (ML113010523).

7.3 Nuclear Energy Institute, “Assessment of On-Shift Emergency Response Organization Staffing and Capabilities,” NEI 10-05, Revision 0, June 2011 (ML111751698).

7.4 U.S. Nuclear Regulatory Commission, “Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants,” NUREG-0654/FEMA-REP-1, Revision 2, December 2019 (ML19347D139).

7.5 NuScale Power, LLC, “NuScale Control Room Staffing Plan,” TR-0420-69456-P-A, Revision 1 (ML21231A286).

7.6 NuScale Power, LLC, “NuScale Revised Staffing Plan Validation Test Report,” RP-0419-65209-P, Revision 2 (ML20352A471).

7.7 NuScale Power, LLC, “Methodology for Establishing the Technical Basis for Plume Exposure Emergency Planning Zones at NuScale Small Modular Reactor Plant Sites,” TR-0915-17772-P-A, Revision 3 (ML22299A145).

Appendix A Plant Operations and Safe Shutdown Analysis Tables

This appendix completes the tables necessary for the plant operations and safe shutdown function OSA, which evaluates the ability of the on-site crew to implement abnormal operating procedures, emergency operating procedures, and general technical guidelines.

Table A-1 Plant Operations and Safe Shutdown Analysis for the Decrease in Reactor Coolant Inventory Event

Line	Generic Title/Role	On-Shift Position	Task Analysis Controlling Method
1	Shift Manager/Control Room Supervisor	Shift Manager/Control Room Supervisor	RSPVT/Operations Training Program
2	Reactor Operator #1	Reactor Operator	RSPVT/Operations Training Program
3	Reactor Operator #2	Reactor Operator	RSPVT/Operations Training Program
4	Main Control Room Communicator Non-Licensed Operator #1	Non-Licensed Operator	Operations Training Program
5	Non-Licensed Operator #2	Non-Licensed Operator	Operations Training Program
6	Radiation Protection Technician #1	Radiation Protection Technician	Radiation Protection Training Program

Table A-2 Plant Operations and Safe Shutdown Analysis for the Radioactive Release from a Subsystem or Component Event

Line	Generic Title/Role	On-Shift Position	Task Analysis Controlling Method
1	Shift Manager/Control Room Supervisor	Shift Manager/Control Room Supervisor	RSPVT/Operations Training Program
2	Reactor Operator #1	Reactor Operator	RSPVT/Operations Training Program
3	Reactor Operator #2	Reactor Operator	RSPVT/Operations Training Program
4	Main Control Room Communicator Non-Licensed Operator #1	Non-Licensed Operator	Operations Training Program
5	Non-Licensed Operator #2	Non-Licensed Operator	Operations Training Program
6	Radiation Protection Technician #1	Radiation Protection Technician	Radiation Protection Training Program

Table A-3 Plant Operations and Safe Shutdown Analysis for the Hostile Action Event

Line	Generic Title/Role	On-Shift Position	Task Analysis Controlling Method
1	Shift Manager/Control Room Supervisor	Shift Manager/Control Room Supervisor	Operations Training Program
2	Reactor Operator #1	Reactor Operator	Operations Training Program
3	Reactor Operator #2	Reactor Operator	Operations Training Program
4	Main Control Room Communicator Non-Licensed Operator #1	Non-Licensed Operator	Operations Training Program
5	Non-Licensed Operator #2	Non-Licensed Operator	Operations Training Program
6	Non-Licensed Operator #3	Non-Licensed Operator	Fire Brigade Training Program

Table A-4 Plant Operations and Safe Shutdown Analysis for the Aircraft Probable Threat Event

Line	Generic Title/Role	On-Shift Position	Task Analysis Controlling Method
1	Shift Manager/Control Room Supervisor	Shift Manager/Control Room Supervisor	Operations Training Program
2	Reactor Operator #1	Reactor Operator	Operations Training Program
3	Reactor Operator #2	Reactor Operator	Operations Training Program
4	Main Control Room Communicator Non-Licensed Operator #1	Non-Licensed Operator	Operations Training Program
5	Non-Licensed Operator #2	Non-Licensed Operator	Operations Training Program
6	Radiation Protection Technician #1	Radiation Protection Technician	Radiation Protection Training Program
7	Non-Licensed Operator #3	Non-Licensed Operator	Fire Brigade Training Program

Table A-5 Plant Operations and Safe Shutdown Analysis for the Control Room Fire Leading to Evacuation Event

Line	Generic Title/Role	On-Shift Position	Task Analysis Controlling Method
1	Shift Manager/Control Room Supervisor	Shift Manager/Control Room Supervisor	Operations Training Program
2	Reactor Operator #1	Reactor Operator	Operations Training Program
3	Reactor Operator #2	Reactor Operator	Operations Training Program
4	Main Control Room Communicator Non-Licensed Operator #1	Non-Licensed Operator	Operations Training Program
5	Non-Licensed Operator #2	Non-Licensed Operator	Operations Training Program
6	Non-Licensed Operator #3	Non-Licensed Operator	Fire Brigade Training Program

Table A-6 Plant Operations and Safe Shutdown Analysis for the ATWS Event

Line	Generic Title/Role	On-Shift Position	Task Analysis Controlling Method
1	Shift Manager/Control Room Supervisor	Shift Manager/Control Room Supervisor	RSPVT/Operations Training Program
2	Reactor Operator #1	Reactor Operator	RSPVT/Operations Training Program
3	Reactor Operator #2	Reactor Operator	RSPVT/Operations Training Program
4	Main Control Room Communicator Non-Licensed Operator #1	Non-Licensed Operator	Operations Training Program
5	Non-Licensed Operator #2	Non-Licensed Operator	Operations Training Program
6	Radiation Protection Technician #1	Radiation Protection Technician	Radiation Protection Training Program

Appendix B Firefighting Analysis Tables

Table B-1 Firefighting Analysis for the Decrease in Reactor Coolant Inventory Event

Line	Performed By	Task Analysis Control Method
N/A	N/A	N/A

Table B-2 Firefighting Analysis for the Radioactive Release from a Subsystem or Component Event

Line	Performed By	Task Analysis Control Method
N/A	N/A	N/A

Table B-3 Firefighting Analysis for the Hostile Action Event

Line	Performed By	Task Analysis Control Method
1	NLO #3	Fire Brigade Training Program

Table B-4 Firefighting Analysis for the Aircraft Probable Threat Event

Line	Performed By	Task Analysis Control Method
1	NLO #3	Fire Brigade Training Program

Table B-5 Firefighting Analysis for the Control Room Fire Leading to Evacuation Event

Line	Performed By	Task Analysis Control Method
1	NLO #3	Fire Brigade Training Program

Table B-6 Firefighting Analysis for ATWS Event

Line	Performed By	Task Analysis Control Method
N/A	N/A	N/A

Appendix C Radiation Protection Analysis Tables

Table C-1 RP Analysis for the Decrease in Reactor Coolant Inventory Event

Line	Personnel Performing Function/Task	Performance Time Period After Emergency Declaration (minutes)											
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-120	120-240
1	In-Plant Survey On-Shift Position: RPT #1	X	X	X									
2	On-Site Survey On-Shift Position: RPT #1				X	X	X	X	X	X	X	X	

Table C-2 RP Analysis for the Radioactive Release from a Subsystem or Component Event

Line	Personnel Performing Function/Task	Performance Time Period After Emergency Declaration (minutes)											
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-120	120-240
1	In-Plant Survey On-Shift Position: RPT #1	X	X	X									
2	On-Site Survey On-Shift Position: RPT #1				X	X	X	X	X	X	X	X	

Table C-3 RP Analysis for the Hostile Action Event

Line	Personnel Performing Function/Task	Performance Time Period After Emergency Declaration (minutes)											
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-120	120-240
1	In-Plant Survey On-Shift Position: RPT #1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	On-Site Survey On-Shift Position: RPT #1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table C-4 RP Analysis for the Aircraft Probable Threat Event

Line	Personnel Performing Function/Task	Performance Time Period After Emergency Declaration (minutes)											
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-120	120-240
1	In-Plant Survey On-Shift Position: RPT #1	X	X	X									
2	On-Site Survey On-Shift Position: RPT #1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table C-5 RP Analysis for the Control Room Fire Leading to Evacuation Event

Line	Personnel Performing Function/Task	Performance Time Period After Emergency Declaration (minutes)											
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-120	120-240
1	In-Plant Survey On-Shift Position: RPT #1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	On-Site Survey On-Shift Position: RPT #1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table C-6 RP Analysis for the ATWS Event

Line	Personnel Performing Function/Task	Performance Time Period After Emergency Declaration (minutes)											
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-120	120-240
1	In-Plant Survey On-Shift Position: RPT #1	X	X	X									
2	On-Site Survey On-Shift Position: RPT #1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Appendix D Emergency Plan Implementation Analysis Tables

Table D-1 Emergency Plan Implementation Analysis for the Decrease in Reactor Coolant Inventory Event

Line	Function/Task	On-Shift Position	Task Analysis Controlling Method
1	Declare the ECL	CRS/SM	RSPVT
2	Approve off-site PARs	N/A	N/A
3	Approve content of state/local notifications(1)	CRS/SM	Operations Training Program
4	Approve extension to allowable dose limits	CRS/SM	Operations Training Program
5	Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)	CRS/SM	Operations Training Program
6	ERO notification	CRS/SM	Operations Training Program
7	Abbreviated NRC notification for DBT event	N/A	N/A
8	Complete state/local notification form(1)	CRS/SM	Operations Training Program
9	Perform state/local notifications(1)	NLO #1	Operations Training Program
10	Complete NRC event notification form	CRS/SM	Operations Training Program
11	Activate ERDS	CRS/SM	Operations Training Program
12	Off-site radiological assessment	CRS/SM	Operations Training Program
13	Perform NRC notifications	NLO #1	Operations Training Program
14	Perform other site specific event notifications(1)	NLO #1	Operations Training Program
15	Personnel accountability	N/A	N/A
16	Other: specify	N/A	N/A

Notes:
(1) As required by site-specific emergency plan.

Table D-2 Emergency Plan Implementation Analysis for the Radioactive Release from a Subsystem or Component Event

Line	Function/Task	On-Shift Position	Task Analysis Controlling Method
1	Declare the ECL	CRS/SM	RSPVT
2	Approve off-site PARs	N/A	N/A
3	Approve content of state/local notifications(1)	CRS/SM	Operations Training Program
4	Approve extension to allowable dose limits	CRS/SM	Operations Training Program
5	Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)	CRS/SM	Operations Training Program
6	ERO notification	CRS/SM	Operations Training Program
7	Abbreviated NRC notification for DBT event	N/A	N/A
8	Complete state/local notification form(1)	CRS/SM	Operations Training Program
9	Perform state/local notifications(1)	NLO #1	Operations Training Program
10	Complete NRC event notification form	CRS/SM	Operations Training Program
11	Activate ERDS	CRS/SM	Operations Training Program
12	Off-site radiological assessment	CRS/SM	Operations Training Program
13	Perform NRC notifications	NLO #1	Operations Training Program
14	Perform other site specific event notifications(1)	NLO #1	Operations Training Program
15	Personnel accountability	CRS/SM	Operations Training Program
16	Other: specify	N/A	N/A

Notes:
(1) As required by the site-specific emergency plan.

Table D-3 Emergency Plan Implementation Analysis for the Hostile Action Event

Line	Function/Task	On-Shift Position	Task Analysis Controlling Method
1	Declare the ECL	CRS/SM	RSPVT
2	Approve off-site PARs	N/A	N/A
3	Approve content of state/local notifications(1)	CRS/SM	Operations Training Program
4	Approve extension to allowable dose limits	N/A	N/A
5	Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)	CRS/SM	Operations Training Program
6	ERO notification	CRS/SM	Operations Training Program
7	Abbreviated NRC notification for DBT event	CRS/SM	Operations Training Program
8	Complete state/local notification form(1)	CRS/SM	Operations Training Program
9	Perform state/local notifications(1)	CRS/SM	Operations Training Program
10	Complete NRC event notification form	CRS/SM	Operations Training Program
11	Activate ERDS	CRS/SM	Operations Training Program
12	Off-site radiological assessment	N/A	N/A
13	Perform NRC notifications	CRS/SM	Operations Training Program
14	Perform other site specific event notifications(1)	NLO #1	Operations Training Program
15	Personnel accountability	N/A(2)	N/A
16	Other: request off-site resources	Security	Security Training Program

Notes:

(1) As required by site-specific emergency plan.

(2) Personnel accountability is important in this event, but will not occur until after security has given the "all clear" signal for the hostile action event.

Table D-4 Emergency Plan Implementation Analysis for the Aircraft Probable Threat Event

Line	Function/Task	On-Shift Position	Task Analysis Controlling Method
1	Declare the ECL	CRS/SM	RSPVT
2	Approve off-site PARs	N/A	N/A
3	Approve content of state/local notifications(1)	CRS/SM	Operations Training Program
4	Approve extension to allowable dose limits	N/A	N/A
5	Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)	CRS/SM	Operations Training Program
6	ERO notification	CRS/SM	Operations Training Program
7	Abbreviated NRC notification for DBT event	N/A	N/A
8	Complete state/local notification form(1)	CRS/SM	Operations Training Program
9	Perform state/local notifications(1)	NLO #1	Operations Training Program
10	Complete NRC event notification form	CRS/SM	Operations Training Program
11	Activate ERDS	CRS/SM	Operations Training Program
12	Off-site radiological assessment	N/A	N/A
13	Perform NRC notifications	NLO #1	Operations Training Program
14	Perform other site specific event notifications(1)	NLO #1	Operations Training Program
15	Personnel accountability	N/A(2)	N/A
16	Other: request off-site resources	Security	Security Training Program

Notes:
(1) As required by site-specific emergency plan.
(2) If site evacuation ordered.

Table D-5 Emergency Plan Implementation Analysis for the Control Room Fire Leading to Evacuation Event

Line	Function/Task	On-Shift Position	Task Analysis Controlling Method
1	Declare the ECL	CRS/SM	RSPVT
2	Approve off-site PARs	N/A	N/A
3	Approve content of state/local notifications(1)	CRS/SM	Operations Training Program
4	Approve extension to allowable dose limits	N/A	N/A
5	Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)	CRS/SM	Operations Training Program
6	ERO notification	CRS/SM	Operations Training Program
7	Abbreviated NRC notification for DBT event	N/A	N/A
8	Complete state/local notification form(1)	CRS/SM	Operations Training Program
9	Perform state/local notifications(1)	NLO #1	Operations Training Program
10	Complete NRC event notification form	CRS/SM	Operations Training Program
11	Activate ERDS	N/A	N/A
12	Off-site radiological assessment	N/A	N/A
13	Perform NRC notifications	NLO #1	Operations Training Program
14	Perform other site specific event notifications(1)	NLO #1	Operations Training Program
15	Personnel accountability	CRS/SM	Operations Training Program
16	Other: request off-site resources	Security	Security Training Program

Notes:
(1) As required by site-specific emergency plan.

Table D-6 Emergency Plan Implementation Analysis for the ATWS Event

Line	Function/Task	On-Shift Position	Task Analysis Controlling Method
1	Declare the ECL	CRS/SM	RSPVT
2	Approve off-site PARs	N/A	N/A
3	Approve content of state/local notifications(1)	CRS/SM	Operations Training Program
4	Approve extension to allowable dose limits	CRS/SM	Operations Training Program
5	Notification and direction to on-site staff (e.g., to assemble, evacuate, etc.)	CRS/SM	Operations Training Program
6	ERO notification	CRS/SM	Operations Training Program
7	Abbreviated NRC notification for DBT event	N/A	N/A
8	Complete state/local notification form(1)	CRS/SM	Operations Training Program
9	Perform state/local notifications(1)	NLO #1	Operations Training Program
10	Complete NRC event notification form	CRS/SM	Operations Training Program
11	Activate ERDS	N/A	N/A
12	Off-site radiological assessment	N/A	N/A
13	Perform NRC notifications	NLO #1	Operations Training Program
14	Perform other site specific event notifications(1)	NLO #1	Operations Training Program
15	Personnel accountability	N/A	N/A
16	Other: specify	N/A	N/A

Notes:

(1) As required by site-specific emergency plan.