This interim staff guidance is the latest guidance that the NRC staff has publicly released to support interactions with the Advisory Committee on Reactor Safeguards (ACRS). This version is based on reviews by NRC staff and consideration of stakeholder input. The NRC staff expects to adopt further changes in the guidance.

This guidance has not been subject to complete NRC management or legal review, and its contents should not be interpreted as official agency positions. The NRC staff plans to continue working on the guidance provided in this document.

DRO-ISG-2023-02

Draft Interim Staff Guidance Augmenting NUREG-1791, "Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)," for Licensing Commercial Nuclear Plants under 10 CFR Part 53

September 2022

DRO-ISG-2023-02

Draft Interim Staff Guidance Augmenting NUREG-1791, "Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)," for Licensing Commercial Nuclear Plants under 10 CFR Part 53

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DRAFT INTERIM STAFF GUIDANCE AUGMENTING NUREG-1791, "GUIDANCE FOR ASSESSING EXEMPTION REQUESTS FROM THE NUCLEAR POWER PLANT LICENSED OPERATOR STAFFING REQUIREMENTS SPECIFIED IN 10 CFR 50.54(M)," FOR LICENSING COMMERCIAL NUCLEAR PLANTS UNDER 10 CFR PART 53

DRO-ISG-2023-02

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) staff is providing this interim staff guidance (ISG) to facilitate NRC staff review of staffing plans submitted under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 53, "Risk-Informed, Technology-Inclusive Regulatory Framework for Commercial Nuclear Plants." This ISG augments NUREG-1791, "Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)," Revision 0, July 2005, for the purpose of reviewing staffing plans described in Part 53.

This guidance provides a flexible review process and a set of systematic methods that the NRC staff can use to evaluate a wide range of staffing plans that may be submitted under Part 53. The NRC staff will review the staffing plans submitted for Part 53 applications and supporting analyses to determine whether the proposed minimum staffing levels will be sufficient to provide assurance that plant safety functions can be maintained across all modes of plant operations. Accordingly, this ISG enables the use of performance-based staffing requirements in Part 53, which allow, in part, an applicant to propose the minimum staffing that is required at its facility. Specifically, it allows the applicant to propose the minimum number, positions, and qualifications of licensed operators across all modes of operation in lieu of the NRC prescribing the number of licensed operators assigned to each unit during specific modes. The approach results in a staffing level that is appropriate for the facility's design, concept of operations, and workload levels for licensed operators.

It also includes review guidance for use of available engineering expertise in lieu of a dedicated Shift Technical Advisor.

BACKGROUND

On July 11, 1983, the NRC published a licensed operator staffing rule in the *Federal Register* (48 FR 31611) that required all licensees of nuclear power units to provide a minimum number of licensed operators and senior operators on shift at all times to respond to normal and emergency conditions (10 CFR 50.54(m)). This rule was created in the aftermath of the Three Mile Island (TMI) accident to ensure that operating nuclear power units were adequately staffed with licensed personnel. The control room staffing levels in 10 CFR 50.54(m) are the result of a number of studies and investigations conducted by the NRC, the industry, and other groups and the recommended changes in the numbers, qualifications, and organization of nuclear power plant personnel. Before the TMI accident, NRC regulations only required the presence of a

licensed senior operator at the facility or readily available on call during operation and an operator or senior operator present at the controls at all times during operation.

The control room staffing levels in 10 CFR 50.54(m) are based on the concept of operations for large light-water reactors (LLWRs) and could require too many or too few operators for a facility licensed under proposed part 53 depending on that facility's design, concept of operations, and workload levels for licensed operators. NUREG-1791 provides a process for systematically reviewing and assessing requests for exemptions from the licensed operator staffing requirements contained in 10 CFR 50.54(m) by licensees of nuclear power plants licensed under 10 CFR part 50 or part 52. The purpose of the NRC staff's review using NUREG-1791 is to ensure public health and safety by verifying that the applicant's staffing plan and supporting analyses sufficiently justify the requested exemption.

Under Frameworks A and B of Part 53, staffing plans must meet the requirements in 53.730(f) as opposed to 10 CFR 50.54(m). Section 53.730(f) provides a performance-based requirement that involves human factors engineering (HFE)-based analyses and assessments to determine a safe level of staffing. Consequently, NUREG-1791 provides an appropriate framework for the review of staffing plans submitted to meet proposed Part 53 staffing plan requirements because it provides a systemic method for reviewing a wide variety of proposals. To clarify how the methodology described in NUREG-1791 can be used to demonstrate compliance with 10 CFR 53.730(f), the staff developed this ISG to augment NUREG-1791 for the purpose of reviewing Part 53 staffing plans. The goal of such reviews is to ensure that design and operational characteristics for a commercial nuclear power plant licensed under Part 53 are appropriately considered in the review of proposed minimum staffing levels.

The goal of the Part 53 rulemaking effort is to develop the regulatory infrastructure to support the licensing of commercial nuclear plants. This proposed rulemaking would revise the NRC's regulations by adding a risk-informed, technology-inclusive regulatory framework in response to the requirements of the Nuclear Energy Innovation and Modernization Act (NEIMA; Public Law 115-439), as amended. The rule language for Part 53 is under development, and the guidance found in this document is subject to change based on the outcome of this rulemaking. Key documents related to the Part 53 rulemaking, including proposed rule language and stakeholder comments, can be found at Regulations.gov under Docket ID NRC-2019-0062.

RATIONALE

The current review guidance related to staffing requirements is specifically for requests for exemptions from the licensed operator staffing requirements contained in 10 CFR 50.54(m) by licensees of nuclear power plants licensed under 10 CFR part 50 or part 52, and may not fully (or efficiently) provide a technology-inclusive, risk-informed, and performance-based review approach for other reactor technologies or identify the information NRC staff should ensure is included in an application. The development of new guidance to support staff readiness to perform consistent and predictable licensing reviews of Part 53 commercial nuclear plants is warranted.

APPLICABILITY

The guidance in this ISG would be limited to the NRC staff review of staffing plans for commercial nuclear plants submitted under Part 53 that are subject to the provisions of proposed Sections 53.760 through 53.795 (i.e., plants with operators with specific operators' licenses to manipulate a control of a facility). Guidance for the review of staffing plans for facilities that meet the criteria for generally licensed reactor operators would not be within the scope of this ISG, though portions of this ISG (e.g., engineering expertise) may be adapted to review these staffing plans.

GUIDANCE

Organization of the Interim Staff Guidance:

This document presents guidance that augments the document NUREG-1791, "Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)," Revision 0, July 2005 for purposes of NRC staff review of staffing plans for commercial nuclear plants submitted under Part 53; all references to NUREG-1791 throughout this document refer to the stated 2005 edition. The ISG is presented in an order and format that aligns with NUREG-1791, adding or modifying each review section. It is meant to be used in conjunction with NUREG-1791; the ISG directs the reviewer when to refer to NUREG-1791 for review instructions or information and when to use instructions and information in the ISG.

Abstract, Forward and Executive Summary [To NUREG-1791]

The "Abstract," "Foreword," and "Executive Summary," sections of NUREG-1791 present background and general information that is applicable to all power reactor licensees or applicants for an operating license under 10 CFR Part 50 and 10 CFR Part 52. For Part 53 applications, the staff can use the information in these sections of the NUREG with the understanding that wherever the term "exemption request" appears it can be interpreted to mean "staffing plan submittal," as appropriate.

PART I
INTRODUCTION

1. OVERVIEW OF THE GUIDANCE DOCUMENT

1.1 Purpose and Scope

The following text replaces NUREG-1791 Section 1.1 in its entirety.

The purpose of this document is to provide the staff of the U.S. Nuclear Regulatory Commission (NRC) with a process for evaluating staffing plans submitted to meet the requirements specified in Section 53.730(f). This guidance provides a flexible review process and a set of systematic methods that the NRC staff can use to evaluate a wide range of staffing plans that may be submitted under Part 53. The NRC staff will review the staffing plans submitted for Part 53 applications and supporting analyses to determine whether the proposed minimum staffing levels will be sufficient to provide assurance that plant safety functions can be maintained across all modes of plant operations.

1.2 Background

The following text replaces NUREG-1791 Section 1.2 in its entirety.

The introduction of new reactor designs and the increased use of advanced automation in existing nuclear power plants will likely change the roles, responsibilities, composition, and size of the crews required to control plant operations. The design features and concepts of operations for new generations of reactors, as well as the introduction of new automated or digital systems into existing plants, may lead to changes to the roles and numbers of staff needed to safely operate the plant. For the purposes of this guidance document, the term, *concept of operations* (ConOps) defines the goals and expectations for the facility and establishes the high-level considerations to address as the detailed design evolves. An HFE-focused ConOps should address the following areas:

- facility missions (goals)
- agents' roles and responsibilities[1]
- staffing, qualifications, and training
- management of normal operations
- management of off-normal conditions and emergencies
- management of maintenance and modifications

NUREG-1791 was developed for the NRC to evaluate requests for exemptions from 10 CFR 50.54(m), which contains control room staffing requirements based upon the concept of

[1] The roles and responsibilities of operating personnel and automation (or any combination thereof) that are responsible for completing plant functions.

operations for LLWRs, for plants licensed under Parts 50 and 52. The guidance in this ISG augments the guidance in NUREG-1791 to provide the NRC staff with a similar methodology to evaluate staffing plans submitted under Part 53.

1.3 Impact of New Technologies on the Roles and Responsibilities of Licensed Personnel

This section of NUREG-1791 is applicable as written.

1.4 Limitations of the Current Regulatory Structure

This section can be used for reference as it provides background information about the prescriptive staffing requirements for LLWRs.

1.5 Implications for the Review of Exemption Requests [Staffing Plans]

This section of NUREG-1791 is used by substituting the term “exemption request” with the term “staffing plan.”

1.6 Applicability

This section of NUREG-1791 is not applicable to this ISG.

1.7 Organization of the Guidance

This section of NUREG-1791 is applicable as written.

2. OVERVIEW OF THE REVIEW PROCESS

The overview of the review process provided in NUREG-1791, including Figure 2, “The Exemption Request Review Process,” is applicable by substituting the term “exemption request” with the term “staffing plan.”

PART II
EVALUATION OF STAFFING PLAN SUBMITTAL

1. REVIEW THE STAFFING PLAN SUBMITTAL

1.1 Discussion

NUREG-1791 Section 1.1 is applicable by substituting the term “exemption request” with the term “staffing plan submittal.”

1.1.1 Scope of the Staffing Plan

The following text replaces NUREG-1791 Section 1.1.1 in its entirety.

The applicant’s staffing plan should include information about the following:

- composition of the minimum shift complement of personnel controlling the plant, including number of licensed and non-licensed operators and their positions and qualifications
- number of units controlled per control room or alternative location(s)
- number of units for which a licensed operator or senior operator is responsible[2]
- responsibilities of the staff controlling the plant, including any combination of responsibilities for operations, maintenance, radiological protection, chemistry, fire brigade, engineering, security, refueling, fuel handling, and emergency response
- the numbers, positions, and responsibilities of support personnel in areas of plant operations, equipment surveillance and maintenance, radiological protection, chemistry control, fire brigades, engineering, security, and emergency response
- definitions of operating modes and how operating mode affects the minimum shift complement
- a description of how units are controlled during operation including which operator positions are present at the controls
- a description of how the plant is monitored during operation to include portable monitoring devices that would allow responsible personnel to monitor plant parameters from either outside the control room or offsite

[2] Operators specifically licensed under Part 53, Sections 53.760 through 53.795, may also be referred to as “reactor operators” and “senior reactor operators.”

- details of how engineering expertise will be available to the on-shift operating personnel in accordance with Section 53.730(f)(1)

The applicant's staffing plan should address the following, if applicable:

- the definition of new operational functions not traditionally assigned to licensed operators at large, light-water reactors, and

- control of operations at multiple sites from one control room.

As part of the staffing plan submittal, the applicant should define any new terminology or operational concepts not addressed in Part 53. If the intent or basis for new terminology or operational concepts is not clear, the staff should request clarification from the applicant.

1.1.2 Information Completeness

This section of NUREG-1791 is applicable by substituting the term "exemption request" with the term "staffing plan."

1.2 Applicant Submittals

This section of NUREG-1791 is applicable by substituting the term "exemption request" with the term "staffing plan submittal" and deleting the following element from the list of what the applicant should submit with the staffing plan: "a description of the specific aspects of 10 CFR 50.54(m) from which an exemption is requested."

1.3 Review Criteria

The following text replaces NUREG-1791 Section 1.3 in its entirety.

The reviewer should ensure that each of the following criteria has been met:

- Confirm that exemptions from other related regulations are either unnecessary or have been appropriately identified and described by the applicant. If additional exemptions are required that have not been identified by the applicant, the applicant should be informed, and the reviewer should discuss the issue with their management and the project manager.

- Confirm that that the scope of the staffing plan includes information about the minimum shift complement of personnel controlling the plant, including number of licensed and non-licensed operators and their positions and qualifications and responsibilities, including how many units each operator controls or monitors.

- Confirm that the scope of the staffing plan includes information about how engineering expertise will be available to the on-shift operating personnel, including details of the position such as location, expected response time, access to plant status information and methods of communication.

- Confirm that the terms used in the submittal are fully defined.

- Confirm that adequate data and information have been submitted to meet the data requirements for the remainder of the review.

1.4 Additional Resources

The following text replaces NUREG-1791 Section 1.4 in its entirety.

The following regulations and guidance should be considered:

- Section 53.725(b), which provides definitions for automation, auxiliary operator, generally licensed reactor operator, controls, operator, and senior operator

- Section 53.730(f), which contains requirements for the staffing plan submitted by a Part 53 applicant or licensee

- Section 53.740(c), which states that, “except as provided under § 53.735, the facility licensee may not permit the manipulation of the controls of a commercial nuclear plant by anyone who is not an operator or senior operator or generally licensed reactor operator, as appropriate”

- Section 53.740(d), which states that, “Facility licensees subject to the requirements of §§ 53.760 through 53.795 and that have not yet certified the permanent cessation of operations and permanent removal of fuel from the reactor vessel as described under §§ 53.1070 or 53.4670, as applicable, must designate senior operators to be responsible for supervising the licensed activities of operators”

- Section 53.740(e), which states that, “Apparatus and mechanisms other than controls, the operation of which may affect the reactivity or power level of a reactor must be manipulated only while plant conditions are being monitored by an individual who is an operator or senior operator or a generally licensed reactor operator, as appropriate”

- Section 53.740(h), which states that, “facility licensees may take reasonable action that departs from a license condition or a technical specification (contained in a license issued under this part) in an emergency when this action is immediately needed to protect the public health and safety and no action consistent with license conditions and technical specifications that can provide adequate or equivalent protection is immediately apparent. Such facility licensee action shall be approved, as a minimum, by a senior operator or a generally licensed reactor operator, as applicable, or, after certifying the permanent cessation of operations and permanent removal of fuel from the reactor vessel as described under §§ 53.1070 or 53.4670, as applicable, by a certified fuel handler, senior operator, or generally licensed reactor operator, as applicable, prior to taking the action”

- Section 53.780(b), which provides the licensed operator and senior licensed operator examination requirements

- ”Policy Statement on Engineering Expertise on Shift,” published in the *Federal Register* (50 FR 43621) on October 28, 1985, which provides information about the use of a Shift Technical Advisor (STA) (An STA position is not required for Part 53 staffing plans; however, the policy statement provides information about engineering expertise on shift.)

- The Commission Policy statement titled, “Education for Senior Reactor Operators and Shift Supervisors at Nuclear Power Plants,” published in the *Federal Register* (54 FR 33639) on August 15, 1989, which provides information about the background of the engineering expertise requirement in Section 53.730(f)(1)

- NUREG-0800, “Standard Review Plan,” Sections 13.1.2 – 13.1.3, “Operating Organization,” which contains acceptance criteria for the review of staffing plans at LLWRs that the staff should consider when reviewing Part 53 staffing plans; the staff should consider how the following attributes of a staffing plan may or may not be necessary to ensure that plant safety functions can be maintained by the proposed staffing plan:

  - Acceptance Criterion C.1: a shift supervisor with a senior operator’s license, who is also a member of the station supervisory staff, be on site at all times when at least one unit is loaded with fuel

  - Acceptance Criterion C.2: an auxiliary operator (non-licensed) be assigned to the control room when a reactor is operating

  - Acceptance Criterion C.6: the assignment, stationing, and relief of operators and senior operators within the control room be as described in Regulatory Guide (RG) 1.114, “Guidance to Operators at the Controls and to Senior Operators in the Control Room of a Nuclear Power Unit”

  - Acceptance Criterion D: staffing plans to include total complements of licensed personnel of no less than that required by five shift rotations

- NUREG/CR-6838, “Technical Basis for Regulatory Guidance for Assessing Exemption Requestsfrom the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m),” which provides the technical basis for the guidance presented in NUREG-1791 and this ISG

2. REVIEW THE CONCEPT OF OPERATIONS

2.1 – 2.4

The review steps and criteria of NUREG-1791 Sections 2.1 – 2.4 are applicable by substituting the term “exemption request” with “staffing plan,” and adding the following items to the list in Section 2.2, “Applicant Submittals”:

- load-following operations
- refueling operations

If available at the time of this review, the staff should review the characterization of the facility performed by the HFE reviewer in accordance with Appendix A.2 of DRO-ISG-2023-03, "Development of Scalable Human Factors Engineering Review Plans." The characterization provides an overview of key considerations for the staff's review of HFE program elements including staffing and qualifications. Likewise, if the staffing plan review yields insights not in the characterization of the facility, the characterization may need to be revised.

Additionally, in Section 2.4, the current version of NUREG-0711, "Human Factors Engineering Program Review Model" and DRO-ISG-2023-03, "Development of Scalable Human Factors Engineering Review Plans," should be used as an additional resource.

3. REVIEW THE OPERATIONAL CONDITIONS

3.1 – 3.3

The review steps of NUREG-1791, Sections 3.1, 3.2, and 3.3 are applicable by substituting the terms "exemption," "exemption request," or "exemptions to 10 CFR 50.54(m)," with "staffing plan," or "staffing plan submittal" as it is related to a staffing plan submitted by an applicant under Section 53.730(f).

The applicant should analyze the full range of operational conditions that the personnel in the staffing plan will be expected to manage.

3.4 Additional Resources

The additional resources in NUREG-1791, Section 3.4 are applicable with the addition of the following:

- NUREG-0711: *Human Factors Engineering Program Review Model*, Section 11.4.1 Operational Conditions Sampling, (NRC, 2012) (in lieu of previous versions listed)

- NUREG-0800, *Standard Review Plan*, Chapter 18, Revision 3 (NRC, 2016), Attachment B, *Methodology to Assess the Workload of Challenging Operation Conditions*, Section 1, Identify Challenging Operational Conditions

4. REVIEW OPERATING EXPERIENCE

4.1 – 4.3

The review steps of NUREG-1791 Sections 4.1, 4.2, and 4.3 are applicable by substituting the term "exemption request," with "staffing plan." Replace the seventh bullet in Section 4.3, "Review Criteria," with –

- The applicant has identified the risk-important or safety significant human actions associated with existing plants, systems or relevant technologies that could potentially impact the staffing plan, if approved.

4.4 Additional Resources

The additional resources in NUREG-1791 Section 4.4 are applicable with the addition of the following:

- NUREG-0711: *Human Factors Engineering Program Review Model*, Section 3 Operating Experience Review, (NRC, 2012) (in lieu of previous versions listed)

5. REVIEW THE FUNCTIONAL REQUIREMENTS ANALYSIS AND FUNCTION ALLOCATION

5.1 – 5.4

The review steps, review criteria and additional resources of NUREG-1791 Sections 5.1 – 5.4 are applicable by substituting the term “exemption request,” with “staffing plan.” The reviewer should refer to the current revision of NUREG-0711 instead of the 2004 revision.

6. REVIEW THE TASK ANALYSIS

6.1 – 6.2

The review steps of NUREG-1791 Sections 6.1 – 6.2 are applicable by substituting the term “exemption request,” with “staffing plan.” In addition, reviewers can use the guidance in NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition – Human Factors Engineering (NUREG-0800, Chapter 18),” Revision 3, Attachment B, “Methodology to Assess the Workload of Challenging Operational Conditions in Support of Minimum Staffing Level Reviews,” (NRC, 2016) to assess high workload scenarios during the task analysis phase of HFE design. The results from this type of task analysis can be used to support the staffing and qualification analysis.

6.3 Review Criteria

The following replaces NUREG-1791 Section 6.3 in its entirety.

The reviewer should ensure that each of the following criteria has been met:

- The set of tasks identified as applicable to the staffing plan analysis is complete and appropriately characterized.

- The task performance requirements for key tasks were identified.

- The tasks for each licensed operator position have been identified and characterized.
- The data analyses were performed using appropriate parameters and methods.
- The assumptions and estimates used in conducting the analyses were documented and appropriate.

6.4 Additional Resources

The addition resources listed in NUREG-1791 Section 6.4 are applicable with the addition of Regulatory Information Letter 2020-07 *Cognitive Task Analysis Technical Basis and Guidance Development*. The reviewer should refer to the current revision of NUREG-0711 instead of the 2004 revision.

7. REVIEW THE JOB DEFINITIONS

7.1 Discussion

The following replaces NUREG-1791 Section 7.1 in its entirety:

The purpose of the job definition review is to confirm that the applicant has established clear and rational job definitions for the personnel who will be responsible for controlling the plant and maintaining plant safety functions. For an existing plant in which new systems and strategies will be implemented, the purpose of the review is to ensure that the applicant has retained clear and rational job definitions for control personnel. A *job* is defined as the group of tasks and functions that are assigned to a personnel position. A *job definition* specifies the responsibilities, authorities, knowledge, skills, and abilities that the applicant has determined are necessary to perform the tasks and functions assigned to a job.

The applicant should provide the job definition for each position in the staffing plan. For example, the applicant could describe the functions and tasks of the on-shift supervisor position, including their responsibilities for coordinating and overseeing the activities of reactor operators and executing the emergency plan.

A new job could be created that has no analogue in an existing plant or under the Part 53 regulations. As a hypothetical example, a specialist job could be created in which an individual is uniquely trained and qualified to troubleshoot the software that supports new systems or new human-system interfaces (HSIs), and to assume control if the systems fail and backups must be used.

A job may consist of conflicting interrelated responsibilities and authorities. A classic example of conflicting responsibilities would be a senior operator in a traditional control room, who is charged with maintaining an overview of operational conditions. Assigning responsibilities for operating the plant could compromise their ability to maintain “the big picture.” Conflicting responsibilities, in the past, have included responsibilities for taking control actions or

responding to information requests from personnel outside of the control room. The reviewer should ensure that the applicant's job definitions appropriately prioritize the responsibilities of each job and do not incorporate role conflicts that affect plant safety or the ability to prioritize maintaining plant safety functions.

An important aspect of the job definition review is to ensure that the qualifications necessary for each job are delineated. The qualifications consist of the knowledge, skills, and abilities/aptitudes (KSAs) an individual must possess to meet the performance criteria established for the tasks assigned to the job. The information derived from the function and task analyses should provide a basis for identifying the KSAs for each job.
The job definition review will be necessary for each job described in the staffing plan.

The Part 53 staffing requirement for engineering expertise replaces the traditional (10 CFR Part 50 and 10 CFR Part 52) STA job with a more flexible requirement for technical assistance to be available to the on-shift operating crew if they encounter a situation not covered by training or procedures. The original purpose of the STA, in the aftermath of the accident at TMI-2, was to improve the ability of the on-shift operating crew to recognize, diagnose, and effectively respond to plant transients and abnormal conditions. With an increased reliance on automation and passive safety features, the staff expects that reactors licensed under Part 53 will have very few, if any, risk-significant operator actions during plant transients and abnormal events. The purpose of this requirement is for a qualified person to provide on-shift operators technical support if a situation arises that is not covered through operator training or operating procedures.

The staff considered the function of the traditional STA role and Commission policies for education and engineering expertise on shift when creating this requirement, which offers flexibilities for providing engineering expertise on-shift. For example, the engineering expertise requirement could be met by personnel serving in a dual-role capacity as part of the on-shift operating crew as a senior operator, or, if applicable, as a generally licensed reactor operator, on the unit(s) to which they are assigned. This is similar to the dual STA/senior reactor operator model at operating LLWRs licensed under 10 CFR Part 50 or 10 CFR Part 52.

The Part 53 requirement for engineering expertise is aligned with Commission policy for, "Education for Senior Reactor Operators and Shift Supervisors at Nuclear Power Plants," (published in the Federal Register (54 FR 33639) on August 15, 1989) in which the Commission acknowledged the potential for situations to arise, which are not covered through training or operating procedures, and therefore there is a "need for some individuals on each nuclear power plant operating shift who have an innate understanding of the systems-level performance of a nuclear power plant" and "knowledge of scientific and engineering fundamentals and the basic scientific principles that govern the behavior of electrical, mechanical and other engineering systems." This kind of knowledge is acquired from an academic degree program in a technical discipline. Individuals with technical degrees can utilize their in-depth knowledge when called upon to assess the causes of a novel incident and determine the appropriate response.

Personnel fulfilling the engineering expertise requirement should maintain an appropriate level of awareness of plant status at an interval that allows them to provide accurate technical

assistance to the on-shift operating personnel. They should be aware of equipment out of service and major plant evolutions and either attend important shift turnovers and briefs or be able to access the relevant information that would be included in those activities. Personnel assigned to the job use engineering expertise and knowledge of the plant design and operation to provide an assessment of abnormal events and can advise the on-shift operators on courses of action to take to maintain plant safety functions. During an actual accident event, the engineer could support the operators until the emergency response organization is staffed and additional resources are available to assist with event response, mitigation, and recovery.

7.2 Applicant Submittals

The review steps of NUREG-1791 Section 7.2 are applicable by substituting the term "exemption request," with "staffing plan." The first bullet in the list of applicant submittals, for a description of the scope and impacts, does not apply to this type of staffing plan review and can be removed from the list of applicant submittals. Additionally, use the following instructions for reviewing the applicant's submittal for the job of fulfilling the engineering expertise requirement:

The applicant should submit a description of how engineering expertise will be available to the on-shift operating personnel during all plant conditions. The description should include the following details:

- education and experience prerequisites for personnel fulfilling the engineering expertise requirement
- scope of the training program for personnel fulfilling the engineering expertise requirement
- responsibilities for personnel fulfilling the engineering expertise requirement, including expectations for maintaining awareness of plant status
- location and expected response time of personnel fulfilling the engineering expertise requirement, including how the facility licensee plans to determine that the response time is adequate
- if personnel fulfilling the engineering expertise requirement will be responsible for more than one plant facility at a time, the number, location, and design of reactors (or plant facilities) assigned to personnel fulfilling the engineering expertise requirement
- primary and back-up communication method(s) between on-shift operating personnel and personnel fulfilling the engineering expertise requirement
- data and display(s) available to personnel fulfilling the engineering expertise requirement, including data refresh rate
- how reliability and integrity for the data and communications are maintained
- how tasks, data displays and communication methods for personnel fulfilling the engineering expertise requirement were or will be validated to be adequate to support these personnel in performance of their duties to be sufficient for their intended purpose (e.g., results from human factors validation tests that show the HSI is adequate).

7.3 Review Criteria

The following replaces NUREG-1791, Section 7.3 in its entirety.

The reviewer should be able to confirm that each of the following criteria has been met:

- Applicable data from the concept of operations, operational conditions, operating experience, functional requirements analysis and function allocation, and task analysis support the roles and responsibilities assigned to each job in the staffing plan.

- The KSA analysis is complete, and the KSAs are consistent with the qualifications required for each job identified in the staffing plan.

- Coherent job descriptions exist for each position included as a part of the staffing plan.

- The job definitions for control personnel who will work in crews are coordinated.

- The applicant's staffing plan adequately accounts for how engineering expertise will be available to the on-shift operating personnel during all plant conditions. Specifically, the reviewer should confirm the following:
  - Education and experience prerequisites for personnel fulfilling the engineering expertise requirement, at a minimum, meet the requirements of Section 53.730(f)(1)(i) – (iii).
  - To meet Section 53.830(c), the training and qualification program for personnel fulfilling the engineering expertise requirement must be derived from a systems approach to training as defined in Section 53.725(b). The initial training program for personnel fulfilling the engineering expertise requirement is derived from a systems approach to training and includes at a minimum –
    - general plant orientation
    - generic fundamentals (i.e., math, physics, thermodynamics, component design, reactor theory, and chemical theory topics that are of specific relevance to the operation of the specific nuclear power plant)
    - plant systems
    - conduct of operations
    - operating procedures and their bases
    - integrated plant operations
    - analysis of transient events and accidents
    - mitigating core damage
    - lessons learned from operating experience
  - Training course design should incorporate a simulation facility for training on conduct of operations, integrated plant operations, and event analysis, when the facility licensee must maintain a simulation facility.
  - The applicant has allocated responsibilities for personnel fulfilling the engineering expertise requirement that do not conflict with the command-and-control structure of the on-shift crew. Personnel fulfilling the engineering expertise requirement consult and advise control personnel on appropriate actions but do not direct actions or manipulate plant equipment unless they are also fulfilling a concurrent operational role that would separately authorize them to do so.

- Data, data refresh rate, and display(s) are adequate for personnel fulfilling the engineering expertise requirement.
- If located offsite, personnel fulfilling the engineering expertise requirement have access to the same suite of displays or a similar set of data that is available to the on-shift crew; they can respond to requests for assistance in timely manner, not to exceed 10 minutes.
- If located on-site, personnel fulfilling the engineer expertise requirement can arrive within 10 minutes to the location of the on-shift crew to provide technical assistance.
- Multiple people may be assigned to provide engineering expertise to a given facility at the same time as long as the other criteria are met.
- If one person is assigned to provide engineering expertise to multiple facilities at the same time, the facilities are of the same or similar design type, and the engineer is capable of identifying and assessing any relevant differences between sites. The applicant has performed an analysis of workload and situational awareness for this organizational structure with adequate results. The applicant should consider any impact to response time and effectiveness when assigning one person to provide engineering expertise to multiple facilities in different geographic regions.
- There is a reliable primary communication and a back-up communication method(s) between on-shift crew and personnel fulfilling the engineering expertise requirement. The primary and back-up communications methods are sufficiently diverse to reduce the likelihood of being rendered unavailable simultaneously by the same event.
- Appropriate controls will be maintained to ensure the integrity of the data and communications.
- Tasks, data displays, and communication methods for personnel fulfilling the engineering expertise requirement were, or will be, validated

7.4 Additional Resources

The following list of resources replaces NUREG-1791 Section 7.4 in its entirety.

- *Code of Federal Regulations, Title 10, "Energy,"* Section 53.830, "Training and Qualification of Commercial Nuclear Plant Personnel," which requires, in part, that the training program for personnel fulfilling the engineering expertise requirement is derived from a systems approach to training as defined in Section 53.725

- NUREG-0711: *Human Factors Engineering Program Review Model*, Section 6 Staffing and Qualifications, and Section 10 Training Program Development (NRC, 2012)

- NUREG-1122: *Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors*, (NRC, 2020)

- NUREG-1123: *Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Boiling Water Reactors*, (NRC, 2020)

- DRO-ISG-2023-01, *Operator Licensing Programs*

- RG 1.149: *Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations*, (NRC, 1996)

- RG 1.8: *Qualification and Training of Personnel for Nuclear Power Plants*, (NRC, 2000)

- RG 1.114: *Guidance to Operators and to Senior Operators in the Control Room of a Nuclear Power Plant*, (NRC, 1989)

- SECY 21-0039, *Elimination of the STA for the NuScale Design*

8. REVIEW THE STAFFING PLAN

8.1 Discussion

NUREG-1791 Section 8.1 is applicable by substituting the term “exemption request” with the term “staffing plan.”

8.2 Applicant Submittals

The following replaces Section 8.2 in its entirety.

The staffing plan submitted should include the following elements:

- the set of operational conditions considered for the staffing plan

- the proposed staffing levels, shift composition, and shift schedules for the identified operational conditions

- a description of integrated staff roles across shifts and operational conditions and how they support the staffing plan level

- identification of the types of substitutions allowed within each position, given the concept of operations (for example, a licensed senior operator who is qualified to do so may stand-in as the person fulfilling the engineering expertise requirement.)

- expected travel time or response times for control personnel who need to move to new locations (e.g., home to the plant or office) or provide other support (e.g., to log in to system control computers from home or a different corporate location), when applicable

- a description of how the staffing plan relates to the larger plant staffing and the support roles that control personnel may play in the larger staffing context

- a description of any allowances for temporary deviations from the proposed minimum staffing levels

- a description of the position(s) and qualifications of individuals who are assigned responsibility for overall plant operation at all times there is fuel in any unit

- a description of how key plant parameters are monitored and how the reactor is controlled during operation

- a description of how plant safety functions are monitored

- a description of how Section 53.740(g)(1) is met
- a description of how engineering expertise will be available to the on-shift operating personnel during all plant conditions

- a description of any additional roles and responsibilities that control personnel have while on-shift

- applicable supporting data from the concept of operations, the set of operational conditions considered, the functional requirements analysis and function allocation, task analysis, job definitions, and the operating experience review

8.3 Review Criteria

The following replaces Section 8.3 in its entirety.

The review should be able to ensure that each of the following criteria has been met:

- The set of operational conditions identified as applicable to the staffing plan is complete and representative of the staffing plan for the design that exists at the time of staffing plan validation.

- The staffing plan will provide an adequate number of qualified personnel to operate the plant safely and maintain plant safety functions under the operational conditions considered.

- Roles and responsibilities are integrated across shifts and among personnel.

- Travel and response times are adequate for maintaining the safety of the plant.

- The staffing plan uses data from previous sections in a logical/rational manner.

- The staffing plan adequately accounts for how engineering expertise will be available to the on-shift operating personnel during all plant conditions.

8.4 Additional Resources

The resources in Section 8.4 are applicable.

9. REVIEW OF ADDITIONAL DATA AND ANALYSES

The information in NUREG-1791 Section 9 is applicable by substituting the term “exemption request,” with “staffing plan.”

10. REVIEW THE STAFFING PLAN VALIDATION

10.1 – 10.4

The review steps, review criteria and additional resources of NUREG-1791, Sections 10.1 – 10.4, are applicable by substituting the term “exemption request,” with “staffing plan,” and the reviewer should refer to the current revision of NUREG-0711 instead of the 2004 revision. The following additional resources should be considered:

- DRO-ISG-2023-03, “Development of Scalable Human Factors Engineering Review Plans,” should be considered as a resource for alternative validation methods and review criteria.

- NUREG-0800, *Standard Review Plan*, Chapter 18, Revision 3 (NRC, 2016), Attachment B, *Methodology to Assess the Workload of Challenging Operation Conditions*, Section 1, Identify Challenging Operational Conditions.

11. DETERMINE THE ACCEPTABILITY OF THE STAFFING PLAN

The following replaces NUREG-1791, Section 11 in its entirety.

In this step, the NRC staff must make a final decision regarding the acceptability of the staffing plan. The decision will be based on the aggregate findings from the previous steps of the review. The reviewer should be able to satisfactorily answer the following questions regarding the acceptability of the staffing plan:

- Was sufficient justification provided that the following components support the acceptability of the staffing plan:
  - concept of operations
  - operational conditions
  - operating experience
  - functional requirements analyses and function allocation (or reallocation)
  - task analyses
  - job definitions
  - staffing plan
  - additional supporting data and analyses
  - verification and validation of the staffing plan

- Were the range and combination of operational conditions considered by the applicant appropriate and adequate?

- Were the data analyses performed using appropriate parameters and methods?

- Were the assumptions and estimates used in conducting the analyses documented and appropriate?

- Will acceptance of the staffing plan provide reasonable assurance that plant safety functions can be maintained?

- Are minimum staffing requirements implemented through sufficient administrative controls (e.g., Technical Specifications, the Design Certification, or a change control process)?

- Are there any exemptions (pending or approved) from the regulations in Part 53 that may affect the acceptability of the staffing plan?

The reviewer should prepare a summary of the overall findings along with the determination of the acceptability of the staffing plan. If the reviewer determines that there is insufficient evidence to support the staffing plan, the reviewer should identify the limitations of the submittals and the further analyses, data, or changes in the staffing plan that are needed.

APPENDIX A REVIEW CHECKLISTS

Appendix A of NUREG-1791 does not apply to the review of Part 53 staffing plans; it may be augmented in the future to support the review of Part 53 staffing plans.

APPENDIX B GLOSSARY

Appendix B of NUREG-1791 is replaced with the following proposed list of terms and definitions for use in a Part 53 staffing plan review using this ISG. This appendix will be updated as key terms needing definition are identified or revised as the staff works to produce the preliminary proposed rule language and delivers the proposed rule to the Commission and develops and finalizes related guidance.

Algorithm - A step-by-step procedure for solving a problem or accomplishing some task through a process, especially by a computer.

Automation - A device or system that accomplishes (partially or fully) a function or task.

Auxiliary operator - Staff of a commercial nuclear plant [or facility] who operate plant components but are not required to be licensed under the provisions of Part 53.

Cognitive workload - The degree to which a person's mental capabilities are taxed during the performance of the tasks that comprise their job.

Computer-supported cooperative network - The use of computers and electronic devices as a medium through which to communicate in real time

Concept of operations - A description of the goals and expectations for the facility that establishes the high-level considerations to address as the detail design evolves.

Controls – When used with respect to a nuclear reactor, apparatus and mechanisms, the manipulation of which directly affects the reactivity or power level of the reactor.

Control personnel - Individuals licensed to manipulate controls that affect the reactivity or power level of a nuclear reactor, manipulate fuel, and/or direct the activities of individuals so licensed or non-licensed.

Exemption application - A request for licensing that asks for an exemption from any of the requirements of Part 53.

Function - A process or activity that is required to achieve a desired goal.

Function allocation - The analysis of the requirements for plant control and the assignment of control functions to personnel or system elements or a combination of personnel or system elements.

Functional requirements analysis - The identification of functions that must be performed to prevent or mitigate the consequences of postulated accidents that could damage the plant or cause undue risk to the health and safety of the public.

Human reliability analysis - The process of evaluating the potential for and mechanisms of human error that may affect plant safety.

Human-system interface - The part of a system through which personnel interact to perform their functions and tasks. In this document, “system” refers to a nuclear power plant. Major HSIs include alarms, information displays, controls, and job performance aids.

Intelligent agent - Any computer system that interacts with a human to assist in cognitive processing functions or, in some cases, initiate purposeful action as a result of predictions related to the user’s goal (i.e., computer-supported decision-making)

Integrated system validation - An evaluation using performance-based tests to determine whether an integrated system design (i.e., hardware, software, and personnel elements) meets performance requirements and acceptably supports safe operation of the plant.

Job - A group of tasks that are assigned to a personnel position.

Job definition - The responsibilities, authorities, knowledge, skills, and abilities that are necessary to perform the tasks and functions assigned to a job.

Light-water reactor - A term used to describe reactors that uses water that does not include deuterium as its coolant and neutron moderator.

Licensed operator – An individual licensed by the NRC as an operator or senior operator for a commercial nuclear plant licensed under Part 53.

Load following - A nuclear power plant automatically changing its generation of electricity to match expected electrical demand in response to externally originated instructions or signals.

Model - A representation of how a complex entity or system is structured and functions.

Operator - An individual licensed under the provisions of Sections 53.760 through 53.795 to manipulate controls of a commercial nuclear plant.

Operating experience review - A review of relevant history from a plant’s ongoing collection, analysis, and documentation of operating experiences; including relevant experience from other plants and/or other industries.

Passive safety feature - Design characteristics that use natural forces, such as convection and gravity, which are less dependent on active systems and components like pumps and valves to maintain plant safety.

Performance shaping factors - Factors that influence human reliability through their effects on performance, including environmental conditions, HSI design, procedures, training, and supervision.

Performance testing - Testing conducted to verify a simulation facility's performance as compared to actual or predicted reference plant performance.

Procedures - Written instructions providing guidance to plant personnel for operating and maintaining the plant and for handling disturbances and emergency conditions.

Reference plant - The specific nuclear power plant on which a simulation facility's configuration, system control arrangement, and design data are based. The reference plant may or may not be actually constructed.

Request for exemption - An analogous term to exemption application (above).

Senior operator - An individual licensed under the provisions of Sections 53.760 through 53.795 to manipulate controls of a commercial nuclear plant and to direct the licensed activities of operators.

Shift composition - The different types of jobs that must be filled on each shift and the number of personnel necessary for each of the jobs on a shift.

Simulator [or simulation facility] - An interface designed to provide a realistic imitation of the operation of a facility, used for either the conduct of examinations for operator licensing or operator certification, training, or to establish on-the-job training and experience prerequisites for operator licensing or operator certification eligibility.

Systems approach to training - a training program that includes the following five elements:
(1) Systematic analysis of the jobs to be performed.
(2) Learning objectives derived from the analysis which describe desired performance after training.
(3) Training design and implementation based on the learning objectives.
(4) Evaluation of trainee mastery of the objectives during training.
(5) Evaluation and revision of the training based on the performance of trained personnel in the job setting.

Situation/situational awareness - An individual’s mental model of what has happened, the current status of the system, and what will happen in the next brief time period.

Task - A group of related activities that have a common objective or goal.

Task analysis - The identification of requirements for accomplishing tasks (i.e., for specifying the requirements for the displays, data process, controls, and job aids needed to accomplish tasks.)

Validation - The set of activities to ensure that a system can accomplish its intended use,

goals, and objectives in the particular operational environment. (See also “Integrated system validation”).

Verification - The process by which the design is evaluated to determine whether it acceptably satisfies personnel task needs and HFE design guidance.

Workload - The physical and cognitive demands placed on plant personnel.

APPENDIX C REFERENCES

Appendix C of NUREG-1791 will be replaced with a list of references applicable to the ISG. This appendix will be provided when the draft ISG is finalized.

IMPLEMENTATION

The NRC staff will use this ISG to support the review of staffing plans submitted under Section 53.730(f). The NRC intends to incorporate feedback obtained during the public comment period for the 10 CFR Part 53 proposed rule and associated guidance into a final version of this ISG, which would be issued along with the issuance of the final rule for 10 CFR Part 53.

BACKFITTING AND ISSUE FINALITY DISCUSSION

DRO-ISG-2023-02, if finalized, would not constitute backfitting as defined under proposed 10 CFR 53.1590 or 53.6090, “Backfitting,” and as described in MD 8.4; constitute forward fitting as that term is defined and described in MD 8.4; or affect the issue finality of any approval issued under proposed 10 CFR part 53, “Risk-Informed, Technology-Inclusive Regulatory Frameworks for Commercial Nuclear Plants.” The guidance would not apply to any current licensees or applicants or existing or requested approvals under proposed 10 CFR Part 53, and therefore its issuance cannot be a backfit or forward fit or affect issue finality. Further, applicants and licensees would not be required to comply with the positions set forth in this ISG

CONGRESSIONAL REVIEW ACT

Discussion to be provided in the final ISG.

FINAL RESOLUTION

The NRC staff will transition the information and guidance in this ISG into the RG or NUREG series, as appropriate. Following the transition of all pertinent information and guidance in this document into the RG or NUREG series, or other appropriate guidance, this ISG will be closed.

ACRONYMS

ADAMS	Agencywide Documents Access and Management System
CFR	*Code of Federal Regulations*
ConOps	concept of operations
HFE	human factors engineering
HSI	human system interface
ISG	interim staff guidance
KSA	knowledge, skills, and abilities/aptitudes
LLWR	large light-water reactor
LWR	light-water reactor
NEIMA	Nuclear Energy Innovation and Modernization Act
NRC	U.S. Nuclear Regulatory Commission
NUREG	U.S. Nuclear Regulatory Commission technical report designation
NUREG/CR	contractor-prepared NUREG
RG	regulatory guide
SECY	Office of the Secretary
SRP	standard review plan
STA	shift technical advisor
TMI	Three Mile Island
U.S.C.	United States Code