U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Advisory Committee on Reactor Safeguards (ACRS)
Full Committee

10 CFR Part 53 Subpart F
Staffing, Personnel Qualifications, Training, and Human Factors

February 2, 2022

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Agenda

3:45pm – 3:55pm	Opening Remarks & Staff Introductions
3:55pm – 5:00pm	Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors
5:00pm – 5:15pm	Discussion

Welcome / Introductions

- **Welcome:**
  - Lauren Nist, Office of Nuclear Reactor Regulation (NRR)

- **Presenters:**
  - Jesse Seymour, NRR
  - Maurin Scheetz, NRR
  - Theresa Buchanan, NRR

- **Public Meeting Slides**:
  - ADAMS Accession No. ML22027A369

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Overview of Primary Staff Contributors (NRR & Office of Nuclear Regulatory Research)

- Theresa Buchanan, Senior Reactor Engineer (Examiner)
- Dr. David Desaulniers, Senior Technical Advisor for Human Factors and Human Performance Evaluation
- Dr. Brian Green, Human Factors Team Leader
- Dr. Niav Hughes Green, Human Factors Psychologist
- Dr. Stephanie Morrow, Human Factors Psychologist
- Lauren Nist, Branch Chief, Operator Licensing and Human Factors Branch
- Maurin Scheetz, Reactor Engineer (Examiner)
- Jesse Seymour, Reactor Operations Engineer (Human Factors)

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Presentation Topics

- Overview of Preliminary Rule Language
- Key Operations Staffing Considerations
  - Staffing Plans
  - Shift Technical Advisor
  - Certified Operators
- Simulator Considerations
- Regulatory Guidance Documents
- Questions

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Overview of §§ 53.750-789 Structure and Key Content

- §§ 53.750-759: General Requirements
  - § 53.753: Technical Requirements for operating license (OL) and combined license (COL) Applicants
    - Human Factors Engineering (HFE) design requirements
    - Human-System Interface (HSI) design requirements
    - Concept of Operations, Functional Requirements Analysis, and Function Allocation requirements
    - Staffing Plan requirements
    - Licensed & Certified Operator program requirements
  - § 53.755: Conditions of Licenses for OL and COL Holders
    - Provisions for not using licensed operators and criteria
    - Provisions for load-following
- §§ 53.760-769: Operator Licensing Requirements
  - Training, examination, requalification, and simulator requirements
- §§ 53.770-779: Operator Certification Requirements
- §§ 53.780-789: General Training and Qualification Requirements.

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

§§ 53.750-759: Staffing, Training, Qualifications, and Human Factors

- Fulfills role similar to aspects of § 50.34(f) post-Three Mile Island (TMI) requirements, § 50.54 conditions of facility licenses, and Part 55 operator licensing requirements
- Key areas now linked to design safety functions and their fulfillment:
  - HFE now required where needed to support safety function fulfillment
  - Operator staffing now required to the extent needed to support safety function fulfilment, versus reliance on prescribed numbers of operators
  - Licensed operator role centered on fulfilling/managing safety functions
- Includes criteria for when licensed operator staffing would not be required
  - 1st proposal - no mitigative actions by operators needed to meet safety criteria, safety functions, or provide defense in depth (as supported by probabilistic risk assessment) and structures, systems, and components performance needed for licensing basis event (LBE) response not reliant on humans
  - 2nd proposal - Design-basis accident safety criteria met without mitigative actions by operators, active engineered features, or passive design features (except those able to survive LBEs and resist credible human errors).

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

§§ 53.760 through 53.789 - Overview of Key Aspects

- §§ 53.760-769, Operator Licensing Requirements
  - Requires training programs to be based on systems approach to training (SAT) and ensure licensed operators possess the knowledge/abilities needed to protect public health and maintain plant safety functions
  - Incorporates facility-developed and NRC-approved examination programs that are tailored to the design specific operator roles
- §§ 53.770-779, Operator Certification Requirements
  - Requires training programs to be based on SAT and ensure non-licensed, certified operators possess the knowledge and abilities needed to protect public health and perform job duties
  - Uses facility-developed/NRC-approved, tailored exam programs
- §§ 53.780-789, General Training & Qualification Requirements
  - Builds upon the § 50.120, “Training Rule,” but adjusts timeframe for program establishment and updates personnel categories

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Part 53 Staffing Approach

- Accommodate novel concepts of operations and diverse technologies
- Prescriptive staffing ratios (like those for large light water reactors) may not be needed/appropriate to support safe operation
- Consider differences in staffing needs when:
  - Operators have a safety role
  - Operators do not have a safety role
- Conduct of Operations, Functional Requirements Analysis and Function allocation as input to staffing plan review
- Staff experience from recent review of NuScale small modular reactor staffing plans

Part 53 Staffing Plan Requirements

- Describe numbers, positions, and qualifications of reactor operators (RO) and senior reactor operators (SRO) (or certified operators) across all modes
- Describe personnel in other support roles (e.g., operations, maintenance, radiological protection, chemistry, fire brigades, engineering, security, and emergency response)
- Facilities with licensed operators: describe how the proposed staffing level is sufficient to provide assurance that plant safety functions can be maintained (must provide support via HFE-analyses and assessments)

Shift Technical Advisor (STA) Position in Part 53

- Prior concerns raised by the ACRS subcommittee have included:
  - Reservation about blanket STA elimination under rule
  - Value of having an independent individual for event assessment
  - Desirability of maintaining engineering expertise available
  - Relevance of role in light of uncertainties with new designs
- Considering three different options as part of staffing plan requirements:
  1. No requirement for STA
  2. STA required with provision for omitting STA with justification
  3. Requirement for engineering expertise that is independent from and readily available to the on-shift operators (for certified and licensed operators)

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Certified Operators – Background

The staff proposed the option of non-licensed, certified operators for facilities meeting specific requirements as an alternative to SROs & ROs

- Certified operator would be responsible for important administrative functions that would otherwise be performed by SROs
- Certified operator staffing would need to provide a continuity of responsibility for facility operations during the operating phase, including monitoring of fueled units with the following capabilities:
  - Receiving plant operating data and parameters
  - Ability to immediately initiate a reactor shutdown
  - Ability to promptly dispatch ops/maintenance personnel
  - The ability to implement any emergency plan responsibilities
  - Conducting reactivity manipulations that require human action

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Reasoning Behind the Certified Operator Alternative

- If a facility lacks an operator role in safety (e.g., an autonomous reactor design), then a key driver warranting federal licensing of individuals is removed (i.e., operator performance would not have a meaningful influence on public health and safety outcomes within that context)
  - Regardless of whether the operators were licensed, the facility itself would still be licensed by the NRC
- Important administrative job tasks that would remain still need to be accomplished by adequately qualified personnel.
  - Precedent shows that similar administrative tasks have been fulfilled by non-licensed personnel, such as Certified Fuel Handlers
- Durable rule should account for future safety advancements

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Certified Operators versus Licensed Operators Considerations

- Prior concerns raised by the ACRS subcommittee have included:
  - Differences in accountability compared to licensed operators
  - Lessened ability to resist coercion by inappropriate management
  - Redundancy to scalable operator licensing provisions
  - Lack of certification by an independent entity (i.e., the NRC)
- At present, the staff perspective remains that the certified operator alternative is appropriate based upon the following considerations:
  - The framework should be able to efficiently account for staffing requirements when there is no significant human role in safety
  - Precedent for using non-licensed personnel in comparable roles
  - Designers have indicated that they may be able to meet criteria and have expressed potential demand for such an alternative
  - Ability to administratively assign responsibilities to management
  - Effects of a potential STA or engineering expertise requirement
  - Regulatory approval and oversight of certification programs

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Simulator Scope – Background

- Part 53 preliminary establishes simulation facility requirements for plants with licensed operators, along with less stringent simulation facility requirements for plants with certified operators; some key aspects include the following:
  - Full-scope simulators are not mandated; partial scope simulators may be acceptable, provided that the scope is adequate to meet intended usage; alternatives to simulators are possible as well
  - Simulation facilities for plants with licensed operators must be approved by the Commission if the facility licensee will rely upon them for training, experience requirements, or for initial or requalification examinations
    - Equivalent approval not required for certified operator facilities
  - Must demonstrate that adequate simulator scope is provided to support HFE analyses/assessments in order to use a simulation facility for conducting these analyses/assessments

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Simulator Scope

- In developing preliminary rule language, staff reviewed Section 306 of the Nuclear Waste Policy Act (NWPA) and 52 FR 9453 which discussed implementation of the Act's simulator-related provisions:
  - Flexibilities historically provided to allow for potential use of the plant itself, and/or a plant-referenced simulator, and/or some other type of simulation device (such as a part-task or basic-principles simulator) for the conduct of the simulator portion of the operating test
  - The NRC's stated intent was not to permit the initiation of transients on the plant itself if used as a simulation facility; rather, the use of the plant was envisioned as an option that might be used in conjunction with another simulation device or devices, in lieu of a plant-referenced simulator
- Current perspective is that NWPA does not mandate NRC to require that plants have *simulators,* but instead requires regulations address the use of *simulations* in training; flexibility exists to allow the use of the actual plant to "simulate" tasks for training and operating test purposes without having a separate simulator
- Prior concerns raised by the ACRS subcommittee have included the potential for reductions in training and evaluative efficacy, impacts on procedure quality, reduced support of analyses, and staff experience in the approval of partial scope simulators

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Simulator Scope (cont'd)

- Philosophical basis behind preliminary rule language is:
  - Plant-referenced, full-scope simulators remain the preferred approach and would represent the best route for meeting Part 53 requirements
    - Staff expect majority of Part 53 applicants will have them due to regulatory certainty and technology lowering the associated costs
  - Existing regulations do not strictly mandate plant-referenced, full-scope simulators either, but still adopted by all current power reactors
  - Part 53 rule language leaves alternatives to simulator usage (full-scope or otherwise), but the burden will be on the applicant to demonstrate how the following are supported:
    - Licensed or certified operator training and exams; simulators used require sufficient scope and fidelity for operators to acquire and demonstrate knowledge and abilities needed for job duties.
    - Experience requirements (i.e., reactivity manipulations)
    - HFE analyses/assessments and HSI design testbed needs
  - Additional staff review guidance may be needed, such as to support reviews of partial scope simulation facilities

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Subpart F – Staffing, Personnel Qualifications, Training, and Human Factors Requirements

Regulatory Guidance Development Overview

- HFE Review Guidance
  - Supports scalable reviews, developed with Brookhaven National Laboratory support, goal is draft by June
- Staffing Plan Review Guidance
  - Facilitates review of staffing plans using NUREG-1791, goal is draft by June
- Operator Licensing Examination Review Guidance
  - Supports review of tailored programs, developed with Idaho National Laboratory, goal is draft by June
- SAT-based Training Program Review Guidance
  - Supports the review of non-accredited training programs; developed by staff
  - Updates the existing, dated SAT review guidance of NUREG-1220 & IP 41500
  - Current development goal is 1 year to support near-term applicants as needed
  - Team includes HQ and regional operator licensing staff (inc. former instructors)
- Advanced Reactor Content of Application Project, ISG Chapter 11, “Organization and Human-System Considerations,” as supplemented with guidance for Part 53
  - Will support other review areas beyond those covered above or by existing guidance (e.g., load following, post-TMI items, simulation facilities, etc.)

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Final Discussion and Questions

Acronyms and Abbreviations

ACRS	Advisory Committee for Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
COL	Combined license
FR	*Federal Register*
HFE	Human factors engineering
HSI	Human-system interface
ISG	Interim staff guidance
IP	Inspection procedure
LBE	Licensing basis event

NRR	Office of Nuclear Reactor Regulation
NUREG	U.S. NRC technical report designation
NWPA	Nuclear Waste Policy Act
OL	Operating license
RO	Reactor operator
SAT	Systems approach to training
SRO	Senior reactor operator
STA	Shift technical advisor
TMI	Three Mile Island