

2022 Power Plant Simulator Conference

NRC Update

Presented by Jesse Seymour
Reactor Operations Engineer
(Human Factors)
Operator Licensing and Human Factors
Branch

January 12, 2022

Simulator Regulation: Past, Present, and Future



Disclaimer: the contents of this presentation do not necessarily indicate the Nuclear Regulatory Commission's views.

Agenda

- Origins of existing simulator-related requirements
- General structure of existing requirements and associated guidance
- Considerations for future simulator requirements under the preliminary, proposed 10 CFR Part 53 rulemaking
- Questions

Statutory Basis

Nuclear Waste Policy Act of 1982, as amended (NWPA), Section 306 states, in part, the following:

The Nuclear Regulatory Commission is authorized and directed to promulgate regulations, or other appropriate Commission regulatory guidance, for the training and qualifications of civilian nuclear power plant operators, supervisors, technicians and other appropriate operating personnel. Such regulations or guidance shall establish simulator training requirements for applicants for civilian nuclear powerplant operator licenses and for operator requalification programs... [and] requirements for operating tests at civilian nuclear powerplant simulators...

Regulatory Background

- The NRC first established simulator requirements in 1987; at that time, the NRC's considerations included the following:
 - The NRC identified a need to clarify how simulators should be used, as well as to reflect upgraded training requirements following the accident at Three Mile Island
 - A requirement for having a “simulation facility” was established
 - Initially these simulation facility requirements were located with the operating test requirements of 10 CFR 55.45; they were later relocated to 10 CFR 55.46

Current Regulations and Guidance

- 10 CFR 50.34(f)(2)(i) – requires a simulator that models the control room and has small-break loss of coolant accident simulation capability for construction permit applicants
- 10 CFR 55.46 - addresses use of simulation facilities for administering operating tests and plant-referenced simulators for meeting operator license applicant experience requirements
- RG 1.149, “Nuclear Power Plant Simulation Facilities for Use In Operator Training, License Examinations, and Applicant Experience Requirements”; Rev. 4 of this Regulatory Guide provides endorsement of ANSI/ANS-3.5-2009
- ANSI/ANS-3.5, “Nuclear Power Plant Simulators for Use in Operator Training and Examination”

Other Considerations

- While the existing operator licensing examination process for power reactors requires a simulator to support both dynamic simulator scenarios and a subset of the job performance measures, the non-power (i.e., research and test) reactor operator licensing examination process does not require a simulator for the operating test.
- Beyond operator training and licensing, simulators are also relied upon for facility licensing actions, such as performance-based testing to support human factors engineering analyses, staffing validations, and overall adequacy of a new (or modified) design.

NEIMA and 10 CFR Part 53

- Consistent with Section 103 of Nuclear Energy Innovation and Modernization Act (NEIMA), the NRC staff have been engaged in efforts to establish a risk-informed, technology-inclusive regulatory framework for optional use by applicants for new commercial nuclear reactor licenses by December 31, 2027
- NRC staff are currently developing preliminary, proposed rule language under 10 CFR Part 53, along with associated key regulatory guidance documents
- Preliminary, proposed rule language has been released incrementally for stakeholder feedback; Part 53, Subpart “F” covers areas associated with plant operations

Human-System Integration

- Preliminary requirements in areas of human factors engineering (HFE) , staffing, and operator licensing are directly linked to design-specific safety functions and their fulfillment
- HFE is required where needed to support safety functions, versus being limited to a control room
- Operator staffing is required to the extent necessary to support design-specific needs for safety function fulfilment, versus relying upon a prescribed number of reactor operators (RO) and senior reactor operators (SRO)
- The fundamental role of the licensed operator centers around the management and fulfilment of safety functions, in addition to the manipulation of facility controls

Preliminary Approach for Part 53

- Past NRC considerations regarding simulators had included:
 - Flexibilities were 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)
 - Intent was not to permit initiation of transients on the plant if used as a simulation facility; use of the plant was envisioned as an option in conjunction with another simulation device, in lieu of plant-referenced simulator
 - A present goal is for a regulation that is performance-based, versus prescriptive, to better account for future designs

Preliminary Simulator Requirements

- Preliminary, proposed 10 CFR Part 53 Subpart “F” language contains simulation facility requirements for facilities with licensed operators; key aspects are:
 - Full-scope simulators are not mandated; partial scope simulators may be acceptable if adequate to meet needs
 - Simulation facilities must be approved by the Commission if relied upon for training purposes, meeting experience requirements, or for initial or requalification examinations
 - Use of a simulation facility for conducting HFE analyses or assessments requires demonstrating that adequate simulator scope is provided as well
 - Prior to initial fuel load, simulator models are allowed to replicate the intended initial core loads

Additional Information

- Preliminary, proposed rule language covering the areas of staffing, training, personnel qualifications, and human factors have been made publicly available for stakeholder engagement via the NRC's Agencywide Document Access and Management System (ADAMS) Accession No. ML21267A006
- A related white paper on "Risk-Informed and Performance-Based Human-System Considerations for Advanced Reactors" is available at ADAMS Accession No. ML21069A003
- ADAMS link: <https://www.nrc.gov/reading-rm/adams.html>
- Stakeholder meetings, other public meetings, and opportunities to comment are posted on the NRC's public website; see <https://www.nrc.gov/pmns/mtg> for meetings

Questions?

Jesse Seymour

Jesse.Seymour@nrc.gov