

Enclosure
Presentation Slides for the April 28, 2025
Pre-submittal Meeting Regarding Kairos Power's
Operator Training and Testing Program
for Test Reactors Topical Report
(Non-Proprietary)



Test Reactor Operator Training and Testing Program Topical Report

NRC PRE-SUBMITTAL MEETING

APRIL 28, 2025



Kairos Power's mission is to enable the world's transition to clean energy, with the ultimate goal of dramatically improving people's quality of life while protecting the environment.

In order to achieve this mission, we must prioritize our efforts to focus on a clean energy technology that is *affordable* and *safe*.

Purpose

- In December 2024, Kairos Power and the NRC staff discussed the draft operator training and testing topical report.
- The purpose of this meeting is to:
 - Update the NRC staff since the December 2024 meeting.
 - Address the staff's feedback from the December 2024 meeting.
 - Obtain NRC feedback on Kairos Power's operator training and testing simulation facility.
- The scope of this meeting will be limited to Chapter 4, the simulation facility.
 - The operator training and testing portions (Chapter 2 and 3) were addressed in the April 16, 2025 meeting.

Topical Report Outline

- Chapter 1: Introduction
 - New scope clarification added to the regulatory ask for the proposed part-task simulator.
- Chapter 2: Initial Operator Training and Testing Program
- Chapter 3: Operator Training Requalification Program
- Chapter 4: Simulation Facility
 - New content added to description, examination integrity, performance testing, and configuration management
- Appendix A – Applicability
 - NUREG-1478, Rev. 2, “Operator Licensing and Examiner Standards for Research and Test Reactors”
 - ANSI/ANS – 3.5 -2009 “Nuclear Power Plant Simulators for Use in Operator Training and Examination”

Part-task Simulator and Scope

- NRC staff feedback suggested that the simulator portion of the topical report be clear in what type of Commission approval being sought.
 - The simulation facility is consistent with the 10 CFR 55 definition of a part-task simulation device that will be approved under 10 CFR 55.46(b).
 - Due to the digital nature of the reference unit control rooms, digital static components are fully replicated.
 - Portions of the simulation facility that would not be replicated is the exact furniture, carpeting, spacing of control room components.
 - The part-task simulation facility follows the endorsed standard, ANSI/ANS-3.5-2009, except for portions that are LWR technology-specific, which are identified as deviations in the topical report.
- NRC staff feedback suggested that the simulation facility scope address the 13 items listed in 10 CFR 55.45.
 - The simulation facility complies with all 13 items to provide a representative sampling for the operating test.

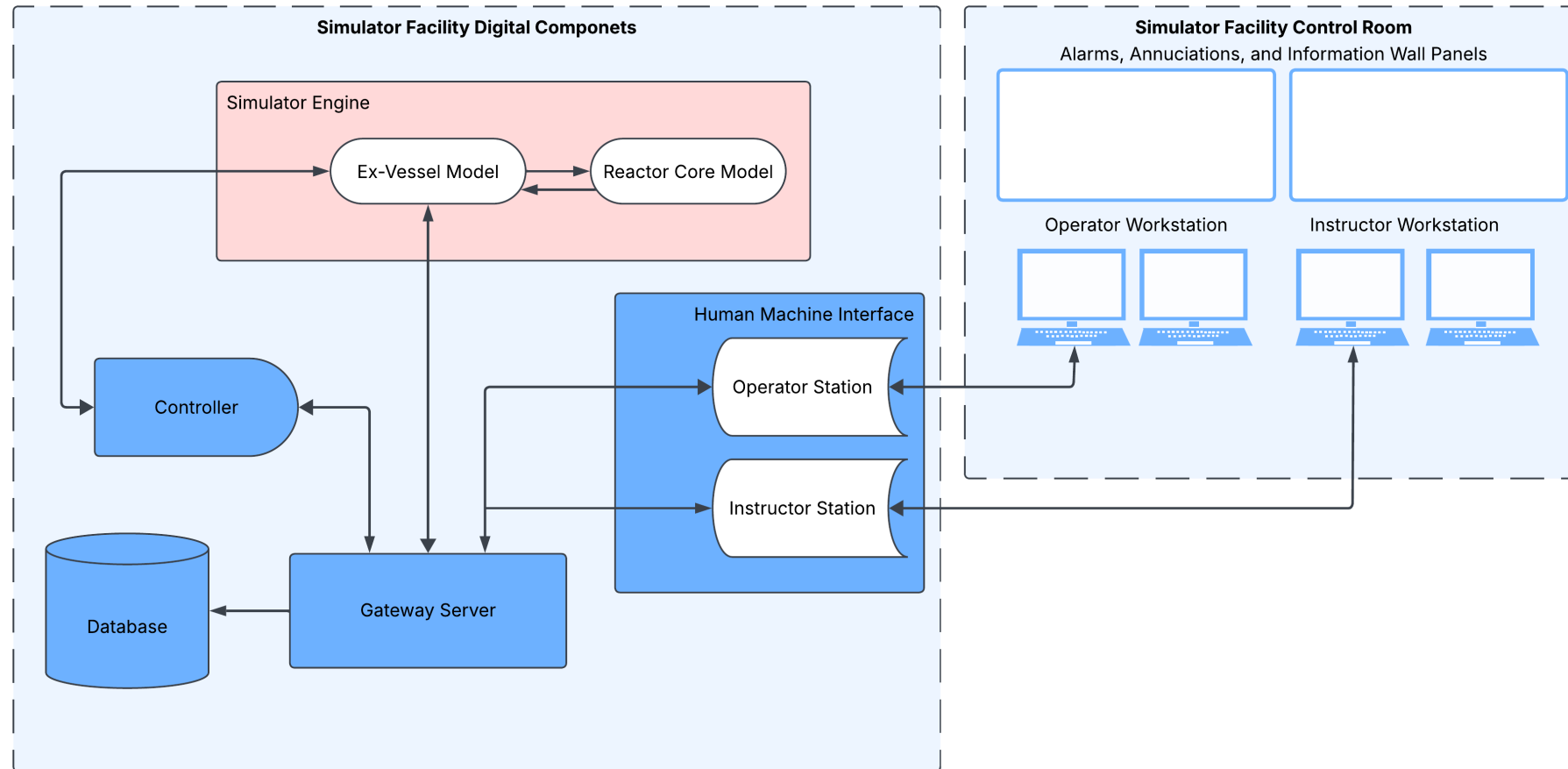
Regulatory Ask and Scope

- Regulatory Ask
 - “Kairos Power is requesting NRC review and approval of the scope and requirements to receive approval of a ~~Commission-approved~~ part-task simulation facility, under 10 CFR 55.46(b), ... for use by KP-FHR operator applicants and licensed operators.”
- Part-task simulator methodology, with use of Appendix D in ANSI/ANS-3.5-2009
 - Deriving deviations from the standard according to a systematic analysis.

Static & Dynamic Components

- Description is provided in accordance with 10 CFR 55.46(b)(i).
- Static Components
 - Simulation Facility Control Room Components
 - Human Machine Interface (HMI)
 - Gateway Server and Database
 - Controller
- The dynamic component is the reactor physics software that represents the reference unit systems from the control room.
 - Reactor Core Model
 - Ex-vessel Model

Description of Simulation Facility



Performance Testing

- Performance testing descriptions provided in accordance with 10 CFR 55.46(b)(ii), except for the final testing results that would be provided at the time of the simulation facility inspection.
- Operability Testing
 - Steady-state testing according to KP-FHR reference unit parameters.
 - Transient performance testing confirms that the simulator engine complies with the 13 items identified in 10 CFR 55.45.
- Scenario-based Testing
 - Prior to using scenarios for training exams and the operating testing, the simulation facility is evaluated for use of the test learning objectives and KSAs.
- Reactor Core Performance Testing
 - After reaching one of the four KP-FHR core configurations, the simulation facility is tested to ensure the simulator engine appropriately represent each of the KP-FHR core configurations.
- Post-event Simulator Testing
 - Following a reference unit event, the simulator is tested and updated to ensure that the simulation facility can accurately reproduce the reference unit response to the event.

Examination Integrity

- Examination integrity description provided in accordance with 10 CFR 55.46(b)(iii).
- Use of NUREG-1021 guidance for protecting simulation facility software such as:
 - Programmer tools
 - Instructor Controls
 - External Interconnections
- Other key features include:
 - Controlled updates
 - Prohibited use of audio and video recording during operating tests
 - Controls and restrictions around the simulation facility's historical data

Simulator Fidelity

- The simulator fidelity plan is provided in accordance with 10 CFR 55.46(d).
- Design database
 - The cold startup simulation facility uses design documents, engineering analysis, testing data, and other sources.
 - The simulation facility is appropriately updated with reference unit data as data becomes available.
- Discrepancies
 - Differences between the reference unit and simulation facility are tracked, evaluated, and either accepted or rejected.
 - The basis of acceptance and rejection is the determination if the impact contributes to negative training.
- Records
 - Controlled documentation of performance testing criteria and results, database, source code, and discrepancies.

Appendix A. Table A-2 Departures from ANS/ANSI 3.5-2009

- Criteria Number | Applicability | Justification
- Applicability Assignments
 - N/A – the examiner standard is not applicable to the Kairos Power training and testing program
 - e.g., LWR technology specific testing criteria.
 - Partial – Portions of the examiner standard are applicable to the Kairos Power training and testing program
 - e.g., LWR technology specific, but portions of it are applicable to KP-FHR technology
 - Full - the examiner standard is fully applicable to the Kairos Power training and testing program

Next Steps

- Kairos Power plans to submit the topical report and the exemption request for NRC review and approval in May 2025.
 - Based on the current draft of the topical report, and the discussions in today's meeting, does the staff see any gaps that could threaten topical report acceptance?
- Kairos Power requests the staff provide any additional feedback within the next week to support the submittal timeline.