U.S.NRC
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Protecting People and the Environment

Regulatory Perspectives with Simulators in Region IV

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Overview

- **Current Challenges with Simulators**
  1. Exam Security
  2. Data Capture for Exams
  3. Fidelity issues
  4. Continue to improve models
  5. Upgrades to plant <-> affects Sim
  6. SBT challenges
  7. Broken plant equipment

Exam Security

- 10 CFR 55.49
- NUREG 1021 - Examination Standards
  - ES-201, Attachment 1 – Examination Security and Integrity Considerations
  - App. D, Section F – Security Considerations for Simulator Operating Tests

10 CFR 55.49 (The Law)

Integrity of Examinations and Tests

- "Applicants, licensees, and facility licensees shall not engage in any activity that compromises the integrity of an application, test, or examination required by this part."

55.49 cont'd….(2)

"The integrity of a test or examination is considered compromised if any activity, regardless of intent, affected, or, but for detection, would have affected the equitable and consistent administration of the test or examination."

55.49..cont'd (3)

"This includes activities related to the preparation and certification of license applications and all activities related to the preparation, administration, and grading of the tests and examinations required by this part."

NUREG-1021

Examination Security and Integrity Considerations (ES-201, Attachment 1)

- Physical Security Guidelines
- Communications (cell, texting, IM)
- Other Considerations

NUREG-1021 cont (2)

Exam Security Agreement

Signs posted, Doors locked

Simulator isolated from network

Simulator setup files protected

Cleanup between runs and when releasing the machine back for regular use

NUREG-1021, ES-201, Att 1

Physical Security Guidelines

Exam Material shall be positively and continuously controlled and protected.

- Computer security (Networks and Printers) we will focus on this one for now
- Under lock and key or secured custody
- Limit copies (and identify and control each)
- Properly dispose of drafts, copies, and waste

NUREG-1021, ES-201, Att 1

Physical Security Guidelines

Review Simulator Security Considerations with the NRC Chief Examiner:

- Appendix D, Section F – Security Considerations for Simulator Operating Tests
- Primary objective is to ensure exam material cannot be read or recorded
- Exam materials are physically secured or electronically protected

NUREG-1021, App. D - Section F

Areas of Consideration:

- Instructor Stations
- Programmers' Tools
- External Interconnections

NUREG-1021, App. D - Section F

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Instructor Stations

- Malfunction Summary
- Monitored Parameters
- Trend Recording
- Video and Audio Recording
- Snapshots

Instructor Stations cont'd (2)

- Backtrack
- Replay / Playback
- Computer Assisted Exercises
- Initial Condition Summary

Programmer Tools

- Software Terminals
- Independent Executives
- Graphical User Interfaces

External Connections

- ESF Feeds (Data Links), ERDS, EOS system
- Remote Plant Process Computer and Instructor Station Screens
- Modems and Remote Simulator Support Systems

Real issues from Region IV

The examples that follow are recent examples of issues with the simulator and/or exam security associated with the simulator in Region IV plants.

Example #1

Exam Security Issue at STP during requal exams earlier this year-instructor not on exam security was able to browse and get to secure, password protected files for NRC BRQ scenarios and JPMS…and open them without a password!

Software flaw in the login process is believed to be the culprit. Good exam security kept this minor.

Example #2

Exam Security Issue at PV earlier this year when an instructor texted to plant staff that were not on the security agreement that a condenser vacuum event was not working correctly.

See Example 3 for resolution of this issue. Good exam security kept this minor.

Example #3

A condenser vacuum issue revealed itself during the actual initial exam administration. It was an identified uncorrected performance test failure that had been fixed but not rolled into the current load.

This is a SLIV violation of the simulator rule, 10 CFR 55.46(d)(3).

10 CFR 55.46 (d) (3)

§ 55.46 Simulation facilities.

- (d) *Continued assurance of simulator fidelity.* Facility licensees that maintain a simulation facility shall:

- (1) Conduct performance testing throughout the life of the simulation facility in a manner sufficient to ensure that paragraphs (c)(2)(ii), as applicable, and (d)(3) of this section are met. The results of performance tests must be retained for four years after the completion of each performance test or until superseded by updated test results;

- (2) Correct modeling and hardware discrepancies and discrepancies identified from scenario validation and from performance testing;

- (3) Make results of any uncorrected performance test failures that may exist at the time of the operating test or requalification program inspection available for NRC review, prior to or concurrent with preparations for each operating test or requalification program inspection; and

- (4) Maintain the provisions for license application, examination, and test integrity consistent with § 55.49.

Example #4

Data capture of parameters necessary for the NRC to make licensing decisions:

Stations are struggling with this requirement even though it is not hard to figure out what must be captured from the exam contents.

The requirement is located in NUREG-1021 and also documented in the NRC's Exam Corporate Notification Letter sent at the beginning of the process. Also, the Chief Examiner should discuss this during the kickoff call with the licensee staff.

Example #5

Exam security issue at Waterford with EOS log in the simulator a few years ago.

The Chief examiner had them turn the monitor off during the exam to prevent this from impacting the exam.

Example #6

Exam development issues over past several years at various sites on how to setup malfunctions in the simulator, using IC snaps over the entire core life (BOC, MOC, and EOC) and also using variety of powers (low, mid, and high powers) for scenarios.

No violations but required changes to op test setup in many cases. Painful.

Example #7

Leaking feedwater valves in the plant over many years were never incorporated into the simulator models. During actual event led to confusion of operators, delayed actions. Negative training resulted.

White finding at RBS a few years ago.

Example #8

Update to simulator models between prep week and admin week led to a rogue main turbine model during the early events in the scenarios for an initial license class at RBS a few years ago.

Moral of this example is don't change anything in the simulator after exam validation week!

Example #9

At DC a few years ago after a requal scenario run all the items were reset for exam security except the x and y axis labels were still there. The crew could guess that it was a tube leak/rupture from these two axes.

Bottom line is to be thorough in your checklists and add more items as they are found thru OpEx and peer reviews.

Example #10

At GG in 2018 plant experienced turbine control system issues, plant scram. Crew struggled to control RCIC. Subsequent investigation revealed simulator fidelity issues with respect to discharge pressure and governor valve position indication.

This was a Green NCV in 2018.

Discussion on the word “replicate”

The regulation 55.46 (c)(2)(i) states that :

(i) The plant-referenced simulator utilizes models relating to nuclear and thermal-hydraulic characteristics that **replicate** the most recent core load in the nuclear power reference plant for which a license is being sought;

Discussion on Sim differences list

Must be up to date for physical and software differences and must be trained on to ensure that operators know the limits of the machine so that when they are on shift they are not negatively influenced by the simulator's performance when responding to an actual event.

This is called Negative Training.

Conclusions

1. **Keep the NRC informed of everything while you are in the exam process (Requal or Initial).**
2. **Follow your processes for Exam security and defense in depth could save you**
3. **Read the QA forms carefully and know what you are signing**
4. **Keep the simulator up to date (via required testing)**

Questions

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