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

U.S. Nuclear Power Plant Simulation Facility Perspective

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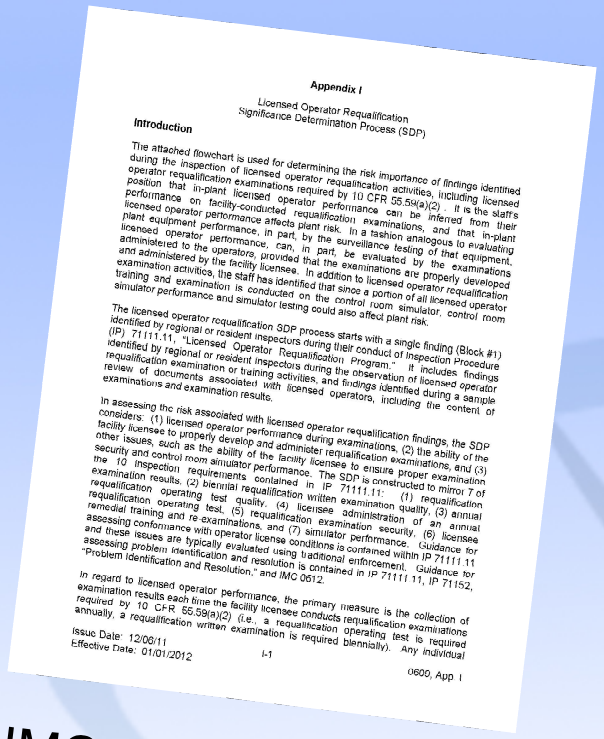
Topics

- NRC Actions
- One Standard & One Inspection Approach
- Simulation Facility Reviews
- SBT Inspections Under RG 1.149 R4
- IMC 0609, Appendix I

NRC Actions

- RG 1.149 Revision 4 (ML110420119)
  - Endorsement of ANSI/ANS-3.5-2009 (ANS Copyright)
  - Endorsement of NEI-09-09 Revision 1 (ML093521659)
- IP-71111.11 Revised (ML113270192)
  - Biennial simulation facility inspection approach remains unchanged
- IMC 0609, Appendix I Revised (ML113270313)
  - Simulator SDP flowchart now has two possible color findings (GREEN and/or WHITE) instead of one (GREEN)

NRC Actions



Appendix I

Licensed Operator Requalification
Significance Determination Process (SDP)

Introduction

The attached flowchart is used for determining the risk importance of findings identified during the inspection of licensed operator requalification activities, including licensed operator requalification examinations required by 10 CFR 55.59(a)(2) . It is the staff's position that in-plant licensed operator performance can be inferred from their performance on facility-conducted requalification examinations, and that in-plant licensed operator performance affects plant risk. In a fashion analogous to evaluating plant equipment performance, in part, by the surveillance testing of that equipment, licensed operator performance, can, in part, be evaluated by the examinations administered to the operators, provided that the examinations are properly developed and administered by the facility licensee. In addition to licensed operator requalification examination activities, the staff has identified that since a portion of all licensed operator training and examination is conducted on the control room simulator, control room simulator performance and simulator testing could also affect plant risk.

The licensed operator requalification SDP process starts with a single finding (Block #1) identified by regional or resident inspectors during their conduct of Inspection Procedure (IP) 71111.11, "Licensed Operator Requalification Program." It includes findings identified by regional or resident inspectors during the observation of licensed operator requalification examination or training activities, and findings identified during a sample review of documents associated with licensed operators, including the content of examinations and examination results.

In assessing the risk associated with licensed operator requalification findings, the SDP considers: (1) licensed operator performance during examinations, (2) the ability of the facility licensee to properly develop and administer requalification examinations, and (3) other issues, such as the ability of the facility licensee to ensure proper examination security and control room simulator performance. The SDP is constructed to mirror 7 of the 10 inspection requirements contained in IP 71111.11: (1) requalification examination results, (2) biennial requalification written examination quality, (3) annual requalification operating test quality, (4) licensee administration of an annual remedial training and re-examinations, and (7) simulator performance. Guidance for assessing conformance with operator license conditions is contained within IP 71111.11 and these issues are typically evaluated using traditional enforcement. Guidance for assessing problem identification and resolution is contained in IP 71111.11, IP 71152, "Problem Identification and Resolution," and IMC 0612.

In regard to licensed operator performance, the primary measure is the collection of examination results each time the facility licensee conducts requalification examinations required by 10 CFR 55.59(a)(2) (i.e., a requalification operating test is required annually, a requalification written examination is required biennially). Any individual

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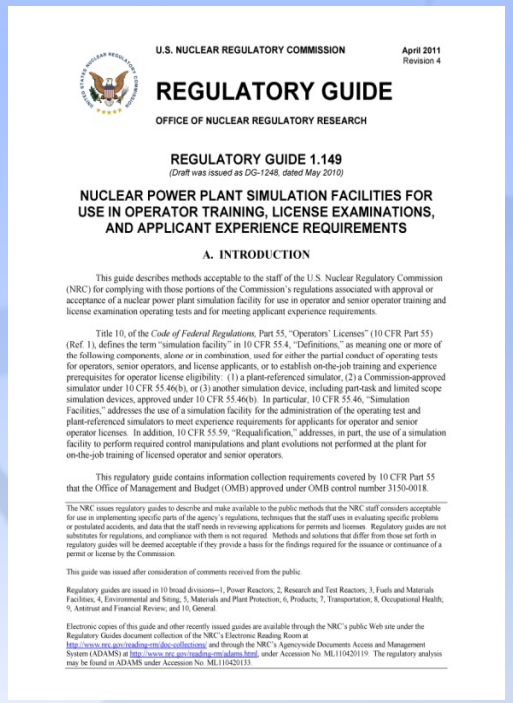
IMC 0609, Appendix I



U.S. NUCLEAR REGULATORY COMMISSION

April 2011
Revision 4

REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 1.149
(Draft was issued as DG-1248, dated May 2010)

NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING, LICENSE EXAMINATIONS, AND APPLICANT EXPERIENCE REQUIREMENTS

A. INTRODUCTION

This guide describes methods acceptable to the staff of the U.S. Nuclear Regulatory Commission (NRC) for complying with those portions of the Commission's regulations associated with approval or acceptance of a nuclear power plant simulation facility for use in operator and senior operator training and license examination operating tests and for meeting applicant experience requirements.

Title 10, of the *Code of Federal Regulations*, Part 55, "Operators' Licenses" (10 CFR Part 55) (Ref. 1), defines the term "simulation facility" in 10 CFR 55.4, "Definitions," as meaning one or more of the following components, alone or in combination, used for either the partial conduct of operating tests for operators, senior operators, and license applicants, or to establish on-the-job training and experience prerequisites for operator license eligibility: (1) a plant-referenced simulator, (2) a Commission-approved simulator under 10 CFR 55.46(b), or (3) another simulation device, including part-task and limited scope simulation devices, approved under 10 CFR 55.46(b). In particular, 10 CFR 55.46, "Simulation Facilities," addresses the use of a simulation facility for the administration of the operating test and plant-referenced simulators to meet experience requirements for applicants for operator and senior operator licenses. In addition, 10 CFR 55.59, "Requalification," addresses, in part, the use of a simulation facility to perform required control manipulations and plant evolutions not performed at the plant for on-the-job training of licensed operator and senior operators.

This regulatory guide contains information collection requirements covered by 10 CFR Part 55 that the Office of Management and Budget (OMB) approved under OMB control number 3150-0018.

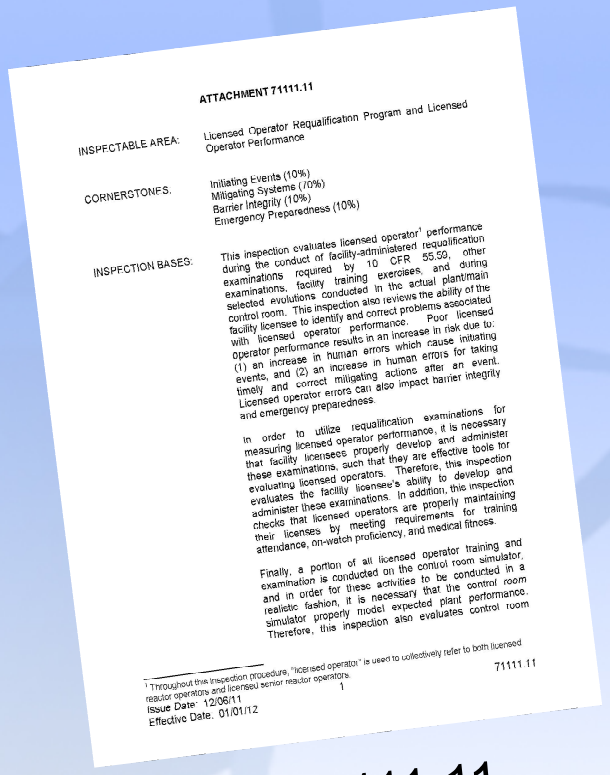
The NRC issues regulatory guides to describe and make available to the public methods that the NRC staff considers acceptable for use in implementing specific parts of the agency's regulations, techniques that the staff uses in evaluating specific problems or postulated accidents, and data that the staff needs in reviewing applications for permits and licenses. Regulatory guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions that differ from those set forth in regulatory guides will be deemed acceptable if they provide a basis for the findings required for the issuance or continuance of a permit or license by the Commission.

This guide was issued after consideration of comments received from the public.

Regulatory guides are issued in 10 broad divisions—1, Power Reactors; 2, Research and Test Reactors; 3, Fuels and Materials Facilities; 4, Environmental and Siting; 5, Materials and Plant Protection; 6, Products; 7, Transportation; 8, Occupational Health; 9, Antitrust and Financial Review; and 10, General.

Electronic copies of this guide and other recently issued guides are available through the NRC's public Web site under the Regulatory Guides document collection of the NRC's Electronic Reading Room at http://www.nrc.gov/reading-rm/doc-collections/ and through the NRC's Agencywide Documents Access and Management System (ADAMS) at http://www.nrc.gov/reading-rm/adams.html, under Accession No. ML11042019. The regulatory analysis may be found in ADAMS under Accession No. ML11042033.

RG 1.149, Rev 4



ATTACHMENT 71111.11

INSPECTABLE AREA: Licensed Operator Requalificatinn Program and Licensed Operator Performance

CORNERSTONES: Initiating Events (10%)
Mitigating Systems (10%)
Barrier Integrity (10%)
Emergency Preparedness (10%)

INSPECTION BASES: This inspection evaluates licensed operator[1] performance during the conduct of facility-administered requalification examinations required by 10 CFR 55.59, other examinations, facility training exercises, and during selected evolutions conducted in the actual plant/main control room. This inspection also reviews the ability of the facility licensee to identify and correct problems associated with licensed operator performance. Poor licensed operator performance results in an increase in risk due to: (1) an increase in human errors which cause initiating events, and (2) an increase in human errors for taking timely and correct mitigating actions after an event. Licensed operator errors can also impact barrier integrity and emergency preparedness.

In order to utilize requalification examinations for measuring licensed operator performance, it is necessary that facility licensees properly develop and administer these examinations, such that they are effective tools for evaluating licensed operators. Therefore, this inspection evaluates the facility licensee's ability to develop and administer these examinations. In addition, this inspection checks that licensed operators are properly maintaining their licenses by meeting requirements for training attendance, on-watch proficiency, and medical fitness.

Finally, a portion of all licensed operator training and examination is conducted on the control room simulator, and in order for these activities to be conducted in a realistic fashion, it is necessary that the control room simulator properly model expected plant performance. Therefore, this inspection also evaluates control room

[1] Throughout this inspection procedure, "licensed operator" is used to collectively refer to both licensed reactor operators and licensed senior reactor operators.

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71111.11

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IP-71111.11

NRC Actions - continued

- NRC Public Web Page "Operator Licensing Program Feedback" on "Simulators" Updated
  - Removed outdated material
  - Incorporates current practices concerning simulator scope, fidelity, and performance testing

- NRC is considering a new supplemental inspection procedure IP-41502, "Nuclear Power Plant Simulation Facilities" for use on new and/or current simulators – it will be a stand-alone document apart from IP-71111.11

One Standard & One Inspection Approach

- NRC advocates the use of a single industry consensus standard (preferably the most recently adopted standard, ANSI/ANS-3.5-2009) to facilitate one inspection approach.
- Approximately 33% of all 10 CFR 55.46(c) U.S. simulation facilities have moved to ANSI/ANS-3.5-2009.
- Another 15% have plans to move to the adopted new standard this year (after their current operator licensing training cycle ends and or during the next scheduled refueling outage).

Simulation Facility Reviews

- **NRC inspectors use IP-71111.11 to evaluate and assess conformance with 10 CFR 55.46**
- **NRC conducted about 35 simulation facility reviews in FY2011 (review schedule is posted on NRC web page)**

Simulation Facility Reviews -continued

- **NRC resident inspectors also conduct quarterly reviews using IP-71111.11**
- **Simulator fidelity discrepancies observed during the conduct of NRC operating tests are documented in the site-specific NRC Examination Report under "Simulator Fidelity Report"**

Simulation Facility Reviews -continued

- **Most simulator regulatory findings have been Non-Cited Violations (NCVs) against 10 CFR 55.46(c)(1) and/or (d)(1)**
- **Very few regulatory findings have been cited against other requirements of 55.46**
- **Most ANSI/ANS-3.5 findings have been against implementation of specific requirements of the standard and the conduct of simulator performance tests.**

Simulation Facility Reviews -continued

- Verify adequacy of plant-referenced simulator for use in operator licensing examinations (initial & requalification) and/or for use in satisfying experience requirements
- Review samples of simulator performance tests as well as samples of modeling and hardware discrepancies (open & closed)
- Review licensee's process for ensuring continued simulator fidelity

SBT Inspections Under RG 1.149 R4

- Inspectors use IP-71111.11 to evaluate and assess licensee's compliance with 10 CFR 55.46(c) and (d)
- Review sample(s) are taken from the following types of simulator scenarios:
  - NRC Initial License Examinations (operating tests scenarios not JPMs)
  - Licensed Operator Requalification Annual Examinations (operating tests scenarios not JPMs)
  - Scenarios used for reactivity control manipulation experience

SBT Inspections - continued

- Confirmation regarding ANS-3.5 standard and associated RG 1.149 commitment
- Confirmation sampled SBT testing and methodology aligns with NEI-09-09 Revision 1
- Evaluate and assess SBT sample(s) as simulator performance tests

SBT Inspections - continued

- Confirmation ANS-3.5 related malfunction tests & test results demonstrate expected reference plant response

- Process identified simulator issue(s) that warrants entry into 0609, Appendix I SDP flowchart block #13 with follow-up, as needed, in the inspection report.

SBT Inspections - continued

- Confirmation that simulator fidelity has been sufficiently demonstrated and met
- Confirmation that significant control manipulations are completed without procedural exceptions, simulator performance exceptions, or deviations from the approved training scenario sequence.

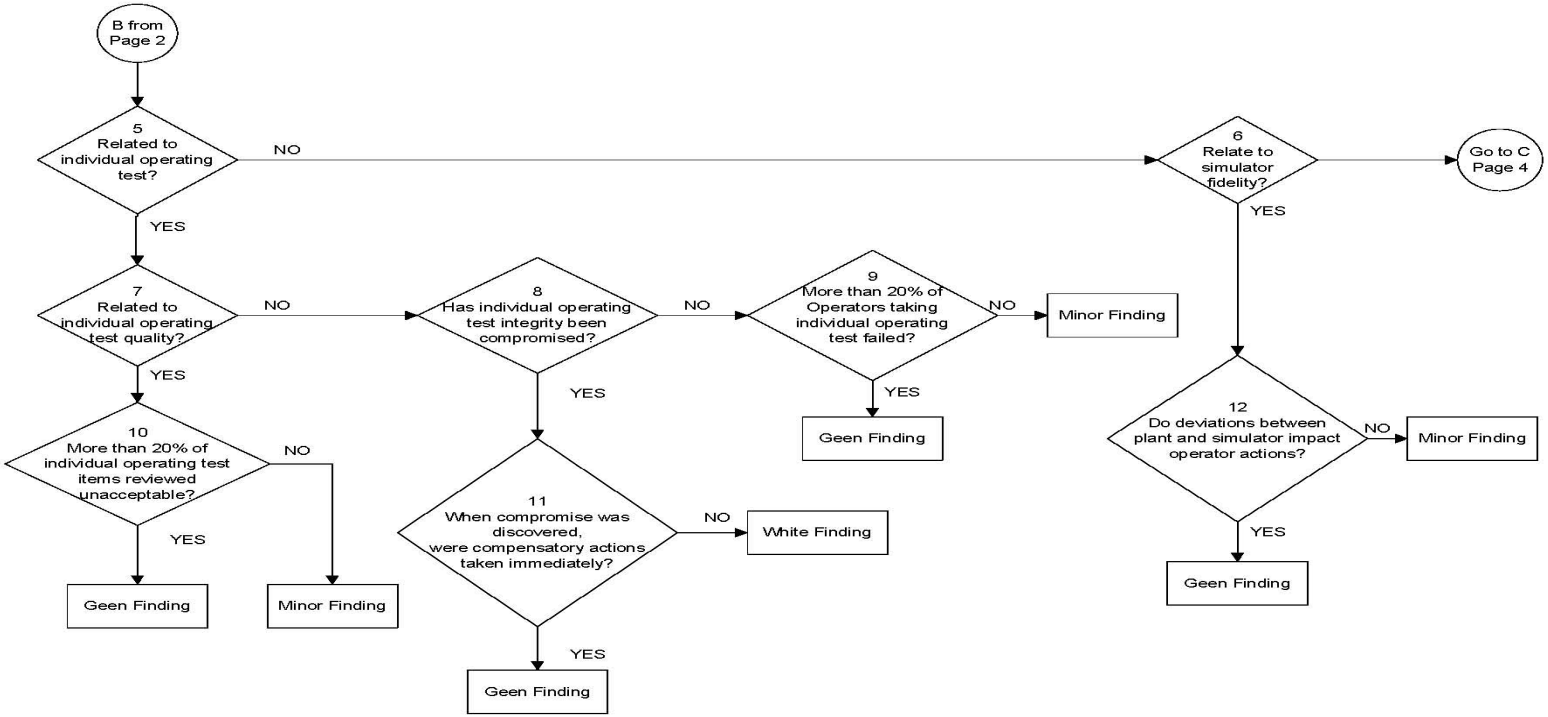
SBT Inspections - continued

- Confirmation of the simulator's demonstrated expected plant response to operator input and to normal, transient, and accident conditions to which the simulator has been designed to respond.

- Confirm the simulator is sufficient in scope and fidelity to allow conduct of the evolutions listed in 10 CFR 55.45(a)(1) through (13), and 55.59(c)(3)(i)(A) through (AA), as applicable to the design of the reference plant.

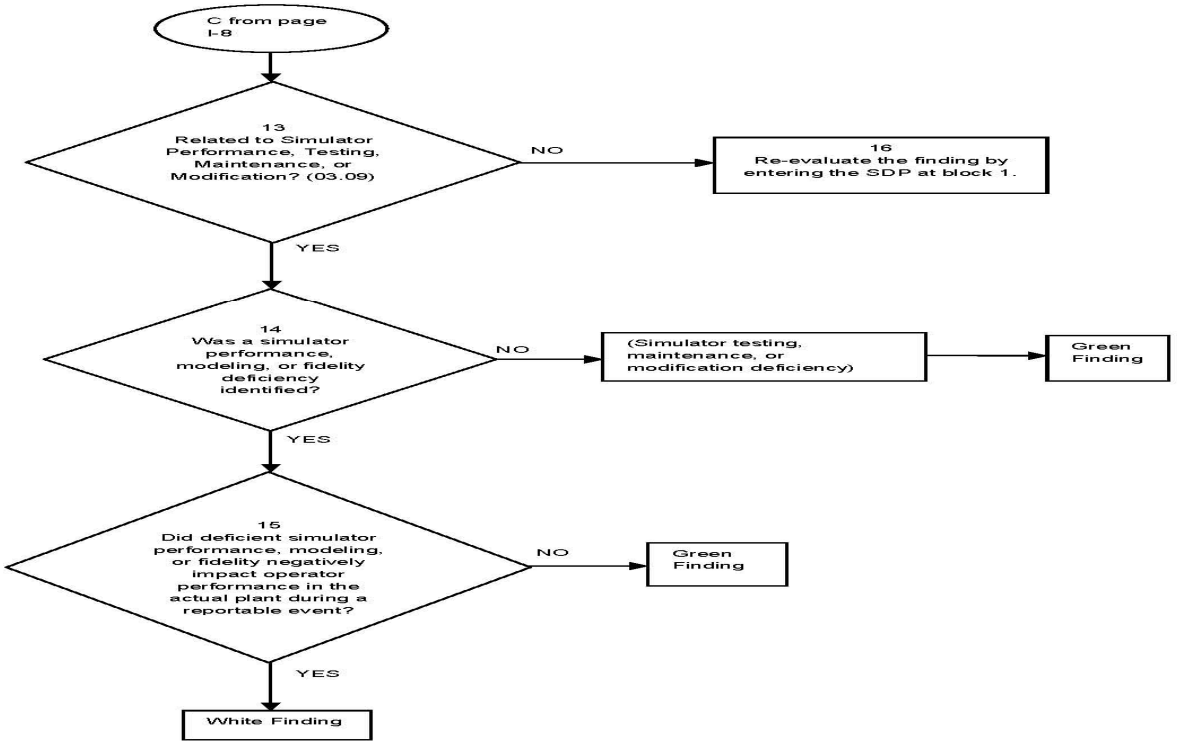
IMC 0609 Appendix I (old)

Operator Requalification Human Performance SDP
Appendix I



IMC 0609 SDP Appendix I (Revised)

Licensed Operator Requalification SDP – Appendix I



IMC 0609 SDP Appendix I (Revised)

- Block #13 - “Related to simulator performance, testing, maintenance, or modification?” (03.09).
  - Top-level entry block associated with control room simulator performance, maintenance, and testing, as specified in 10 CFR 55.46.
  - Answered “yes” or “no” based upon completing the specific guidance contained in section 03.09 and Appendix G of IP-71111.11, and upon completing the screening of inspection issues in accordance with IMC 0612.

IMC 0609 SDP Appendix I (Revised)

- Block #14 - "Was a simulator performance, modeling, or fidelity deficiency identified?"
  - Block differentiates between deficiencies associated simulator performance (including modeling or fidelity) and deficiencies associated with simulator testing, maintenance, and modification.
  - These issues have the potential for unrealistic operator training due to deficient simulator performance.
  - If answered "no," deficiency is related to testing, maintenance, or modification – results in a GREEN finding.
  - If answered "yes," proceed to block #15.

IMC 0609 SDP Appendix I (Revised)

- **Block #15 - "Did deficient simulator performance, modeling, or fidelity negatively impact operator performance in the actual plant during a reportable event?"**
  - **Simulator provided un-realistic or negative training to licensed operators (due to deficiencies in simulator performance, modeling, or fidelity), which impacted operator performance during an event that was reportable per 10 CFR 50.72 or 50.73.**
  - **If answered "no," deficient simulator performance was still identified – results in a GREEN finding.**
  - **If answered "yes," results in a WHITE finding based upon deficient simulator performance affecting licensed operator performance during a plant event of NRC concern.**

The End

- Questions & Comments