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OFFICE OF NUCLEAR REGULATORY RESEARCH

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NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR LICENSE EXAMINATIONS

A. INTRODUCTION

Paragraphs 55.45(a) and 55.59(c)(3) of 10 CFR Part 55, "Operators' Licenses," require that an applicant for an operator or senior operator license and each licensed operator of a utilization facility demonstrate both an understanding of and the ability to perform certain essential job tasks. Paragraph 55.45(b) specifies that these operating tests will be administered, in part, either in a simulation facility consisting solely of a plant-referenced simulator that has been certified to the Commission by the facility licensee or in a simulation facility approved by the Commission after application has been made by the facility licensee.

A simulation facility is defined in 10 CFR 55.4 as "one or more of the following components, alone or in combination, used for the partial conduct of operating tests for operators, senior operators, and candidates: (1) the plant, (2) a plant-referenced simulator, (3) another simulation device."

This regulatory guide describes methods acceptable to the NRC staff for complying with those portions of the Commission's regulations regarding (1) certification of a simulation facility consisting solely of a plant-referenced simulator and (2) application for prior approval of a simulation facility for testing. Facility licensees maintaining simulation facilities that were previously certified under ANSI/ANS-3.5-1985, as endorsed by Revision 1 of this Regulatory Guide 1.149, may opt to implement ANSI/ANS-3.5-1993, as endorsed by Revision 2 of this Regulatory Guide 1.149.

Any information collection activities mentioned in this regulatory guide are contained as requirements in those sections of 10 CFR Part 55 that provide the regulatory basis for this guide. The information collection requirements in 10 CFR Part 55 have been cleared under Clearance No. 3150-0018 and No. 3150-0138.

B. DISCUSSION

Ensuring that individuals who receive operator or senior operator licenses possess the knowledge, skills, and abilities necessary to operate the facility in a safe manner is the responsibility of facility licensees. In addition, the NRC performs an independent audit of this process. Section 55.45, "Operating Tests," of 10 CFR Part 55 requires the candidate for a license to demonstrate (1) an understanding of and the ability to perform the actions necessary during normal, abnormal, and emergency situations; (2) the operation of systems that affect heat removal or reactivity changes; and (3) behaviors that show the individual's ability to function within the control room team in such a way that the facility licensee's procedures are adhered to and that

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This guide was issued after consideration of comments received from the public. Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience.

Written comments may be submitted to the Rules Review and Directives Branch, DFIPS, ADM, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

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the limitations in its license and amendments are not violated.

The use of a plant-referenced simulator for testing enables the examiner to evaluate a candidate's performance in an environment closely correlated with conditions in the specific plant for which that candidate has applied for a license. When applicants are tested on plant-specific simulators, major facility differences are minimized between testing and operating environments, and examiners are able to make pass-fail judgments with confidence.

In accordance with the requirements in 10 CFR 55.45, the portion of the operating test given in the simulation facility will not be administered on other than an approved or a certified simulation facility after:

1. The facility licensee has submitted a certification in accordance with 10 CFR 55.45(b)(5)(i), or
2. The staff has approved an application submitted by the facility licensee in accordance with 10 CFR 55.45(b)(4), whichever occurs sooner.

Although the increased use of plant-referenced simulators has provided examiners with the opportunity to better discriminate between success and failure in a candidate than could be achieved with non-plant-referenced simulators, the staff recognizes the existence of several factors that could suggest the use of alternative systems or devices for conducting the non-walkthrough portions of operating tests. These factors include the cost and lead time associated with procurement or upgrading of a plant-referenced simulator. Moreover, rapidly changing technology in the simulation industry is resulting in previously unavailable options that could lead a facility licensee to seek alternative ways to meet the requirements of 10 CFR 55.45. ANSI/ANS-3.5-1993, "Nuclear Power Plant Simulators for Use in Operator Training and Examination" (the Standard), in conjunction with this regulatory guide, provides guidance in these areas.

C. REGULATORY POSITION

1. ENDORSEMENT OF ANSI/ANS-3.5-1993

Requirements are set forth in ANSI/ANS-3.5-1993, "Nuclear Power Plant Simulators for Use in Operator Training and Examination," for specifying minimum performance and configuration criteria for a simulator, for comparing a simulator to its reference plant, and for upgrading simulators to reflect changes to reference plant response or control room configuration or to improve simulator fidelity. The requirements in ANSI/ANS-3.5-1993 provide methods acceptable to the NRC staff for a facility licensee (1) to certify a simulation facility consisting solely of a plant-referenced simulator or (2) to obtain approval of a simulation facility for use in portions of reactor operator and senior operator license examinations, subject to the following clarifications and exceptions.

1.1 Simulation facilities as defined in 10 CFR 55.4, to the extent that the facility licensee applies for approval under the requirements of 10 CFR 55.45(b), should meet the applicable requirements of the Standard.

1.2 In Section 1.2, "Background," the Standard identifies other documents to be included as part of the Standard. The applicability of one of these documents, ANSI/ANS-3.1, is covered in Revision 2 to Regulatory Guide 1.8, "Qualification and Training of Personnel for Nuclear Power Plants."

1.3 Section 2, "Definitions," of ANSI/ANS-3.5-1993 defines both "malfunctions" and "overrides." Overrides, as defined, should be considered to be features that affect input/output (I/O) devices at the man-machine interface, such as panel instrumentation and controls. Other simulator features that might be referred to as overrides in their documentation and instructor station presentation, but which affect or alter the normal operation of simulated instrumentation or components within the model, should be considered to be malfunctions for the purposes of validation and periodic performance testing. Malfunctions should be considered to be "applicable to the facility" for the purposes of performance testing in accordance with Regulatory Position 1.5, below, if they are integral to the facility's training and examination scenarios and exercises.

1.4 A verification that the simulator represents the reference unit to the scope defined in Section 3, "General Requirements," is required by Section 4.4.1, "Simulator Validation Testing," of ANSI/ANS-3.5-1993. Validation testing should not be limited to Section 3.2, "Scope of Simulation."

1.5 Section 4.4.2, "Simulator Operability Testing," of ANSI/ANS-3.5-1993 requires that specific tests be conducted annually to verify the simulator's performance and operability as described in Section 4.1.3, "Steady State and Normal Evolutions," and Appendix B, "Guidelines for the Conduct of Simulator Operability Testing." In addition to these procedures, applicable malfunctions to be simulated that are listed in Section 3.1.4, "Malfunctions," should be tested at least once every four years, approximately 25% per year, to ensure continued acceptability of the simulation facility for the planned training and examination application as required by 10 CFR Parts 55.45 and 55.59.

Operability of other malfunctions, as clarified in Regulatory Position 1.3, if applicable to the facility by incorporation in the planned training and

examination scenarios and exercises, should also be demonstrated at least once every four years, approximately 25% per year.

Performance and malfunction testing may be integrated with a facility licensee's approved or accredited training program that uses a systems approach to training if performance data are obtained during either scenario dry-runs or the training session and analyzed for compliance with the performance criteria listed in ANSI/ANS-3.5-1993.

1.6 Section 5.1.2, "Simulator Design Data Base Update," of ANSI/ANS-3.5-1993 requires that reference-plant modifications be reviewed annually against the simulator and that the simulator design data base be revised as appropriate. This should be taken to mean that the first such annual review and update should take place within one year following the facility licensee's certification as specified in 10 CFR 55.45(b)(5)(i) or within 18 months following the submittal of the application for approval as specified in 10 CFR 55.45(b)(4)(i).

1.7 The appendices to ANSI/ANS-3.5-1993, Appendix A, "Guideline for Documentation of Simulator Design and Test Performance"; Appendix B, "Guidelines for the Conduct of Simulator Operability Testing"; and Appendix C, "Examples of Application of the Simulator Steady State Tolerance Allowances," should be considered integral parts of the standard.

2. USE OF A SIMULATOR FOR MULTIPLE PLANTS

If a licensee wishes to use a simulation facility to simulate more than one nuclear power plant, it must demonstrate to the NRC in its certification or in its application that the differences between the plants are not so significant that they have an impact on the ability of the simulation facility to meet the requirements and guidance of ANSI/ANS-3.5-1993 as qualified in this regulatory guide for each of the plants. This demonstration should include an analysis and summary of the differences between each plant and the simulation facility, including:

1. Facility design and systems relevant to control room personnel;
2. Technical specifications;
3. Procedures, primarily abnormal and emergency operating procedures;
4. Control room design and instrument/control location; and
5. Operational characteristics.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees about the NRC staff's plans for using this regulatory guide.

Except in those cases in which an applicant or licensee proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the methods described in this guide will be used in the evaluation of an application for approval submitted by a facility licensee for its simulation facility. Facility licensees maintaining simulation facilities that were previously certified under ANSI/ANS-3.5-1985, as endorsed by Revision 1 of this Regulatory Guide 1.149, may opt to implement ANSI/ANS-3.5-1993, as endorsed by Revision 2 of this Regulatory Guide 1.149.

VALUE/IMPACT ANALYSIS

A separate value/impact analysis has not been prepared for this regulatory guide. A value/impact analysis was included in the regulatory analysis for the amendments to 10 CFR Part 55 that were published on March 25, 1987, a copy of which was placed in the Public Document Room. This analysis is also appropriate to Revision 2 of Regulatory Guide 1.149. A copy of the regulatory analysis is available for inspection and copying for a fee at the NRC Public Document Room, 2120 L Street NW., Washington, DC. The Public Document Room's mailing address is Mail Stop LL-6, Washington, DC 20555; telephone (202)634-3273; fax (202)634-3343.

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