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October 21, 1999

Chief, Rules and Directives Branch
Office of Administration
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Gentlemen:

NUCLEAR REGULATORY COMMISSION (NRC) - REQUEST FOR COMMENTS ON DRAFT REGULATORY GUIDE (DG) 1080, "NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS"

On August 23, 1999, the NRC staff issued *Federal Register* 64 FR 45985 to solicit public comments on DG 1080. TVA's comments are provided in Enclosure 1.

TVA appreciates the opportunity to review and comment on this draft regulatory guide. If you have questions, please contact E. W. Whitaker at (423) 751-6369.

Sincerely,


Mark G. Burzynski
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Enclosure

cc (Enclosure):

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cc: Continued on page 2

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Page 2

October 21, 1999

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Enclosure 1

TVA Comments on DG 1080, "NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS"

<p style="text-align: center;">DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149) NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS DG-1080</p>	<p style="text-align: center;">TVA COMMENTS</p>
<p>A. INTRODUCTION</p> <p>In 10 CFR Part 55, "Operators' Licenses," Paragraphs 55.45(a) and 55.59(c) (3) 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.</p> <p>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 license candidates: (1) the plant, (2) a plant-referenced simulator, (3) another simulation device.</p> <p>This regulatory guide describes methods acceptable to the NRC staff for complying with those portions of the Commission's regulations regarding certification of a simulation facility consisting solely of a plant-referenced simulator. Previous revisions of this regulatory guide may still be used for certification of a simulation facility or as a basis for application for prior approval of a</p>	<p>References to "plant" should be changed to "unit". The recent revision of ANSI/ANS 3.5-1998 went to great lengths to make this change, and so should the Regulatory Guide. Consistent phraseology will minimize conflicts in the interpretation of the Regulatory Guide and the ANSI standard.</p> <p>The Regulatory Guide how the timetable for simulator testing that was submitted earlier in the facility's Form 474 should be addressed?</p> <p>There appears to be some inconsistency between the draft guide and 10CFR55.45b. The guide mentions that 10CFR55.45b was suited for a different form of testing and is "difficult to apply" (see 2nd paragraph under SIMULATOR PERFORMANCE TESTING). 10CFR55.45b still requires a 4 year schedule with 25% of tests run each year, whereas ANSI/ANS 3.5-1998 requires running the steady state and operability tests annually along with scenario testing. 10 CFR 55.45 needs to be revised to conform to the new positions or the regulatory guide should give guidance on use of ANSI/ANS 3.5-1998 within the context of 10 CFR 55.45.</p>

DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149)
NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS
DG-1080

TVA COMMENTS

simulation facility for testing.

Regulatory guides are issued to describe to the public methods acceptable to the NRC staff for implementing specific parts of the NRC's regulations, to explain techniques used by the staff in evaluating specific problems or postulated accidents, and to provide guidance to applicants and licensees. Regulatory guides are not substitutes for regulations, and compliance with regulatory guides is not required. Regulatory guides are issued in draft form for public comment to involve the public in developing the regulatory positions. Draft regulatory guides have not received complete staff review and approval, therefore they do not represent official NRC staff positions.

The information collections contained in this draft regulatory guide are covered by the requirements of 10 CFR Part 55 and NRC Form 474, which were approved by the Office of Management and Budget, approval numbers 3150-0018 and 3150-0138. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

B. DISCUSSION

THE ROLE OF SIMULATORS IN OPERATOR LICENSING

Although 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, the NRC performs an independent review of this process. Section 55.45, "Operating Tests," of 10 CFR Part 55 requires the applicant for a license to demonstrate (1) an understanding of and the ability to perform the actions necessary during normal, abnormal, and emergency situations; (2)

DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149)
NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS
DG-1080

TVA COMMENTS

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 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 license applicant's performance in an environment closely correlated with conditions in the specific plant for which that applicant 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.

The increased use of plant-referenced simulators has provided examiners with the opportunity to better discriminate between success and failure in a license applicant's knowledge and performance than could be achieved with non-plant-referenced simulators. However, the staff recognizes the existence of several factors that could suggest the use of alternative systems or devices for conducting

DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149)
NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS
DG-1080

TVA COMMENTS

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 simulation facility requirements of 10 CFR 55.45. ANSI/ANS 3.5-1998, "Nuclear Power Plant Simulators for Use in Operator Training and Examination" (the Standard), in conjunction with this regulatory guide, provides guidance in these areas.

REGULATORY BACKGROUND

In 1981, NRC evaluated alternative methodologies for regulatory guidance regarding simulator applications. Of the three alternatives -- rulemaking, a regulatory guide, or a national standard endorsed by a regulatory guide -- endorsement of a national standard was favored because it would achieve the desired result while taking advantage of the work performed by industry in its development of ANSI/ANS 3.5-1981, "Nuclear Power Plant Simulators for Use in Operator Training." The basis for NRC's choice of procedural alternatives for its regulatory position remains valid in terms of industry's continuing review and revision of the standard.

Industry initiatives have revised ANSI/ANS 3.5 three times, in 1985, 1993 and in 1998. Regulatory Guide 1.149 has been revised with each successive version of the standard. Throughout its revision history, the regulatory guide has consistently endorsed the standard as an acceptable method for meeting the requirements of the regulations. Exceptions to the standard in the area of performance testing

DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149)
NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS
DG-1080

TVA COMMENTS

were specified in the initial issuance through Revision 2 in 1996 of Regulatory Guide 1.149 to ensure that application of the standard would comport with the requirements of the regulations and be responsive to the NCR's concern that simulator fidelity must be ensured on a continuing basis. In the staff's view, the 1998 revision of the standard incorporates the essential aspects of the exceptions that characterized the NRC's endorsement of prior revisions.

SIMULATOR PERFORMANCE TESTING

The 1981 version of the standard specified a testing regimen that was written in the context of initial simulator procurement. Until the 1998 revision, the primary focus of the standard was initial design and construction of the simulator, a unique condition in which extensive factory acceptance testing is performed on the basis of individual simulator capabilities prior to establishing a software configuration baseline. Except for infrequent simulator replacements, facility licensees' simulators are now in an update and maintenance phase of the simulator life cycle, an area for which previous revisions of the standard were not intended and for which the standard has offered little specific guidance. In most cases, the exhaustive full-scope testing and development of initial software has been completed and is not expected to be repeated; but facility licensees' recurring performance testing programs continue to be structured to remain consistent with the structure of 10 CFR 55.45(b). In the staff's view, the type of testing described in previous revisions of the standard, while providing basic quality assurance, does not adequately consider the training and examination environment in which

Regulatory Guide 1.149 should not discuss software quality assurance as a description of the current process. The "software QA" phrase has meaning in the nuclear industry that is not applicable to simulation software. Use of "software configuration control and verification/validation testing" or similar wording would be more appropriate for this application

The verification and validation process in software development is the standard procedure for changes to the simulation environment. Scenario based testing is a new requirement that could add extra burden to the utilities depending upon what the scope of testing is defined to be. Presently scenarios are tested by instructors to ensure they meet their training objectives, and this aspect is currently a part of the SAT process. If a modification is installed into the simulator and is verified to operate as designed for the known set of conditions, the modification should not have to be verified for a variety of scenarios to meet the requirement of scenario based testing. For the case of adding a containment pressure indicator to one that is already there -- does it have to be tested with a MSLB, FWLB, LOCA, with varying degrees of severity's since they all represent different scenarios with multiple other malfunctions?

DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149)
NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS
DG-1080

TVA COMMENTS

the simulator will be used; this was the basis for the staff's exceptions to previous revisions of the standard.

The performance testing specified in 10 CFR 55.45(b) is suited for a capabilities and schedule-based performance testing program. This requirement is difficult to apply to the process of structured software development coupled with the scenario-based testing that is now fully adopted by the 1998 revision of the standard. The software development and performance testing requirements of ANSI/ANS 3.5-1998, while not prescriptive with respect to the details of implementation, bring the simulator application into closer conformance with current industry norms and practices for software quality assurance and training program administration than did the 1985 and 1993 revisions of the national standard. The NRC staff considers this improved software development and testing philosophy to be consistent with the NRC's intent that the simulation facility's ability to faithfully portray malfunctions and its general operability are to be verified by periodic performance testing.

In the staff's view, verification and validation testing in the software development process, coupled with scenario-based testing in the training and examination preparation processes, provides improved assurance of acceptable simulator performance over that provided by previous simulator capabilities-based, stand-alone testing programs. The staff also considers the inclusion of Appendix D, "Guidance on Part-Task and Limited-Scope Simulator Features and Fidelity," in the standard to be advantageous in improving training and examination capabilities of

Additional guidance should be provided to define when a modification has been satisfactorily "scenario base tested".

When modeling is truly performed with the use of first law principles, where matter and energy are fully accounted, scenario based testing for the sake of validity is unnecessary. Scenario based testing is only necessary to ensure that the students are trained on the procedure flow paths that are required for the training objectives.

If scenario based testing is required for modeling changes, The Reg. Guide should address what reference data would be used to determine the test acceptance criteria. For example, in single failure/malfunction testing, many plant responses are best estimate in that very little actual plant data can be obtained to verify the correct simulator response. Placing several such malfunctions together will only complicate the testing process and make it more difficult to "test" whether the simulator behavior is correct.

DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149)
NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS
DG-1080

TVA COMMENTS

simulation facilities.

C. REGULATORY POSITION

1. ENDORSEMENT OF ANSI/ANS 3.5-1998

Requirements are set forth in ANSI/ANS 3.5-1998, "Nuclear Power Plant Simulators for Use in Operator Training and Examination," for specifying minimum design, testing, performance, and configuration criteria for a full scope, a part-task, or a limited-scope simulator; for integrating simulator design and performance with an accredited training program; 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 3.5-1998 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.

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 ANSI/ANS 3.5-1998.

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."

2. USE OF A SIMULATOR FOR MULTIPLE PLANTS

DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149)
NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS
DG-1080

TVA COMMENTS

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-3.5-1998 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.

"Significant" should be better explained or defined, and examples given. Without additional guidance NRC inspectors may make individual interpretations that will not promote consistent regulation.

The term "nuclear power plant" should be changed to "nuclear power plant unit". If the licensing basis shows that an operator needs to have a multi-unit license for a nuclear power plant with more than one unit, then the simulator, referenced to one unit, should be able to train operators for use on both units. This point is not evident in ANSI/ANS 3.5 (any version), so the clarification provided here is needed. This analysis of the differences between each unit, however, does not seem to align well with ANSI/ANS 3.5-1998 section 4.2.1.4. The additional requirements of DG-1080 need further clarification.

3. ACCEPTABILITY OF LICENSEE'S SIMULATION FACILITY

Licensees who maintain simulation facilities that were certified under editions of ANSI/ANS 3.5 that were previously endorsed by the NRC may, but are not required to, revise existing programs such that the simulation facility will be maintained in accordance with ANSI/ANS 3.5-1998. Because ANSI/ANS 3.5-1985 has been relegated to an "Historical" status by ANS, licensees whose simulation facilities are currently certified under ANSI/ANS 3.5-1985 should, but are not required to, review their simulator programs for conformance to an active edition of the standard.

4. SCHEDULING OF PERFORMANCE TESTING

The scheduling and evaluation of simulation

ANSI/ANS 3.5-1998 specifically states that once

DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149)
NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS
DG-1080

TVA COMMENTS

facility testing under ANSI/ANS 3.5-1998 is a function of the facility licensee's accredited training program. Therefore, the licensee may reference the licensed operator training schedules of the accredited training program as adequate submittal of a schedule for conduct of approximately 25 percent per year of the performance tests as required by 10 CFR 55.45(b)(4)(iii) and (vii) and 10 CFR 55.45(b)(5)(vi).

per year simulator performance testing will be conducted. It also states that performance based testing is comprised of operability and scenario based testing. Specific tests that can be done by the scenario based testing are normal evolutions, malfunctions, local operator actions, and other features exercised by the scenario. It appears that all ANSI required malfunctions no longer need to be tested yearly, only those which are used by the scenarios for a given year. This also appears to be an open-ended way to include all malfunctions under the "certification" umbrella, such that any malfunction on the simulator must be certified if it is ever used. There would no longer be a differentiation between the two.

The new standard allows the use of an accredited training program and license training schedules to perform 25% of the yearly tests. With the new standard the malfunctions, overrides, remote functions, and procedures to be tested are not known until the end of the year. If the scenarios are already tested based upon the scenario-based testing process, the Reg. Guide should specify what would constitute the 25%. One interpretation could be that only 25% of the scenarios have to be scenario-tested for a given year. This should be clarified.

D. IMPLEMENTATION

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

This proposed revision has been released to encourage public participation in its development. Except in those cases in which an applicant proposes an acceptable alternative method for complying with the specified portions of the NRC's regulations, the methods to be described in the final revision of this guide reflecting public comments will be used in the

Will the NRC permit Reactivity Manipulations to be performed on the simulator, in accordance with 10CFR55 (proposed change), if a licensee does not adopt the ANSI/ANS 3.5-1998 standard in total?

DRAFT REGULATORY GUIDE DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149)
NUCLEAR POWER PLANT SIMULATION FACILITIES FOR USE IN OPERATOR TRAINING AND LICENSE EXAMINATIONS
DG-1080

TVA COMMENTS

evaluation of the implementation of a facility licensee's simulation facility. Editions of ANSI/ANS 3.5 that were previously endorsed by the NRC remain acceptable methods of meeting the regulations, and revision of this guide will not alter any prior or existing licensing commitments based on their use.