

March 1, 2002

MEMORANDUM TO Theodore R. Quay, Chief
Equipment and Human Performance Branch
Division of Inspection Program Management, NRR

FROM: */RA/*
Lawrence Vick, Reactor Engineer (Examiner Qualified)
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SUBJECT: 2002 WESTERN MULTICONFERENCE

During the week of January 28-31, 2002, as a member of NRR's Operator Licensing and Human Performance Section, I participated as a NRC panelist in the 2002 Western MultiConference ("Nuclear Power Plants and Systems" program track) sponsored by The Society for Modeling and Simulation International (SCS), in San Antonio, Texas.

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As a panelist on the program, I provided a brief presentation on the status of (1) the NRC's recently amended 10 CFR Part 55, "Operator Licenses" regarding operator license eligibility and the use of simulation facilities in operator licensing and (2) Revision 3 of Regulatory Guide 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations." It was pointed out that the final rule was published in the *Federal Register* on October 17, 2001, and become effective on November 16, 2001.

I am happy to report that attendee response to the presentation on the two topic areas, as well as verbal feedback afterwards, was that it was well received and most appreciated. Thank you for the opportunity to participate and represent the agency in this popular nuclear power plant simulation conference.

Attachments: 1. Speech - "Changes to 10 CFR Part 55 and RG 1.149"
2. 2002 Western MultiConference Final Program
3. L. Vick Slide Presentation "NRC Update"

**2002 WESTERN MULTI CONFERENCE
INTERNATIONAL CONFERENCE
ON
SIMULATION TECHNOLOGY FOR NUCLEAR POWER PLANTS AND SYSTEMS**

JANUARY 30, 2002

CHANGES TO 10 CFR PART 55 & RG 1.149

**LAWRENCE VICK
U.S. NUCLEAR REGULATORY COMMISSION**

Introduction

[SLIDE NO. 1] Thank you. Good morning, ladies and gentlemen. I am pleased to join you at this annual conference on "Simulation Technology for Nuclear Power Plants and Systems" sponsored by the Society for Modeling and Simulation International (SCS). **[a.k.a. 2002 Western Multi Conference]** I view this allotted time with you as an excellent opportunity to exchange information with you.

First, I want to bring you up to date on the NRC's amended regulations regarding 10 CFR Part 55, "Operators' Licenses."

The Amended Regulations (10 CFR Part 55, Operators' Licenses)

[SLIDE NO. 2] As you know, via the *Federal Register* **[66 FR 52657]**, on November 16, 2001, the Nuclear Regulatory Commission (NRC) amended its regulations **[10 CFR Part 55, Operators' Licenses]** to permit applicants for operator and senior operator licenses to fulfill a portion of the required experience prerequisites by manipulating a plant-referenced simulator as an alternative to manipulation of the controls of the actual nuclear power plant. While the new rule allows use of the plant-referenced simulator for satisfying these experience requirements, use of the plant for this experience is still encouraged. The amended regulation (i.e., new rule) also removed requirements for facility licensee certification of their simulation facilities and routine submittal of reports to the NRC for review that identify any uncorrected performance test failures and a related schedule for correction. Also, the amended rule revised two definitions **["plant-referenced simulator" and "simulation facility"]** and added clarity to the regulations by relocating requirements relating to the use of a simulation facility **[from previous rule 55.45(b)]** to a new section, designated 55.46, "Simulation Facilities."

Finally, the final rule facilitates voluntary licensee transition to an improved approach to simulator testing as described in an American National Standards Institute/American Nuclear Society (ANSI/ANS) standard, ANSI/ANS-3.5-1998, "Nuclear Power Plant Simulators for Use in Operator Training and Examination." Revision 3 to Regulatory Guide 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations," (RG 1.149) endorses this standard and was published in October 2001 in conjunction with this final rule.

I see my role today as one of (1) encouraging you to read the *Federal Register* notice to become familiar with the new rule and to read the revised R.G. 1.149, and (2) taking back any questions so that clear answers can be developed and promulgated to licensees.

[SLIDE NO. 3] With that background, today's presentation topic will be limited to three areas of interest:

- (1) Performance of Control Manipulations on the Plant-Referenced Simulator [i.e., 10CFR55.31(a)(5)].
- (2) Simulation facilities [i.e., 10 CFR 55.46], and
- (3) Revision 3 of R.G. 1.149, " Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations".

Performance of Control Manipulations on the Plant-Referenced Simulator

[SLIDE NO. 4] Previously, the old rule [52FR9453, effective March 25, 1987] required that applicants for operator and senior operator licenses perform five significant control manipulations that affect reactivity or power level on the actual plant. Now, the new rule [66FR52657, effective November 16, 2001] allows applicants to perform the manipulations either on a plant-referenced simulator or on the actual plant at the facility licensee's discretion.

It is important to understand that when plant-referenced simulators are used to satisfy experience requirements for the performance of control manipulations [that affect reactivity or power level], the new rule requires that: (1) Simulator models replicate the nuclear and thermal-hydraulic characteristics of the most recent core load in the nuclear power reference plant for which a license is being sought; and (2) significant control manipulations are completed without procedural exceptions, simulator performance exceptions, or deviation from the approved training scenario sequence. These requirements ensure that simulator experience replicates evolutions on the plant and that license applicants receive the same overall experience in safe plant operation as they would on the plant itself.

[SLIDE NO. 5] Control manipulations [which affect reactivity and power level, are identified in Sec 55.31(a)(5)] performed on the plant-referenced simulator may be chosen from a representative sampling of the control manipulations and plant evolutions described in Sec. 55.59(c)(3)(i)(A-F), (R), (T), (W), and (X), as applicable to the design of the plant for which the license application is submitted. [these 10 examples exclude major transients and accidents.]

New Section 55.46, Simulation facilities

[SLIDE NO. 6] The new rule includes administrative changes to move the requirements for the use of simulation facilities from Sec. 55.45 [of the old rule] to a new Sec. 55.46, "Simulation Facilities." Parts of the old rule [in Secs. 55.45(b) (4) and (5)] dealing with simulators have been separated from Sec. 55.45 and consolidated in the new Sec. 55.46. This is simply an administrative change to improve clarity. [i.e., to clarify the old rule by separating requirements concerning simulation facilities from requirements in Sec. 55.45 concerning operating tests.]

In general, this section addresses the use of a simulation facility or the plant, if such use is approved by the NRC, for the administration of the operating test and plant-referenced simulators to meet experience requirements for applicants for operator and senior operator licenses.

[SLIDE NO. 6] The new section addresses three key implementation criteria/elements: They are: (1) Commission-approved simulation facilities and Commission approval of use of the plant in the administration of the operating test, (2) Plant-referenced simulators, and (3) Continued assurance of simulator fidelity.

Lets talk briefly about the first criteria/element.

[SLIDE NO. 7] *Commission approved simulation facilities and Commission approval of use of the plant in the administration of the operating test.*

Section 55.45(b) requires that the operating test for an operators license be administered on either a Commission-approved simulation facility, a plant-referenced simulator, or on the actual plant, if approved by the Commission. Facility licensees proposing to use a plant-referenced simulator [meeting the definition in Sec. 55.4] are not required to submit a request for Commission approval of that simulator. For cases when facility licensees propose to use a simulation facility not meeting the definition of a plant-referenced simulator, [i.e., other than a plant-referenced simulator] or the actual plant, the Commission will continue to require additional information to determine the acceptability of the simulator or use of the actual plant and thus, will require an application [request] for Commission approval.

[SLIDE NO. 8] Every request must include [as a minimum]: (i) A description of the components of the simulation facility intended to be used, or the way the plant would be used for each part of the operating test, unless previously approved; and (ii) A description of the performance tests for the simulation facility as part of the request, and the results of these tests; and (iii) A description of the procedures for maintaining examination and test integrity consistent with the requirements of Sec. 55.49. [Integrity of examination and tests]

The Commission will approve a simulation facility or use of the plant for administration of operating tests if it finds that the simulation facility and its proposed use, or the proposed use of the plant, are suitable for the conduct of operating tests for the facility licensee's reference plant under Sec. 55.45(a).

Let's move our attention to the second criteria/element.

Plant-referenced simulators.

[SLIDE NO.9] First, the new rule **[Section 55.46(c)]** requires that a plant-referenced simulator used for the administration of the operator licensing operating test or to meet the experience requirements of Sec. 55.31(a)(5) demonstrate expected plant response to operator input and to normal, transient, and accident conditions to which the simulator has been designed to respond.

In other words, the plant-referenced simulator is designed and implemented so that it: (1) Is sufficient in scope and fidelity to allow conduct of the evolutions listed in Secs. 55.45(a)(1) through (13) and Secs. 55.59(c)(3)(i)(A) through (AA), as applicable to the design of the reference plant; and, (2) allows for the completion of control manipulations for licensed operator applicant eligibility **[consistent with Sec. 55.46(c)(2).]**

Second, in regard to control manipulations for licensed operator applicant eligibility, the new rule **[in Section 55.46(c)(2)(i)]** provides that 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. **[the phrase ``most recent'' means the current core. If the plant is in a refueling outage, the core just previous to the outage is acceptable.]** It also **[in Section 55.46(c)(2)(ii)]** provides that simulator fidelity has been demonstrated so that significant control manipulations are completed without procedural exceptions, simulator performance exceptions, or deviation from the approved training scenario sequence.

Third, the new rule **[in Section 55.46(c)(3)]** provides criteria for the Commission to accept the plant-referenced simulator for conducting operating tests **[as described in Sec. 55.45(a)]**, for requalification training **[as described in Sec. 55.59(c)(3)]**, or for performing control manipulations that affect reactivity to establish eligibility for an operator's license **[as described in Sec. 55.31(a)(5)]**. The plant-referenced simulator must meet the requirements of 55.46(c)(1) **[that we just talked about]** and 55.46(d)(1) and (4) **[that I will speak to next]**.

Let's move on to the third criteria/element.

Continued Assurance of Simulator Fidelity

[SLIDE NO.10] Although the new rule eliminates facility licensee certification of their simulation facilities **[i.e., NRC Form 474]**, and routine submittal of reports to the NRC for

review which identify any uncorrected performance test failures and a schedule for correction, continued assurance of simulator fidelity is provided in the new rule in new Sec. 55.46(d), by requiring licensees to: (1) Conduct performance testing and retain results for four years, (2) correct modeling and hardware discrepancies and discrepancies identified from scenario validation and from performance testing, (3) make the results of any uncorrected performance test failures available for NRC review, and (4) maintain the provisions for license application, examination, and test integrity consistent with Section 55.49 [Integrity of examination and tests].

Continued assurance is checked by way of NRC reviews associated with operating tests for operator license applicants [NUREG-1021, Examiner Standards] or inspections completed using the Requalification Inspection Procedure [IP-71111.11] as part of the reactor oversight process [and use of the Requal SDP flowchart]. If these reviews find that a plant-referenced simulator is unsuitable because it does not demonstrate expected plant performance or meet the requirement specified in items (1) and (4) above, then the simulator may not be used to conduct operating tests for operator license applicants, requalification training, or control manipulations until the simulator is made suitable. In any case, simulation facilities, including plant-referenced simulators, must additionally meet (2) and (3) [above] of the requirements of Sec. 55.46(d) for continued assurance of simulator fidelity.

Let's now move to our third topic of interest.

Regulatory Guide 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations," Revision 3

[SLIDE NO. 11] RG1.149, Revision 3, describes methods acceptable to the NRC for complying with those portions of the NRC's regulations associated with approval or acceptance of a simulation facility for use in reactor operator and senior operator training and NRC license examinations.

The Role of simulators in operator training and licensing

Everyone understands that facility licensees are responsible for ensuring that individuals who receive RO or SRO licenses possess the knowledge, skills, and abilities necessary to operate the facility in a safe manner. The use of a plant-referenced simulator for operator training and testing enables the trainer and/or examiner to evaluate a license applicant's performance in a manner that replicates conditions in the plant.

Simulator Performance Testing

[SLIDE NO. 12] Prior to the new rule, facility licensees trained licensed operators and applicants for operator and senior operator licenses on plant-referenced simulators that were certified by licensee to meet the standards set forth in accordance with the 1985 [or 1993] edition of ANSI/ANS-3.5, [Nuclear Power Plant Simulators for Use in Operator Training and

Examination."] This national industry standard specifies full-scope, stand-alone testing of system models and simulator training capabilities as part of initial simulator acceptance testing.

Since 1987, the industry's approach to computer software development and simulator testing has changed considerably. The new rule allows **[facility licensees that adopt the 1998 revised national standard]** for a change in the type of performance testing from a prescriptive simulator testing program in the context of initial simulator procurement to a scenario-based and operability performance testing program. The new rule does not require facility licensees to adopt the 1998 version of ANSI/ANS-3.5 or to modify existing simulator support programs or practices.

Because the new rule continues to require performance testing, facility licensees that do not adopt the 1998 revised national standard will perform the same type of performance testing as before. The new rule allows facility licensees to adjust their performance test programs to their end-user needs, as defined by their accredited systems-approach-to-training (SAT) programs, or to conform their existing simulator programs to the new revision of ANSI/ANS-3.5.

Endorsement of ANSI/ANS-3.5-1998

[SLIDE NO. 13] RG 1.149, Revision 3, endorses ANSI/ANS-3.5-1998 without exceptions, because it sets forth provisions acceptable to the NRC for addressing minimum design, testing, performance, and configuration criteria for a plant-referenced simulator; for integrating simulator design and performance with an accredited training program; for comparing a simulator to its reference plant; for upgrading simulators to reflect changes to reference plant response or control room configuration; and for improving simulator fidelity. ANSI/ANS-3.5-1998 provides methods acceptable to the NRC staff for a facility licensee to demonstrate that, through meeting the criteria of ANSI/ANS-3.5-1998, the plant-referenced simulator will possess a sufficient degree of completeness and accuracy to meet the requirements of 10 CFR Part 55, "Operator's Licenses," for use in RO and SRO training and NRC license examinations.

[SLIDE NO.14] One important clarification applicable to this endorsement that you should be made aware of is that editions of ANSI/ANS-3.5 that were previously endorsed by the NRC remain acceptable methods of meeting the regulations. It is important to note that the new rule does not require facility licensees to adopt the 1998 version of ANSI/ANS-3.5 or to modify existing simulator support programs or practices. The new rule continues to require performance testing, whether or not facility licensees adopt the 1998 revised national standard.

Let me bring you up to-date on several related activities we are working on as a follow-up to the new rule.

Update on Related Activities

[SLIDE NO. 15] Currently, the NRC staff is developing revisions to NUREG-1021, Revision 8, [Operator Licensing Examination Standards for Power Reactors] and the "Licensed Operator Requalification Program Inspection Procedure," [IP-71111.11] of the reactor oversight process. These revisions will provide guidance to NRC examiners and inspectors for determining compliance with the rule. Training of examiners will be conducted as appropriate. As noticed in the *Federal Register* (66FR52657), the NRC staff expects that these revisions will be completed one year from the date the final rule was published [i.e., October 17, 2002].

The staff is planning a public meeting/workshop concerning the new rule. Tentatively we are looking at early March -April, 2002, time frame. [several logistical factors remain to be resolved - such as final consensus on changes to NUREG-1021, IP-71111.11, SDP, and availability of meeting room, calendar conflicts, etc.]

Conclusion

[SLIDE NO. 16] In conclusion, as we go down the road with the new rule let me point out that for the first time we are effectively synchronized in that we have [or will have] six (6) important documents that are tightly coupled in the topical area of "plant-referenced simulators."

They are: (1) 10 CFR Part 55; (2) R.G. 1.149, Revision 3; (3) NUREG-1021, Revision 8; (4) IP-71111.11; (5) REQUAL SDP; and (6) ANSI/ANS-3.5-1998

I think it is quite remarkable that we have all worked together to achieve this type of milestone. I believe it will become more appreciated as time and experience passes. Let us go forward in confidence that we are making a positive difference in the nuclear power plant simulation arena and operator licensing.

Thank you for your undivided attention. I will now entertain questions from the floor. [ensure that all questions from the floor are tracked and followed-up (indicate who ask question, the question, and topic area)]

[SLIDE NO. 17] Available Key Information [display only]

[SLIDE NO. 17] Summary of What the Final Rule Does [display only]

ATTACHMENT 2 - SLIDES

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