

September 8, 1999

FOR: The Commissioners

FROM: William D. Travers /s/  
Executive Director for Operations

SUBJECT: RULEMAKING PLAN FOR CHANGES TO 10 CFR PART 55 TO REDUCE UNNECESSARY REGULATORY BURDEN ASSOCIATED WITH THE USE OF SIMULATION FACILITIES IN OPERATOR LICENSING

## SUMMARY

The attached Rulemaking Plan and recommended reductions in unnecessary regulatory burden in 10 CFR Part 55 address industry concerns associated with establishing license eligibility for operators and maintaining simulation facilities for use in training and testing of operators. The plan also addresses related changes for 55.4, "Definitions," and 55.59, "Requalification."

## PURPOSE:

To obtain Commission approval to proceed with the development of rulemaking to revise 10 CFR Part 55 in the following areas:

- 1) eligibility to apply for a license as prescribed in 55.31(a)(5), "How to apply," and
- 2) implementation of simulation facilities for use in operator licensing tests as prescribed in 55.45(b), "Operating tests."
- 3) conforming changes for 55.4, "Definitions," and 55.59, "Requalification."

## BACKGROUND:

- Actual Plant Operating Experience
- Simulation Facility Certification and Testing
- PROPOSED CHANGES TO 10 CFR PART 55:
- Revise 10 CFR 55.31(a)(5), "How to apply"
- Revise 10 CFR 55.45, "Operating tests"
- Revise 10 CFR 55.4, "Definitions"
- Revise 10 CFR 55.59, "Requalification"
- RELATED REGULATORY ACTIVITY:
- NRC Endorsement of ANSI/ANS 3.5-1998
- INTERIM REGULATORY BURDEN RELIEF THROUGH EXEMPTIONS TO 10 CFR PART 55.31(a)(5):

## ACTUAL PLANT OPERATING EXPERIENCE

In 1976, an operator licensing testing process was promulgated in NUREG-0094, "NRC Operator Licensing Guide" (Section VIII.3), in which the license applicant was asked to start up the reactor from a substantially subcritical condition and to raise power to a predetermined level to satisfy then-extant 55.23(b). Alternative eligibility criteria were presented in Appendix F to NUREG-0094, which included manipulation by the applicant of the controls of the reactor facility during five significant reactivity changes as described in the requalification program for the facility. The requalification program for reactor operators and senior reactor operators, as described in then-extant 10 CFR Part 55, Appendix A, section (3)(a), consisted of at least ten reactivity control manipulations to be performed over the term of the license. For license eligibility, five reactivity manipulations were considered sufficient to ensure that a diversification of experience in reactivity changes existed for each applicant.

The current 55.31(a)(5), as amended in 1987, requires evidence that the applicant, as a trainee, has successfully manipulated the controls of the facility for which a license is sought. Five significant control manipulations which affect reactivity or power level must be performed as a prerequisite for license eligibility. Because applicants at "cold" license facilities cannot use the actual plant prior to initial startup, they may use the simulator to satisfy this requirement as part of a Commission-approved training program. Applicants at "hot" license facilities, including those facilities which are shutdown for extended periods, are required under the current rule to perform manipulations on the actual plant.

Some facility licensees have reported difficulty finding opportunities to complete the five control manipulations required by 55.31(a)(5) and some have reported that associated plant operating and training costs may have increased as a result of delays or of having to maneuver the plant to satisfy the reactivity manipulations requirement. Two facility licensees that recently responded to the NRC's request for comments on a proposed amendment to the initial operator licensing testing requirements in Part 55 recommended that the NRC permit some or all of the required reactivity or power changes to be performed on the plants' certified plant-reference simulators. Facility licensees cite not only cost savings associated with using the simulator but also enhanced training through a wider range of possible manipulations in an environment that is more conducive to individualized learning, i.e., more time for individual instruction and operation of the "controls."

In a controlled environment, such as an accredited training program or testing of operators for licensing, the plant-specific simulator faithfully replicates the reference plant environment and characteristics. Portions of the experience usually associated with on-the-job training may therefore effectively be gained using the simulator. On the basis of successful use of plant-specific simulation facilities since the 1987 revision of the rule first required the use

of a simulator for testing of operators and requalification program inspections, the staff believes that use of a plant-specific simulator of appropriate fidelity, that follows approved scenario sequences, may be an acceptable alternative to operation of the actual plant for gaining experience in control manipulations that affect reactivity.

#### SIMULATION FACILITY CERTIFICATION AND TESTING

When 55.45(b) was written to promulgate regulations for the use of simulators in qualification of nuclear power plant operators in accordance with Section 306 of the Nuclear Waste Policy Act of 1982, simulators were being initially developed for certification in accordance with American National Standards Institute/American Nuclear Society (ANSI/ANS) national standard ANSI/ANS 3.5-1985, "Nuclear Power Plant Simulators for Use in Operator Training." This national standard specified full-scope, stand-alone testing of system models and simulator training capabilities that normally would not be repeated once the software was put in use in the simulator. However, the 1987 revision of the rule required periodic scheduling and reporting of testing results on the assumption that full scope, stand alone testing would continue after the simulator was put in service. As a result, although it may be neither technically needed or required to support the training and testing of operators, licensees continue to test simulators in the manner they were tested during initial development, and submit test schedules and reports on a quadrennial basis to comply with the rule.

Since the rule first required certification of a simulation facility in 1987, the national standard, ANSI/ANS 3.5, has been revised twice. Each revision employed a different testing and quality control philosophy and was reviewed for endorsement by the NRC. The staff intends to endorse the latest revision of the standard, ANSI/ANS 3.5-1998, through revised regulatory guidance, as discussed below under "Related Regulatory Activity." In contrast to the testing assumptions and requirements of the present language of the rule, the standard has moved away from continued full-scope, stand alone testing of system models and simulator training capabilities, toward a scenario-based testing and quality control philosophy that is associated with the facility licensee's planned simulator usage. The focus of the standard has shifted from initial simulator development to life-cycle support. The staff believes that revision of the rule will allow greater flexibility in voluntary implementation of later revisions of the standard by facility licensees by precluding duplicate and inefficient simulator performance testing.

The 1987 revision of the rule provided a phased implementation schedule for the requirement that facility licensees certify the availability of a simulation facility. The certification requirement also contained associated requirements for submittal of test documentation and schedules on a quadrennial basis. The staff's experience has shown these reports to be of minimum value in assessing simulator suitability for testing of operators but the staff recognizes their value in establishing baseline performance for future comparison. Facility licensees' experience with the test report has also shown minimum usefulness aside from providing a framework for a continuing performance testing program. The staff believes, therefore, that the current requirement for simulator test and performance data to remain on site for review by the staff should remain in the rule without a requirement for periodic submittal of test reports.

The current definitions in 55.4 neither clearly describe the specific uses of the plant-referenced simulator or provide a definition of performance testing consistent with current industry standards. The staff believes that the definitions should be clarified to combine existing simulator requirements in the regulation. The definition of performance testing should be clarified to include the broader definition of the term as used in the 1998 version of the industry standard.

#### PROPOSED CHANGES TO 10 CFR PART 55:

The staff proposes revisions to the following four sections of 10 CFR Part 55:

##### REVISE 10 CFR 55.31(A)(5), "HOW TO APPLY"

The requirement that five significant control manipulations that affect reactivity be performed on the actual plant should be revised to allow manipulations to be performed either on a plant-referenced simulator or on the actual plant, at the facility licensee's discretion. The distinction between "cold" and "hot" facility licenses should be deleted from the control manipulations requirement. Because the requirement was originally based on adaptation of the on-the-job training required for requalification programs, acceptable simulator training scenarios involving control manipulations that affect reactivity should be identified for clarity by reference to current control manipulations and training scenarios described in 55.59. These changes will allow part of the plant operating experience requirement for license eligibility to be fully satisfied in a timely manner within the accredited training program without impacting operation of the actual plant.

The requirement of 55.31(a)(4) to complete the facility licensee's program of education, experience, and on-the-job training (OJT) as a prerequisite of license eligibility would be unaffected by this proposed change to the regulations. Performance of control manipulations that affect reactivity or power level constitutes only a small part of an applicant's preparedness to perform licensed duties and would continue to be implemented as a subset of OJT. This proposed change to 55.31(a)(5) would equally allow use of the actual plant or the simulation facility, thus broadening the range of options available to facility licensees for selecting the most advantageous training method.

##### REVISE 10 CFR 55.45, "OPERATING TESTS"

The proposed changes to 55.45(b) will modernize the rule and reduce unnecessary regulatory burden by eliminating certification and recurring reporting requirements. The changes will also facilitate coordination of existing simulator performance testing and licensed operator training programs while eliminating duplicate testing for those licensees that choose to adopt a revised national standard. These changes will neither require facility licensees to adopt a newly revised version of the standard or will they require facility licensees to modify existing simulator support programs or practices. These proposed changes do not impose additional burden or increase the risks to the health and safety of any segment of the nuclear industry or the public.

The following three changes should be made to 55.45(b):

- 1) The requirements in 55.45(b) for certification of simulation facilities, including submittal of schedule information, and the requirements for submittal of quadrennial test reports should be deleted. This change will remove duplicate testing and reporting requirements that have

become outdated by revision of the national standard.

- 2) Specific implementation criteria pertaining to simulator fidelity assurance should be provided. The criteria will apply to simulation facilities that are used as an alternative to actually operating the plant in order to gain experience in control manipulations that affect reactivity. These criteria will link 55.45(b) with the proposed changes to 55.31(a)(5).
- 3) The provisions in 55.45(b) regarding the use of simulation facilities should be revised to clearly apply to all planned uses (i.e. testing of operators for licensing, the licensed operator requalification program, and license eligibility). The staff intends to endorse ANSI/ANS 3.5-1998 without exception, although facility licensees will not be required to automatically adopt the new standard. The 1993 revision is still recognized by ANS and the 1985 revision is considered to be an "historical" standard. Simultaneous endorsement of more than one version of the standard is consistent with both the NRC policy of evaluating the latest version of national consensus standards in terms of their suitability for endorsement by regulations or regulatory guides and the established regulatory position regarding simulators, allowing industry to establish recommended and required capabilities and acceptability criteria.

#### REVISE 10 CFR 55.4, "DEFINITIONS"

Section 55.4 should be revised to clarify the definition of "performance testing" to comport with the broader definition in the revised industry standard. The definition of "plant-referenced simulator" should also be revised to describe the uses of the simulator including the completion of experience prerequisites and the conduct of operating tests. This change combines existing simulator requirements in the regulation. The clarified definitions will provide a basis for objective assessment of simulator acceptability for use on operating tests without imposing modifications or additions to the procedures or organization required to operate a facility.

#### REVISE 10 CFR 55.59, "REQUALIFICATION"

Section 55.59(c)(4)(iv) refers to an approved or certified simulator. The previously described changes to 55.45(b) will eliminate the certification requirement. This section of the regulations should be changed by deleting references to simulator approval or certification.

#### RELATED REGULATORY ACTIVITY:

##### NRC ENDORSEMENT OF ANSI/ANS 3.5-1998

The staff has reviewed ANSI/ANS 3.5-1998 with respect to revision of Regulatory Guide 1.149, "Nuclear Power Plant Simulation Facilities for Use in License Examinations." The 1998 revision of the standard was developed with full NRC participation and insight. Accordingly, the staff believes that those testing and fidelity concerns that have required exceptions and clarifications in the regulatory positions of the previous revisions of Regulatory Guide 1.149, are adequately addressed in this latest revision of the standard. The staff further believes that industry's concerns have been addressed in this latest revision of the standard. As noted in the introductory paragraph to the standard, "the consensus committee was balanced to ensure that competent, concerned, and varied interests have had an opportunity to participate." The staff believes that ANSI/ANS 3.5-1998 can, therefore, be endorsed without the exceptions or clarifications that have characterized NRC's endorsement of previous revisions.

The staff is simultaneously issuing Draft Guide DG-1080 (proposed Revision 3 of Regulatory Guide 1.149) for public comment. NRC Form 474 and the associated OMB clearance will also be modified to reflect NRC's endorsement of the 1998 revision of the standard upon final issuance of Regulatory Guide 1.149.

#### INTERIM REGULATORY BURDEN RELIEF THROUGH EXEMPTIONS TO 10 CFR PART 55.31(A)(5):

Facility licensees have expressed some urgency in realizing this particular regulatory relief. Because a change in the rule cannot be completed in the short term, the staff expects licensees to seek exemptions to the existing requirements of 55.31(a)(5). The staff will consider the exemptions in accordance with 10 CFR 55.11.

At the time of the 1987 rulemaking, there was a general unavailability of plant-specific simulators and, because of simulator model and computer limitations, those that were available did not necessarily provide operators with experience equivalent to actual plant operations. Since 1987, these general concerns have been effectively mitigated. Plant-referenced simulators are now readily available and well-suited, within the broad transient performance tolerances of the national standard, to the requirements of operator training and testing of operators. The actual experience requirement for license eligibility (completing five significant control manipulations), on the other hand, ensures that the manipulations are conducted in an environment of highest fidelity so that each license applicant understands the specific plant response expected from the reactivity and power level changes.

Known simulator performance exceptions can be, and routinely are, compensated for by supplemental training or by operator testing program guidance without affecting the degree to which an applicant's knowledge or mastery of abilities can be effectively assessed. The effect of simulator performance on the comparability of simulator training with actual plant experience is not included in programmatic guidance. Acceptable simulator performance has been assumed if a licensee's simulator program conforms to the national standard. However, although consistent with the national standard at a given time, a typical simulator might, to varying degrees, represent a mixture of 1) current plant operating characteristics, 2) some former operating characteristics based on superseded design data, and 3) some future operating characteristics based on planned design data changes. Because a simulator's scope, design data base, and technology are continually changing, the national standard now recognizes a need for software controls (e.g. configuration management, structured software design and development, and quality assurance) that might be similar to, but not necessarily to the level of actual plant design criteria. The standard does not specify the type or extent of software controls but defers to program management for implementation.

Therefore, in order to use the simulator in lieu of actual plant experience, the staff seeks additional assurance that the factors contributing to simulator performance or fidelity discrepancies are minimized and that the experience is gained in the context of evolutions carried out by an operating crew in a realistic control room environment. This assurance can be assumed if a facility licensee's simulator support program includes a combination of software control of key programs and pre-tested, scenario-based evolutions integral to the accredited training program. The staff believes that these

characteristics will ensure simulator performance fidelity and result in training conditions that are comparable to actual plant

experience. Absent these program characteristics, the staff may request additional information while considering an individual license application consistent with the current provisions of 55.31(b). During this rulemaking, the staff is prepared to favorably consider requests for exemption from the requirements of 55.31(a)(5) so that a simulation facility may be considered acceptable for completion of the requirement on a case-by-case basis with evidence from the facility licensee that, with respect to the planned reactivity manipulation scenarios, simulator fidelity is assured by adequate software controls and is confirmed before the training session. Alternatively, the staff will consider a commitment or certification of a simulation facility in accordance with ANSI/ANS 3.5-1998 to be sufficient evidence of simulator acceptability to fulfill the experience requirement of 55.31(a)(5) without a need for submittal of additional information regarding simulator software, software assurance, and fidelity.

COORDINATION:

The Office of the General Counsel (OGC) has no legal objection. The staff also expects the Committee To Review Generic Requirements to review the proposed changes before publication of the proposed rule.

The Office of the Chief Financial Officer has reviewed this Rulemaking Plan for resource implications and has no objections. The Office of the Chief Information Officer has reviewed the Rulemaking Plan for information technology and information management implications.

However, the plan suggests changes in information collection requirements that must be submitted to the Office of Management and Budget for approval at the same time the proposed rule is forwarded to the Office of the Federal Register for publication. Copies have also been sent to the Advisory Committee on Reactor Safeguards and the Office of the Inspector General for information.

RECOMMENDATION:

That the Commission note that the staff intends to proceed with the rulemaking plan and changes to 10 CFR Part 55.

Staff requests action within 10 days. Action will not be taken until the SRM is received. We consider this action to be within the delegated authority of the EDO.

original /s/ by  
William D. Travers  
Executive Director for Operations

Contact: Robert M. Gallo, NRR  
(301) 415-1031

Attachments: 1. Rulemaking Plan with Regulatory Analysis  
2. Recommended Changes to 10 CFR Part 55

---

ATTACHMENT 1

---

Rulemaking Plan

---

10 CFR Parts 55.31(a)(5), 55.45(b), 55.4, and 55.59(c)(4)(iv)  
Regarding the Use of Simulators in Operator Licensing

---

- Regulatory Issue
  - Actual Plant Operating Experience
  - Simulation Facility Certification and Testing
- Existing Regulatory Framework
  - Actual Plant Operating Experience
  - Simulation Facility Certification and Testing
- How the Regulatory Problem Will Be Addressed by Rulemaking
  - Actual Plant Operating Experience
  - Simulation Facility Certification and Testing
- Options
  - STATUS QUO (OPTION 1)
  - DELETE CURRENT REQUIREMENTS (OPTION 2)
  - INTEGRATED RULEMAKING (OPTION 3)
  - Actual Plant Operating Experience
  - Simulation Facility Certification and Testing
- Impact(s) on Licensees
  - STATUS QUO (OPTION 1)
  - DELETE CURRENT REQUIREMENTS (OPTION 2)

- INTEGRATED RULEMAKING (OPTION 3)
- Benefits
  - STATUS QUO (OPTION 1)
  - DELETE CURRENT REQUIREMENTS (OPTION 2)
  - INTEGRATED RULEMAKING (OPTION 3)
- Preferred Option
- Office of the General Counsel Legal Analysis
- Category of Rule
- Use of Technical Standards in Rulemaking
- Backfit Analysis
- Supporting Documents Needed
- Issuance by Executive Director for Operations or Commission
- Interoffice Management Steering Group
- Public/Industry Participation
- Resources
- Schedule

## Regulatory Issue

### ACTUAL PLANT OPERATING EXPERIENCE

10 CFR 55.31(a)(5) requires that five significant control manipulations which affect reactivity or power level be performed on the actual plant as a prerequisite for license eligibility. Those facility licensees whose plants have been shut down for extended periods have found this requirement to be particularly burdensome during restart. The plant ascension must be interrupted so that a number of newly licensed operators and license candidates can sequentially manipulate the controls of the reactor in order to remove restrictions from their licenses or to establish license eligibility. Plant operations managers cite not only potential cost savings associated with using the simulator, particularly during periods of steady-state operation, but also enhanced training through a wider range of available operation in an environment that is more conducive to individualized instruction.

### SIMULATION FACILITY CERTIFICATION AND TESTING

The current revision of the national standard, ANSI/ANS 3.5-1998, "Nuclear Power Plant Simulators for Use in Operator Training and Examination," employs a scenario-based testing and quality control philosophy that is inconsistent with the testing assumptions and requirements of the rule. The staff believes that implementation of ANSI/ANS 3.5 -1998 by facility licensees without revision of the rule would result in duplicate and inefficient simulator performance testing. The requirements of 10 CFR 55.45(b), in its present form, have become an impediment to facility licensees who might seek to reduce unnecessary regulatory burden and increase training program efficiency by adopting the staff's endorsement of later revisions of the national standard.

## Existing Regulatory Framework

### ACTUAL PLANT OPERATING EXPERIENCE

In 1984, the Commission took the position that simulator training is not necessarily equivalent to actual plant operating experience. This position supported comments from the industry and the public objecting to simulator training taking the place of actual plant operating experience because of inherent problems and uncertainties in simulator technology and because there were few plant specific simulators in 1984. Consequently, 55.31(a)(5), as amended in 1987, requires five significant control manipulations which affect reactivity or power level to be performed on the actual plant as a prerequisite for license eligibility. The rule made a distinction between "cold" and "hot" license applicants by allowing "cold" license applicants to take the operating test before performing the reactivity control manipulations, although only a conditional license would be issued pending completion of the requirement.

### SIMULATION FACILITY CERTIFICATION AND TESTING

As a result of the revisions to 55.45(b) published in 1987, facility licensees began to develop simulators for certification in accordance with American National Standards Institute/American Nuclear Society (ANSI/ANS) national standard ANSI/ANS 3.5-1985, "Nuclear Power Plant Simulators for Use in Operator Training." This national standard specified full-scope, stand-alone testing of system models and simulator training capabilities as part of initial simulator acceptance testing. The rule, based upon the assumption that similar testing would continue after the simulator was put in service, required periodic scheduling and reporting of test results. Licensees continue to test simulators in the manner of initial development and to submit test schedules and reports on a quadrennial basis to comply with the rule. The approach to simulator testing has changed considerably since the rule was published, and a new approach has been adopted as industry's standard through the issuance of the ANSI/ANS 3.5-1998.

The existing rule contains prescriptive aspects that may no longer be technically needed or required to support the training and examination programs. The existing rule, for example, contains outdated schedule requirements for initial procurement and certification of simulation facilities. The existing rule also contains reporting requirements that impose a performance testing program based on repetition of 25 percent of the full simulator training capability, including thousands of malfunctions, annually. Facility licensees that choose to adopt the latest industry standard and to change their testing programs would find the existing rule to be an obstacle to change.

## How the Regulatory Problem Will Be Addressed by Rulemaking

The requested rulemaking would promote more effective plant operating experience for initial license applicants through improved on-the-job training by allowing use of the simulation facility in lieu of the actual plant to satisfy the license eligibility requirement for performance of control manipulations that affect reactivity or power level.

In the staff's view, the recommended proposed rule also would facilitate adaptation of existing simulator support and requalification training programs to

the 1998 revision of the national standard in order to eliminate recurring outdated, duplicate, and inefficient simulator performance testing and reporting requirements. This proposed rule would bring the current requirements up to date with evolutionary changes in simulation technology and training and examination programs. The proposed rule would clarify minimum simulator capabilities in place of the existing requirements for simulator certification and pre-scheduled, stand-alone performance testing. This proposed rule would remove the impediment to full implementation of the national standard that the wording of the current rule has created.

This proposed rule also would directly reduce unnecessary regulatory burden by eliminating the current requirement for submittal of certification and performance test reports on a quadrennial basis.

#### ACTUAL PLANT OPERATING EXPERIENCE

The requirement for performing five significant control manipulations that affect reactivity to be performed on the actual plant would also be revised to allow use of the simulation facility. The operating experience requirement will be fully satisfied as a prerequisite to license eligibility. The distinction between "cold" and "hot" facility licenses would be deleted from the control manipulations requirement.

As early as 1967, the Atomic Energy Commission (AEC) recognized the developing use of reactor simulators. Thereafter, industry developed the national standard, ANSI N18.1-1971, explicitly providing that simulator training was an acceptable means of acquiring the necessary experience. This standard was endorsed in Regulatory Guide 1.8, September 1975. N18.1-1971 was subsequently revised in 1978 and again in 1981, each time with NRC endorsement by revision of the Regulatory Guide. These revisions of the national standard contained an on-the-job training experience requirement for reactivity manipulations.

Eligibility for a license encompasses education, training, and experience factors. Reactivity manipulations, as they are presently required in 10 CFR 55.31(a)(5) using the actual plant for which a license is sought is an operating experience requirement that is addressed by on-the-job training. The value of an experience requirement lies not only in faithful replication of reactor operating characteristics, but also in faithful replication of the control room environment. Accurate and validated scenarios must be constructed to convey realism, including simultaneous task management and faulted conditions.

Two considerations must be addressed before a simulation facility can be deemed suitable for fulfilling the experience requirements of license. First, a process of structured software development and implementation is needed, at least for the directly associated models, to minimize the introduction of operational performance discrepancies during software modifications and updates. Second, scenario-based testing is needed to ensure that the simulator is capable of being used to satisfy predetermined objectives without significant performance discrepancies, or deviation from the approved scenario sequence.

The proposed rule would eliminate distinctions between "cold" and "hot" licenses. It also would specify the minimum models that must be maintained in a controlled manner and the types of scenario evolutions that are acceptable for equivalence to plant experience.

#### SIMULATION FACILITY CERTIFICATION AND TESTING

This proposed rule would delete the requirement for prescriptive test performance and scheduling. Facility licensees would then be able to voluntarily adjust their performance test programs consistent with user needs as defined by their accredited training programs or voluntarily conform existing simulator programs to new revisions of the national standard. The 1981 version of the standard specified a testing regimen that was written in the context of initial simulator procurement, so much so that the testing program served as the simulator procurement acceptance test list. Since that time, industry initiative has changed ANSI/ANS 3.5 twice, in 1985 and in 1993, but the focus of the standard remained initial construction, a unique condition in which extensive factory acceptance testing is performed on the basis of individual simulator capabilities before establishing a software configuration baseline. This type of testing does not adequately consider the training and examination environment in which the simulator will be used.

For the past several years, the simulators have been in an update and maintenance portion of the life-cycle model, an area for which previous revisions of the standard were not intended and for which the standard has offered virtually no specific guidance. Most utilities have simply archived software specification documents and initial performance data and have built their required performance testing programs around repetition of previous tests and resolution of documented performance discrepancies. Major modifications to simulation modules, operating environments, and computer platforms are continually being performed by both facility licensees and simulator vendors, often with minimal verification, validation, and documentation. Identification and resolution of discrepancies is then made a function of the discrepancy reporting and resolution practice, resulting in a large number of discrepancies being identified by the trainees. The proposed rule would remove apparent inconsistency between the operational phase of facility licensee programs and simulator testing requirements.

#### Options

##### STATUS QUO (OPTION 1)

The existing rule could be left as-is and facility licensees could continue to provide all experience prerequisites for license eligibility using the actual plant and continue to test and report on simulator fidelity.

##### DELETE CURRENT REQUIREMENTS (OPTION 2)

The NRC could initiate rulemaking to delete requirements which are considered to be unnecessarily burdensome on a case-by-case basis.

##### INTEGRATED RULEMAKING (OPTION 3)

This rulemaking plan identifies two significant proposed changes to 10 CFR 55 and two additional conforming changes. The staff considered separate rulemaking activities but opted for an integrated approach because the topics are closely related.

#### ACTUAL PLANT OPERATING EXPERIENCE

The regulatory position for requiring actual plant operating experience has, in one form or another, existed since 1963. The requirement is intended to

ensure that the applicant has learned to operate the controls of the facility before receiving a license. Historically, there has been a difference between the wording of the rule and its implementation in practice. This rulemaking effort addresses that difference.

Since the Commission developed its initial position regarding simulator training, the concerns that precluded or limited the acceptability of simulator training as equivalent to plant operation have been mitigated by advancements in simulation technology and availability. The 1987 changes to 10 CFR Part 55.45 resulted in certification of a simulation facility by each facility licensee. With increased availability of simulation facilities, the industry also experienced maturing of evolving simulation technology through three revisions of the governing national standard with concomitant increases in computing capability, model complexity, and fidelity. Today, simulator model fidelity and computational limitations that influenced decision making processes a decade ago are of significantly lesser concern.

#### SIMULATION FACILITY CERTIFICATION AND TESTING

When NRC's regulatory position was initially adopted in 1981, industry was active in developing and adopting a national standard, ANSI/ANS 3.5, for simulators. The basis for NRC's earlier choice of procedural alternatives for its regulatory position is still valid in terms of industry's continuing active revision of the standard. However, the majority of facility licensees choose to maintain their simulators in accordance with the 1985 revision of the national standard because 55.45(b) requires schedule-based performance testing and reporting that is inconsistent with the scenario-based testing and quality control philosophy that has become acceptable in later revisions of the national standard. The proposed rulemaking would remove obstacles to full and voluntary implementation of improved revisions of the national standard by facility licensees.

#### Impact(s) on Licensees

##### STATUS QUO (OPTION 1)

BURDEN INCREASE - none

BURDEN DECREASE - none

EFFECT ON SAFETY - none

##### COSTS

CAPITAL COST - not applicable because no new capital procurement is required

OPERATIONAL COST - no immediate effect

RECORD KEEPING - no immediate effect

REPORTING BURDEN - no immediate effect

##### DELETE CURRENT REQUIREMENTS (OPTION 2)

BURDEN INCREASE - none

BURDEN DECREASE - reduction due to elimination of recurring performance testing requirements

EFFECT ON SAFETY - increased risk because NRC would have a reduced means of determining that a simulator used in operator training or examination faithfully models the dynamics of the reference plant, resulting in decreased confidence in licensee training programs and questionable conclusions from simulator-based license examinations.

##### COSTS

CAPITAL COST - not applicable because no new capital procurement is required

OPERATIONAL COST - reduction due to elimination of recurring performance testing requirements

RECORD KEEPING - reduction due to elimination of recurring performance testing requirements

REPORTING BURDEN - reduction due to elimination of recurring performance testing requirements and elimination of quadrennial test schedule forecasting and notification of changes in test program administration during the previous quadrennial test period

##### INTEGRATED RULEMAKING (OPTION 3)

BURDEN INCREASE - none

BURDEN DECREASE - allows licensees to use the simulation facility in lieu of the actual plant to perform training activities  
- reduction of stand-alone testing  
- reduction of recurring testing

- reduction of documentation requirements

#### EFFECT ON SAFETY

- As a response to a revised national standard, the backfit requirement of proof of substantial increase in safety is satisfied implicitly.

#### COSTS

##### CAPITAL COST

- not applicable because no new capital procurement is required

##### OPERATIONAL COST

- net reduction in operational cost is expected due to a reduction in required periodic performance testing and coordination with existing training programs. One-time costs are expected to revise existing testing programs.

- net reduction in operational cost due to elimination of performance testing requirements that are not directly related to the training and examination missions of the simulator. One-time costs are expected to revise existing testing programs.

- reduction in lost revenue (replacement power cost) as actual plant startup would not be delayed to conduct on-the-job training

#### RECORD KEEPING

- net reduction of record keeping requirements due to a change in testing philosophy. Scenario-based testing, as defined in ANSI/ANS 3.5-1998, entails "demonstration" of simulator capabilities without the implied documentation burden of more formalized, stand-alone testing. One-time costs are expected to revise existing testing programs.

#### REPORTING BURDEN

- reduction in reporting burden resulting from elimination of quadrennial test schedule forecasting and notification of changes in test program administration during the previous quadrennial test period.

### Benefits

#### STATUS QUO (OPTION 1)

The "status quo" option benefits the facility licensee because no additional costs ensue to restructure programs that are already in place. The "status quo" option does not bring facility licensee simulator programs into conformance with the industry's national standard. Because most facility licensees already conduct a form of scenario-based testing, this option would maintain the present duplicate nature of testing being performed, which is neither required or intended by the rule or by regulatory guidance.

#### DELETE CURRENT REQUIREMENTS (OPTION 2)

The "delete current requirements" option would provide immediate relief from recurring performance testing and reporting requirements. It would not address the Commission's previously expressed concerns about ensuring sufficient testing to prevent negative training. The "delete current requirements" option would increase the possibility of negative training. This option would also fail to address suitability of the simulator for satisfying an operating experience requirement.

#### INTEGRATED RULEMAKING (OPTION 3)

The rulemaking option provides consistency between the national standard and the regulatory position. This consistency relieves facility licensees of testing and reporting requirements that are not directly related to the training and examination missions of the simulator. This focused testing, when coupled with structured software design and implementation, would allow a reduction in the number of operational performance discrepancies, thus reducing the possibility for negative training and enhancing suitability of the simulator for satisfying an experience requirement. A draft regulatory analysis indicates that the industry as a whole is expected to realize net cost savings and schedule flexibility. One-time costs, which will vary as a function of individual licensee programs, are expected to revise existing testing programs.

### Preferred Option

The staff prefers and recommends INTEGRATED RULEMAKING (OPTION 3) rather than the other two options because it offers potential savings for industry in the short term while maintaining NRC's reasonable assurance of simulator fidelity. Option 3 would also provide the greatest operating flexibility to facility licensees in structuring simulator support programs to support changing training objectives and revised industry standards. The staff recognizes that implementation of this option would entail cost on the part of both NRC and industry for one-time revision of existing programs. However, the draft regulatory analysis suggests that industry could recover these costs in the immediate following years for a net gain.

### Office of the General Counsel Legal Analysis

The Office of the General Counsel (OGC) has reviewed the proposed rulemaking plan revising 10 CFR 55.31(a)(5) and 55.45(b) as these pertain to the use of simulators in operator licensing for any potential legal complications or known bases for a legal objection.

OGC has not identified any Paperwork Reduction Act issues. OGC does not believe that this action constitutes a "major rule" pursuant to the Small Business Regulatory Enforcement Act of 1996, but, in accordance with EDO guidance, the rulemaking plan will be submitted to OMB for verification of this position at the earliest point that sufficient information is available on which OMB can render such advice.

This proposed rulemaking plan would revise the requirement for five significant control manipulations which affect reactivity which currently must be performed on the actual plant, to allow these manipulations to be performed on a simulator. Until this rulemaking is complete, the staff is prepared to

favorably consider requests for exemptions from this requirement on a case-by-case basis, as long as a facility licensee can provide evidence that simulator fidelity is controlled in a structured software environment with scenario-based simulator performance testing.

In addition, this proposed rulemaking plan would revise the periodic scheduling and reporting of test results that are currently required on a quadrennial basis. The revised regulation would allow facility licensees to voluntarily adjust their performance test programs consistent with user needs as defined by their accredited training programs and remove obstacles to voluntary implementation of improved revisions of the national standard which, as endorsed by the NRC, focuses on the training and examination environment in which the simulator will be used (whereas earlier standards appropriately focused on the initial construction of simulators).

Because these amendments are voluntary in nature, i.e., they are not imposed on licensees who do not opt to adopt this approach to their use of simulators in their training and testing programs, a backfit analysis pursuant to 10 CFR 50.109, is not necessary. Nor does this action require an environmental assessment because it is categorically excluded pursuant to 10 CFR 51.22 (c)(1).

A draft regulatory analysis is provided. In all other respects, OGC has not identified any potential legal complications or known bases for a legal objection to the proposed rulemaking plan.

### Category of Rule

This rulemaking effort is in the category of unnecessary regulatory burden relief for facility licensees. This rulemaking would also codify facility licensee and current regulatory practices.

### Use of Technical Standards in Rulemaking

The National Technology Transfer Act of 1995, Pub. L. 104-113, requires that Federal agencies use technical standards that are developed or adopted by voluntary consensus standards bodies unless the use of such a standard is inconsistent with applicable law or otherwise impractical. In implementing the proposed rule, the NRC proposes to assess simulator acceptability for training and examination using the 1985, 1993, or 1998 revisions of American National Standards Institute/American Nuclear Society (ANSI/ANS) 3.5, "Nuclear Power Plant Simulators for Use in Operator Training and Examination," as endorsed through Regulatory Guide 1.149. This standard is voluntarily incorporated by facility licensees in their simulator support programs. No government-unique standards will be referenced in the proposed rule. NRC will invite comment on the applicability and use of ANSI/ANS 3.5 and other standards with publication of the proposed rule.

### Backfit Analysis

In the staff's view, implementation of this new regulatory guidance is not a backfit as defined in 10 CFR 50.109(a)(1). Facility licensees would not be required by this rulemaking to change existing programs or to adopt new regulatory guidance. Rather, the proposed rule would permit training to be conducted on five significant control manipulations at either the facility or a plant-referenced simulator.

The proposed rule would also eliminate certification of simulation facilities and submittal of quadrennial test reports and schedule information. Finally, the proposed rule would add criteria on simulator fidelity assurance in order to support the proposed changes permitting simulator training of five significant control manipulations, and would clarify that the requirements of 55.45(b) apply to all planned uses of the simulation facility.

All of the proposed changes constitute either permissible relaxations from current requirements or provide a new alternative to compliance with the existing requirements of the rule. Accordingly, the proposed rule's provisions do not constitute a backfit and a backfit analysis need not be proposed. However, the staff has prepared a regulatory analysis which identifies the benefits and costs of the proposed rule, and evaluates other options for addressing the identified issues. As such, the regulatory analysis constitutes a "disciplined approach" for evaluating the merits of the proposed rule and is consistent with the underlying intent of the Backfit Rule.

### Supporting Documents Needed

The relevant supporting documents which will require modification in whole or in part are:

Draft Guide DG-1080 (proposed Rev. 3 to Regulatory Guide 1.149)

NRC Form 474, "Simulation Facility Certification"

NUREG-1262, "Answers to Questions at Public Meetings Regarding Implementation of Title 10, Code of Federal Regulations, Part 55 on Operators' Licenses," November 1987

NUREG-1258, "Evaluation Procedure for Simulation Facilities Certified Under 10 CFR 55," December 1987

NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," January 1997

### Issuance by Executive Director for Operations or Commission

This rule would be issued by the Commission.

### Interoffice Management Steering Group

An interoffice management steering group will not be used for this rulemaking effort.

### Public/Industry Participation

Industry interest and participation are expected with this rulemaking. This rulemaking, with its related revision of regulatory guidance, would eliminate a burdensome performance testing requirement that burdens all facility licensee simulator support programs.

Previous experience with implementation of revised regulatory guidance involved two to three public meetings and a workshop. Industry has expressed

interest in a workshop in the event that this rulemaking is approved; however, because the interest is directed more toward implementation than to rulemaking itself, the workshop may be mutually scheduled after final rulemaking.

Based on similar revisions to regulatory guidance and the defined tasks in the regulatory analysis, the following industry organizations are expected to participate - in addition to interested facility licensees:

- Nuclear Energy Institute
- Utility Simulator Users Group
- ANSI/ANS 3.5 Writing Committee
- Institute of Nuclear Power Operations

On the basis of similar revisions to regulatory guidance, public comments from outside the industry are expected to be minimal.

## Resources

The current budget includes resources for the rulemaking on 10 CFR 55.31 and 55.45 and the development of implementation guidance, including Regulatory Guide 1.149 and NUREG-1021, NUREG-1258, and NUREG-1262. In Reactor Licensing, NRR budget estimates include 1.25 FTE in FY 1999 to support the rulemaking effort, development of implementation guidance, including revisions to the examination standards and NUREGs, and examiner training. Other NRC staff support effort is 0.3 FTE.

	Rulemaking	Regulatory Guide
NRR Staff Lead	0.65 FTE	0.1FTE
NRR Supporting Division Staff	0.4 FTE	0.1FTE
Regional Contacts	0	0
OGC Staff Contact	0.1 FTE	0.1 FTE
Other Office Contacts (RES)	0.1 FTE	<0.1 FTE

## Schedule

This rulemaking may be a good candidate for "fast-track" processing in that it grants relief from restrictions while not imposing additional burdens on licensees or increasing the risks to the health and safety of any segment of industry or the public.

Proposed Rule to EDO	6 months after approval of the rulemaking plan
Final Rule to EDO	1 year following publication of proposed rule

---

## DRAFT REGULATORY ANALYSIS FOR

## REVISION OF 10 CFR PART 55 TO REDUCE UNNECESSARY REGULATORY BURDEN ASSOCIATED WITH THE USE OF SIMULATION FACILITIES IN OPERATOR LICENSING

---

- 1. Statement of Problem and Objective
- 2. Background
- 3. Identification and Draft Analysis of Alternative Approaches
- 4. Regulatory Impact - Qualitative Costs and Benefits
  - The following values (benefits) were considered in the draft regulatory analysis:
  - The following impacts (costs) were considered in the draft regulatory analysis:
- 5. Decision Rationale
- 6. Implementation
- 6.1 Schedule
- SUMMARY
- PROPOSED RULE, REDLINE-STRIKEOUT VERSION
  - 55.4 Definitions.
  - 55.31 How to apply.
  - 55.45 Operating tests.
  - 55.59 Requalification.
- PROPOSED RECOMMENDED NEW RULE, CLEAN VERSION
  - 55.4 Definitions.
  - 55.31 How to apply.
  - 55.45 Operating tests.
  - 55.59 Requalification.

## 1. Statement of Problem and Objective

refer to rulemaking plan

## 2. Background

refer to rulemaking plan

## 3. Identification and Draft Analysis of Alternative Approaches

refer to rulemaking plan

## 4. Regulatory Impact - Qualitative Costs and Benefits

The proposed rulemaking, including problem identification, the conceptual improvement sought by this regulatory action, an evaluation of alternatives, and proposed language for a revised rule are presented in the Rulemaking Plan and Commission Paper. Because the proposed rulemaking does not constitute a backfit, neither a separate Backfit Regulatory Analysis or a separate Safety Goal Evaluation is required. A separate CRGR review package has been prepared in accordance with CRGR charter requirements. This draft regulatory analysis consists of the results of a value-impact (cost-benefit) quantitative assessment of the proposed rulemaking, using estimated data and stated assumptions.

The draft regulatory analysis considers direct values and impacts for NRC and facility licensees. It also considers indirect costs that are borne by the NRC and by the larger "industry," such as the cost of changes to an existing accreditation program. Values and impacts are presented for the first (implementation) year and subsequent three years. The draft analysis assumes that all plants voluntarily opt to change existing programs, including adoption of ANSI/ANS 3.5-1998, "Nuclear Power Plant Simulators for Use in Operator Training and Examination," and use of the simulation facility to complete the reactivity manipulations prerequisite for an operator's license. A common professional labor rate was assumed for both NRC and industry to expedite the analysis.

The draft regulatory analysis considers both one-time implementation costs and recurring costs. The analysis, therefore, is based on a four year simulator cycle, similar to the quadrennial reporting cycle of the present language of the rule.

THE FOLLOWING VALUES (BENEFITS) WERE CONSIDERED IN THE DRAFT REGULATORY ANALYSIS:

**Reduced Review for Routine (Quadrennial) Reports** - NRC staff will realize savings in the form of reduced review time for routine reports by the proposed deletion of the quadrennial test reporting requirement. The value of the change is based on an assumed four hours per review at a rate of one-fourth of the total number of simulation facilities per year. This change affects only the cost associated with quadrennial performance test reports, not the testing itself. The requirement for recurring performance testing is a function of ANSI/ANS 3.5, as endorsed by Regulatory Guide 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations," and is not changed by this rulemaking.

**Reduced Record Keeping** - Record keeping costs, associated with reduced staff review for routine (quadrennial) reports, including administrative and archival costs, are assumed as 20 percent of the cost of the associated activity.

**Reduced Replacement Power Demand** - The cost of cycling the actual plant to complete reactivity manipulations as a prerequisite for license eligibility is considered in terms of the cost of replacement energy from the grid, assuming that the nuclear power plant is being brought down from full power. A power reduction of 10 per cent of a 1000 Mwe unit for a duration of one hour was considered. It is also assumed that all license applicants perform five evolutions each. The cost of replacement energy is assumed at \$25/MW-hr, which is consistent with on-peak interchange prices for the northeast United States.

**Reduced Routine (Quadrennial) Reporting** - Facility licensee simulator support staff and regulatory compliance staff will realize savings in the form of reduced preparation and review time for routine reports by the proposed deletion of the quadrennial test reporting requirement. Three staff-months per facility per year was assumed. This change affects only the cost associated with preparation and transmittal of quadrennial performance test reports, not the testing itself. The requirement for recurring performance testing is a function of ANSI/ANS 3.5, as endorsed by Regulatory Guide 1.149, and is not changed by this rulemaking.

**Reduced Duplicate Testing** - The draft analysis assumes that facility licensee simulator support programs adopt ANSI/ANS 3.5-1998 and change to scenario-based testing which is a function of the accredited training program. One-hundred and sixty hours simulator support staff hours per year are assumed to be saved by elimination of redundant testing due to improved coordination between the simulator support and user organizations.

**Reduced Record Keeping** - Record keeping costs, associated with reduced licensee duplicate testing, including administrative and archival costs, are assumed as 20 percent of the cost of the associated activity.

**Reduced Number of Discrepancies** - The draft regulatory analysis assumes that adoption of the ANSI/ANS 3.5 provides an efficiency benefit that is measurable in a reduction in significant performance discrepancies. A reduction of five discrepancies per year per simulation facility is assumed. Eight hours labor per discrepancy was assumed for troubleshooting, software correction, and subsequent retesting.

**Reduced Examination Preparation Time** - The draft regulatory analysis assumes that adoption of ANSI/ANS 3.5-1998 provides a benefit that is measurable in a reduction in reduced examination preparation time due to improved simulator fidelity with fewer unresolved performance discrepancies. An efficiency improvement of one-half hour per scheduled examination is assumed. The number of scheduled examinations is determined to be the total number of applicants divided by an assumed six applicants per scheduled examination.

**Reduced Overtime & Backshift Testing** - The draft regulatory analysis assumes that adoption of ANSI/ANS 3.5-1998 provides a benefit that is measurable in a reduction in reduced need for overtime and backshift testing due to improved coordination between simulator support and simulator user organizations and scenario-based testing. The analysis assumes the reduction in overtime and backshift testing to be ten per cent of the reductions in routine test reporting and duplicate testing.

THE FOLLOWING IMPACTS (COSTS) WERE CONSIDERED IN THE DRAFT REGULATORY ANALYSIS:

**Rulemaking** - NRC will realize direct costs from the rulemaking process. The rulemaking plan assumes 0.8 FTE per year for two years, although the total cost associated with rulemaking are shown in the first year.

**Revise Regulatory Guidance (RG-1.149)** - Regulatory Guide 1.149 will be revised to endorse ANSI/ANS 3.5-1998. This is a one-time NRC cost based on 0.3 FTE in the first year only in accordance with the rulemaking plan.

**Revise Regulatory Guidance (NUREG -1262)** - NUREG -1262, "Answers to Questions at Public Meetings Regarding Implementation of Title 10, Code of Federal Regulations, Part 55 on Operators' Licenses," will be revised in part to conform to the language of the proposed rule the revised RG-1.149. This is a one-time NRC cost based on an assumed 3 month (480 hour) effort in the first year only.

**Revise Regulatory Guidance (NUREG -1258)** - NUREG -1258, "Evaluation Procedure for Simulation Facilities Certified Under 10 CFR 55," will be revised in part to conform to the language of the proposed rule the revised RG-1.149. This is a one-time NRC cost based on an assumed 2 month (320 hour) effort. In actual schedule, this effort is expected to occur after implementation, in the second year of the cycle. However, this analysis shows the NUREG-1258 revision as a one-time first year effort to avoid confusion with other recurring costs in the out-years.

**Revise Regulatory Guidance (NUREG -1021)** - Appropriate sections of NUREG -1021, "Operator Licensing Examination Standards for Power Reactors," will be revised to conform to the language of the proposed rule the revised RG-1.149. This is a one-time NRC cost based on an assumed 1 month (160 hour) effort. In actual schedule, this effort is expected to occur after implementation, in the second year of the cycle. However, this analysis shows the NUREG-1021 revision as a one-time first year effort to avoid confusion with other recurring costs in the out-years.

**Implementation Workshop** - NRC will incur one-time costs associated with preparation for and conduct of a one-week (40 hour) implementation workshop for facility licensees. A four-to-one preparation-execution ratio is assumed.

**Train Examiners** - NRC will realize a recurring cost associated with training examiners. The analysis assumes four hours of training each for fifty examiners in the first year and 1 hour per year of refresher training in the out-years.

**Create Cycle-specific Core Model** - The analysis assumes that the nuclear and thermal -hydraulic core models will be modified to replicate the particular core configuration that exists in the plant for which applicants are establishing license eligibility. Over the four year cycle of the analysis, two core model modifications are assumed. An effort of six weeks (240 hours) development and 2 weeks (80) testing/validation per simulation facility is assumed.

**Develop & Validate Reactivity Scenarios** - Facility licensees will realize a one-time cost in the first year related to developing and validating a bank of reactivity manipulation scenarios with which license applicants may use the simulator to establish license eligibility. The analysis assumes a bank of ten scenarios per facility. An effort of ten hours per scenario is assumed.

**Revise Simulator Configuration Management** - Facility licensees will incur a one-time cost in the first year associated with revision of simulator configuration management programs. An effort of one month (160 hours) per facility is assumed.

**Revise Simulator Test Program** - Facility licensees will incur a one-time cost in the first year associated with revision of existing simulator test programs to scenario-based testing. An effort of three months (480 hours) per facility is assumed.

**Revise Administrative Procedures** - Facility licensees will incur a one-time cost in the first year associated with revision of existing simulator-related administrative procedures to accommodate scenario-based testing, changes in record retention processes, and examination security provisions. An effort of one month (160 hours) per facility is assumed.

**Implementation Workshop** - Facility licensees will incur one-time costs associated with participation in a one-week (40 hour) implementation workshop. Participation by two persons (one simulator support staff and one training staff) per facility is assumed.

**Train Licensee Instructors** - Facility licensees will realize a recurring cost associated with training instructors and simulator support staff. The analysis assumes twelve hours of training each for six staff members per facility in the first year and 3 hours per year of refresher training in the out-years.

**Develop Accreditation Criteria for Reactivity Evolutions** - Industry will realize a one-time cost in the first year associated with development and promulgation of appropriate accreditation criteria for reactivity manipulation scenario integration with existing accredited training programs. An effort consisting of a six person task group for three months (480 hours) each and eighty hours of review per facility is assumed.

**Increased Application Review Time for Reactivity Manipulations** - NRC and facility licensees will realize increased review costs for license applications related to reactivity manipulations performed on the simulator. One-half hour per license application is assumed.

**Increased Examination Preparation Time for Simulator Status Review** - NRC will realize increased cost per scheduled examination related to confirmation of simulator acceptability in accordance with the proposed revised rule. One half-hour per scheduled examination is assumed. The number of scheduled examinations is determined to be the total number of applicants divided by an assumed six applicants per scheduled examination.

## 5. Decision Rationale

The analysis suggests that licensees will incur a net cost impact in the first year of implementation of the proposed rule due primarily to one-time restructuring and coordination of existing simulator support programs with training programs. In the following years, a reduced need for replacement power and elimination of quadrennial test reporting requirements will result in net savings as compared with current practices and requirements. Over

the quadrennial period immediately following implementation of the proposed rule, the analysis suggests a positive ratio of industry value/impact.

## 6. Implementation

### 6.1 Schedule

No implementation problems are expected. No effect on other schedules is anticipated.

---

#### Draft Regulatory Analysis for Revision to 10 CFR Parts 55.31(a)(5) and 55.45(b)

##### Assumptions

FTE (hr/yr)	1460
No. simulators	70
Exams/yr	550
Labor Rate (\$/hr)	140
Replacement Power (peak \$/Mw-hr)	25
Load Change/Reactivity Manipulation (MW-hr/evolution)	100
Average Time per Reactivity Manipulation (hr/evolution)	1
Record keeping & Administrative (% task)	0.2
Discrepancy Resolution (hrs/discrepancy)	8
Rulemaking Duration (yrs)	2
Cycle Duration (yrs)	4
Number of Reactivity Scenarios	10
NRC Staff Training (hrs/examiner)	4
Industry Instructor Training (hrs/instructor)	12

Values (\$)	Year 1	Years 2-4
Direct NRC Saving	9800	29400 reduced review for routine (4 yr) reports
	1960	5880 reduced record keeping
Direct Licensee Saving	6875000	20625000 reduced replacement power demand
	4704000	14112000 reduced routine (quadrennial) reporting
	1568000	4704000 reduced duplicate testing
	940800	2822400 reduced record keeping
Indirect Saving	392000	1176000 reduced number of discrepancies
	449166	1347498 reduced examination preparation time
	627200	1881600 reduced overtime & backshift testing
SubTotal Saving (\$)	15567926	46703778
Total Saving		62271704
Total NRC Saving	11760	29424
Total Industry Saving	15556166	46668498

Impacts (\$)	Year 1	Years 2-4
Direct NRC Cost	327040	rulemaking
	61320	revise regulatory guidance (RG-1.149)

	67200		revise regulatory guidance (NUREG -1262)
	44800		revise regulatory guidance (NUREG -1258)
	22400		revise exam standards (NUREG - 1021)
	28000		implementation workshop
	52640	21420	train NRC examiners
Direct Licensee Cost			
	3136000	3136000	create cycle-specific core model
	980000		develop & validate reactivity scenarios
	1568000		revise simulator configuration management
	4704000		revise simulator test program
	1568000		revise administrative procedures
	3136000		revise training program
	784000		implementation workshop
	705664	530460	train licensee instructors
Indirect Cost			
	1187200		develop scenario accreditation criteria
	38500	115500	incr. NRC-398 review for manipulations
	6416	19248	incr. examination prep for simulator review
SubTotal Cost (\$)	18417180	3822628	
Total Cost		22239808	
Total NRC Cost	<b>645108</b>	<b>146544</b>	
NRC Net Value / Impact (\$)	-633348	-117120	
NRC Value / Impact Ratio		5.20e-02	
Total Industry Cost	<b>17772072</b>	<b>3145624</b>	
Industry Net Value / Impact (\$)	-2215906	43522874	
Industry Net Value/Impact per Simulator	-31655	621755	
Industry Value / Impact Ratio		2.97e+00	

ATTACHMENT 2

PROPOSED CHANGES TO 10 CFR 55  
TO REDUCE UNNECESSARY REGULATORY BURDEN  
AND SUPPORT IMPLEMENTATION OF REVISIONS TO NATIONAL CONSENSUS STANDARD ANSI/ANS 3.5

July 1999

- SUMMARY
- PROPOSED RULE, REDLINE-STRIKEOUT VERSION
  - 55.4 Definitions.
  - 55.31 How to apply.
  - 55.45 Operating tests.
  - 55.59 Requalification.
- PROPOSED RECOMMENDED NEW RULE, CLEAN VERSION
  - 55.4 Definitions.
  - 55.31 How to apply.
  - 55.45 Operating tests.
  - 55.59 Requalification.

SUMMARY

Definitions: Three definitions would be modified to provide correlation between the regulatory definition, the national standard, the requirements of the regulations, and established staff and industry practices.

How to apply: The distinction between "hot" and "cold" licenses would be removed, allowing the requirement for five reactivity manipulations to be satisfied using either the plant or the simulator as part of an approved training program. Acceptable control manipulations and evolutions are specified in the proposed rule language.

Operating tests: Outdated schedule requirements for initial procurement and implementation of simulation facilities would be deleted.

The requirements for certification of a simulation facility and associated submittal of a quadrennial test report would be deleted.

Essential characteristics and capabilities of simulators to support minimum requirements of the rule would be clarified within the definition of a plant-referenced simulator.

The requirement for scheduling four years of performance testing at a rate of 25 percent per year would be deleted to comport with the structured software development and implementation methodologies augmented by a scenario-based testing philosophy.

A requirement would be clarified to make results of performance tests and discrepancies available for review prior to or concurrent with examination preparation in lieu of routine submittal of test reports, the requirement for which would also be deleted. Limitations on the usage of an unacceptable plant-referenced simulator would be also clarified.

Existing performance criteria for Commission disapproval of a simulation facility would be modified to comport with structured software development and implementation methodologies augmented by a scenario-based testing philosophy.

Requalification: References to simulator certification would be removed.

## PROPOSED RULE, REDLINE-STRIKEOUT VERSION

### 55.4 DEFINITIONS.

As used in this part:

...

"Performance testing" means validation, scenario-based, or operability testing conducted to verify a simulation facility's performance as compared to actual or predicted reference plant performance.

...

"Plant-referenced simulator" means a simulator modeling the systems of the reference plant with which the operator interfaces in the control room, including operating consoles, and which permits use of the reference plant's procedures. A plant-referenced simulator demonstrates expected plant response to operator input, and to normal, transient, and accident conditions to which the simulator has been designed to respond. A plant-referenced simulator is designed, implemented, and maintained such that it:

(1) Is sufficient in scope and fidelity to allow conduct of the evolutions listed in paragraphs 55.45(a)(1) through (13), and 55.59(c)(3)(i)(A) through (AA), as applicable to the design of the reference unit.

(2) Includes recurring assurance of fidelity by performance testing throughout the life of the simulation facility consistent with paragraphs 55.45(b)(2)(ii)(B) and 55.45(b)(3)(i)(A).

(3) Includes provisions for maintaining examination and test integrity consistent with paragraph 55.49.

... (4) Allows for the completion of on-the-job training experience prerequisites for license operator eligibility consistent with paragraph 55.45(b)(2)(ii).

"Simulation facility" means 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 applicants candidates :

(1) The plant,

(2) A plant-referenced simulator,

(3) Another simulation device, including part-task and limited scope simulation devices.

### 55.31 HOW TO APPLY.

(a) The applicant shall:

(ITEMS 1-4 NO CHANGES)...

(5) Provide evidence that the applicant, as a trainee, has successfully manipulated the controls of the facility for which a license is sought. At a minimum, five significant control manipulations must be performed which affect reactivity or power level. The Commission may accept evidence of satisfactory performance of control manipulations as part of an SAT-based, Commission-approved training program by a trainee on a plant-referenced simulator acceptable to the Commission under Section 55.45(b) of this part in lieu of use of the actual plant. Control manipulations performed on the simulator may be chosen from a representative sampling of the control manipulations and plant evolutions described in Section 55.59(c)(3)(A-F),(R),(T),(W), and (X) of this part, as applicable to the design of the plant for which the license application is submitted. For a facility that has not completed preoperational testing and initial startup test program as described in its Final Safety Analysis Report, as amended and approved by the Commission, the Commission may accept evidence of satisfactory performance of control manipulations as part of a Commission-approved training program by a trainee on a simulation facility acceptable to the Commission under Section 55.45(b) of this part. For a facility which has (i) completed

~~preoperational testing as described in its Final Safety Analysis Report, as amended and approved by the Commission, and (ii) is in an extended shutdown which precludes manipulation of the control of the facility in the control room, the Commission may process the application and may administer the written examination and operating test required by Section 55.41 or 55.43 and 55.45 of this part, but may not issue the license until the required evidence of control manipulations is supplied. For licensed operators applying for a senior operator license, certification that the operator has successfully operated the controls of the facility as a licensed operator shall be accepted; and~~

55.45 OPERATING TESTS.

(a) Content. The operating tests administered to applicants for operator and senior operator licenses in accordance with paragraph (b)(1) of this section are generally similar in scope. The content will be identified, in part, from learning objectives derived from a systematic analysis of licensed operator or senior operator duties performed by each facility licensee and contained in its training program and from information in the Final Safety Analysis Report, system description manuals and operating procedures, facility license and license amendments, Licensee Event Reports, and other materials requested from the facility licensee by the Commission. The operating test, to the extent applicable, requires the applicant to demonstrate an understanding of and the ability to perform the actions necessary to accomplish a representative sample from among the following 13 items.

...(ITEMS 1-13, NO CHANGES)...

(b) Implementation

(1) *Administration.* The operating test will be administered in a plant walkthrough and in either --

(i) A simulation facility which the Commission has approved for use after application has been made by the facility licensee, or

(ii) A simulation facility consisting solely of a plant-referenced simulator ~~which has been certified to the Commission by the facility licensee~~ as defined in Section 55.4.

~~(2) Schedule for facility licensees:~~

~~(i) Within one year after the effective date of this part, each facility licensee which proposes to use a simulation facility pursuant to paragraph (b)(1)(i) of this section, except test and research reactors, shall submit a plan by which its simulation facility will be developed and by which an application will be submitted for its use.~~

~~(ii) Those facility licensees which propose to conform with paragraph (b)(1)(i) of this section, not later than 42 months after the effective date of this rule, shall submit an application for use of this simulation facility to the Commission, in accordance with paragraph (b)(4)(i) of this section.~~

~~(iii) Those facility licensees which propose to conform with paragraph (b)(1)(ii) of this section, not later than 42 months after the effective date of this rule, shall submit a certification for use of this simulation facility to the Commission on Form NRC-474, "Simulation Facility Certification," available from Records and Reports Management Branch, Division of Information Support Services, U.S. Nuclear Regulatory Commission, Washington, DC 20555, in accordance with paragraph (b)(5)(i) of this section.~~

- ~~1. (iv) The simulation facility portion of the operating test will not be administered on other than a certified or an approved simulation facility after May 26, 1991.~~

~~(3) Schedule for facility applicants. (i) For facility licensee applications after the effective date of this rule, except test and research reactors, the applicant shall submit a plan which identifies whether its simulation facility will conform with paragraph (b)(1)(i) or (b)(1)(ii) of this section at the time of application.~~

~~(ii) Those applicants which propose to conform with paragraph (b)(1)(i) of this section, not later than 180 days before the date when the applicant proposes that the Commission conduct operating tests, shall submit an application for use of its simulation facility to the NRC, in accordance with paragraph (b)(4)(i) of this section.~~

~~(iii) Those applicants which propose to conform with paragraph (b)(1)(ii) of this section, not later than 60 days before the date when the applicant proposes that NRC conduct operating tests, shall submit a certification for use of its simulation facility to the Commission on Form NRC-474, in accordance with paragraph (b)(5)(i) of this section.~~

~~(2)(4) Implementation of simulation facilities The Commission will approve a simulation facility if it finds that the simulation facility and its proposed use are suitable for the conduct of operating tests for the facility licensee's reference plant, in accordance with paragraph (a) of this section. Application for and approval of simulation facilities. Those facility licensees which propose, in accordance with paragraph (b)(1)(i) of this section, to use a simulation facility that is other than solely a plant-referenced simulator as defined in Section 55.4 shall --~~

~~(i) In accordance with the plan submitted pursuant to paragraph (b)(2)(i) or (b)(3)(i) of this section, as applicable Those facility licensees which propose, in accordance with paragraph (b)(1)(i) of this section, to use a simulation facility that is other than solely a plant-referenced simulator as defined in Section 55.4 shall submit an application for approval of the simulation facility to the Commission, in accordance with the schedule in paragraph (b)(2)(ii) or (b)(3)(ii) of this section, as appropriate. This application must include:~~

~~(A) A statement that the simulation facility meets the plan submitted to the Commission pursuant to paragraph (b)(2)(i) or (b)(3)(i) of this section, as applicable;~~

~~(A)(B)~~ A description of the components of the simulation facility which are intended to be used for each part of the operating test, unless previously approved; and

~~(B)(C)~~ A description of the performance tests as part of the application, and the results of such tests.

~~(ii)~~ The Commission will approve a simulation facility if it finds that the simulation facility and its proposed use are suitable for the conduct of operating tests for the facility licensee's reference plant, in accordance with paragraph (a) of this section.

(ii) Facility licensees which use a plant-referenced simulator to establish prerequisites for operator license eligibility in accordance with Section 31(a)(5) shall ensure that, in addition to existing performance testing, for those significant control manipulations:

(A) simulator models relating to nuclear and thermal-hydraulic characteristics replicate the core load that exists in the nuclear power unit for which a license is being sought at the time of the applicant's operating test.

(B) 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.

~~(iii)~~ Submit, every four years on the anniversary of the application, a report to the Commission which identifies any uncorrected performance test failures, and submit a schedule for correction of these performance test failures, if any.

~~(iv)~~ Retain the results of the performance tests conducted until four years after the submittal of the application under paragraph (b)(4)(i), each report pursuant to paragraph (b)(2)(4)(iii), or any reapplication under paragraph (b)(4)(iv) of this section, as appropriate.

~~(v)~~ If the Commission determines, based upon the results of performance testing, that an approved simulation facility does not meet the requirements of this part, the simulation facility may not be used to conduct operating tests.

~~(vi)~~ If the Commission determines, pursuant to paragraph (b)(4)(v) of this section, that an approved simulation facility does not meet the requirements of this part, the facility licensee may again submit an application for approval. This application must include a description of corrective actions taken, including results of completed performance testing as required for approval.

~~(vii)~~ Any application or report submitted pursuant to paragraphs (b)(4)(i), (b)(4)(iii) and (b)(4)(vi) of this section must include a description of the performance testing completed for the simulation facility, and must include a description of performance tests, if different, to be conducted on the simulation facility during the subsequent four-year period, and a schedule for the conduct of approximately 25 percent of the performance tests per year for the subsequent four years.

(3) (5) Acceptability of simulation facilities. In order to provide assurance that approved or certified simulation facilities remain acceptable over a period of time to meet the requirements of paragraph (a) of this section: *Certification of simulation facilities:* Those facility licensees which propose, in accordance with paragraph (b)(1)(ii) of this section, to use a simulation facility consisting solely of a plant-referenced simulator as defined in Section 55.4, shall --

(i) Facility licensees which maintain a simulation facility for the conduct of operating tests shall: Submit a certification to the Commission that the simulation facility meets the Commission's regulations. The facility licensee shall provide this certification on Form NRC-474 in accordance with the schedule in paragraph (b)(2)(iii) or (b)(3)(iii) of this section, as applicable.

(A)(ii) Make available for NRC review. ~~Submit, prior to or concurrent with preparations for each operator licensing operating test or requalification program inspection every four years on the anniversary of the approval or certification, a report to the Commission results of which identifies any uncorrected performance test failures provides a schedule for correction of these performance test failures, that will exist at the time of the operating test or requalification program inspection. if any.~~

(B)(iii) Retain the results of the performance tests conducted ~~for until~~ four years or until superseded by updated test results, after the submittal of certification under paragraph (b)(5)(i), each report pursuant to paragraph (b)(5)(ii), or recertification under paragraph (b)(5)(v) of this section, as appropriate.

(ii)(iv) If the Commission determines, based upon the results of pre-examination scenario validation, a review of performance testing results, or uncorrected modeling or hardware discrepancies, performance testing, that a certified simulation facility consisting solely of a plant-referenced simulator does not meet the requirements of this part as defined in Section 55.4, the simulation facility plant-referenced simulator may not be used to conduct operating tests as described in section 55.45(b)(1) of this part, requalification training as described in section 55.59(c)(3) of this part, or for performing control manipulations that affect reactivity to establish eligibility for an operator's license as described in section 55.31(a)(5).

(iii)(v) If the Commission determines, pursuant to paragraph (b)(35)(ii)(v) of this section, that a certified simulation facility does not meet the requirements of this part, the facility licensee may again submit an application for approval of the simulation facility. ~~a recertification to the Commission on Form NRC-474.~~ This application ~~recertification~~ must include a description of corrective actions taken, including results of completed performance testing as required for approval, recertification.

(vi) Any certification report, or recertification submitted pursuant to paragraph (b)(5)(i), (b)(5)(ii) or (b)(5)(v) of this section must include a description of performance testing completed for the simulation facility, and must include a description of the performance tests, if different, to be conducted on the simulation facility during the subsequent four-year period, and a schedule for the conduct of approximately 25 percent of the performance tests per year

~~for the subsequent four years.~~

#### 55.59 REQUALIFICATION.

55.59(c)(4)(iv)

....After the provisions of 55.45(b) have been implemented at a facility, the ~~certified or approved~~ simulation facility must be used to comply with this paragraph.

#### PROPOSED RECOMMENDED NEW RULE, CLEAN VERSION

#### 55.4 DEFINITIONS.

As used in this part:

...

"Performance testing" means validation, scenario-based, or operability testing conducted to verify a simulation facility's performance as compared to actual or predicted reference plant performance.

...

"Plant-referenced simulator" means a simulator modeling the systems of the reference plant with which the operator interfaces in the control room, including operating consoles, and which permits use of the reference plant's procedures. A plant-referenced simulator demonstrates expected plant response to operator input, and to normal, transient, and accident conditions to which the simulator has been designed to respond. A plant-referenced simulator is designed, implemented, and maintained such that it:

(1) Is sufficient in scope and fidelity to allow conduct of the evolutions listed in paragraphs 55.45(a)(1) through (13), and 55.59(c)(3)(i)(A) through (AA), as applicable to the design of the reference unit.

(2) Includes recurring assurance of fidelity by performance testing throughout the life of the simulation facility consistent with paragraphs 55.45(b)(2)(ii)(B) and 55.45(b)(3)(i)(A).

(3) Includes provisions for maintaining examination and test integrity consistent with paragraph 55.49.

(4) Allows for the completion of on-the-job training experience prerequisites for license operator eligibility consistent with paragraph 55.45(b)(2)(ii).

...

"Simulation facility" means 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 applicants or to establish on-the-job training experience prerequisites for operator license eligibility:

(1) The plant,

(2) A plant-referenced simulator

(3) Another simulation device, including part-task and limited scope simulation devices.

#### 55.31 HOW TO APPLY.

(a) The applicant shall:

(ITEMS 1-4 NO CHANGES)...

(5) Provide evidence that the applicant, as a trainee, has successfully manipulated the controls of the facility for which a license is sought. At a minimum, five significant control manipulations must be performed which affect reactivity or power level. The Commission may accept evidence of satisfactory performance of control manipulations as part of an SAT-based, Commission-approved training program by a trainee on a plant-referenced simulator acceptable to the Commission under Section 55.45(b) of this part in lieu of use of the actual plant. Control manipulations performed on the simulator may be chosen from a representative sampling of the control manipulations and plant evolutions described in Section 55.59(c)(3)(A-F), (R), (T), (W), and (X) of this part, as applicable to the design of the plant for which the license application is submitted. For licensed operators applying for a senior operator license, certification that the operator has successfully operated the controls of the facility as a licensed operator shall be accepted; and

#### 55.45 OPERATING TESTS.

(a) Content. The operating tests administered to applicants for operator and senior operator licenses in accordance with paragraph (b)(1) of this section are generally similar in scope. The content will be identified, in part, from learning objectives derived from a systematic analysis of licensed operator or senior operator duties performed by each facility licensee and contained in its training program and from information in the Final Safety Analysis Report, system description manuals and operating procedures, facility license and license amendments, Licensee Event Reports, and other materials requested from the facility licensee by the Commission. The operating test, to the extent applicable, requires the applicant to demonstrate an understanding of and the ability to perform the actions necessary to accomplish a representative sample from among the following 13 items.

...(ITEMS 1-13, NO CHANGES)...

(b) Implementation

(1) *Administration.* The operating test will be administered in a plant walkthrough and in either --

(i) A simulation facility which the Commission has approved for use after application has been made by the facility licensee, or

(ii) A simulation facility consisting solely of a plant-referenced simulator as defined in Section 55.4.

(2) *Implementation of simulation facilities.* The Commission will approve a simulation facility if it finds that the simulation facility and its proposed use are suitable for the conduct of operating tests for the facility licensee's reference plant, in accordance with paragraph (a) of this section.

(i) Those facility licensees which propose, in accordance with paragraph (b)(1)(i) of this section, to use a simulation facility that is other than solely a plant-referenced simulator as defined in Section 55.4, shall submit an application for approval of the simulation facility to the Commission. This application must include:

(A) A description of the components of the simulation facility which are intended to be used for each part of the operating test, unless previously approved; and

(B) A description of the performance tests as part of the application, and the results of such tests.

(ii) Facility licensees which use a plant-referenced simulator to establish prerequisites for operator license eligibility in accordance with Section 31(a)(5) shall ensure that, in addition to existing performance testing, for those significant control manipulations:

(A) simulator models relating to nuclear and thermal-hydraulic characteristics replicate the core load that exists in the nuclear power unit for which a license is being sought at the time of the applicant's operating test.

(B) 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.

(3) *Acceptability of simulation facilities.* In order to provide assurance that approved or certified simulation facilities remain acceptable over a period of time to meet the requirements of paragraph (a) of this section:

(i) Facility licensees which maintain a simulation facility for the conduct of operating tests shall:

(A) Make available for NRC review, prior to or concurrent with preparations for each operator licensing operating test or requalification program inspection, results of any uncorrected performance test failures that will exist at the time of the operating test or requalification program inspection.

(B) Retain the results of performance tests conducted for four years or until superseded by updated test results.

(ii) If the Commission determines, based upon the results of pre-examination scenario validation, a review of performance testing results, or uncorrected modeling or hardware discrepancies, that a simulation facility consisting solely of a plant-referenced simulator does not meet the requirements of this part as defined in Section 55.4, the plant-referenced simulator may not be used to conduct operating tests as described in section 55.45(b)(1) of this part, requalification training as described in section 55.59(c)(3) of this part, or for performing control manipulations that affect reactivity to establish eligibility for an operator's license as described in section 55.31(a)(5).

(iii) If the Commission determines, pursuant to paragraph (b)(3)(ii) of this section, that a simulation facility does not meet the requirements of this part, the facility licensee may submit an application for approval of the simulation facility. This application must include a description of corrective actions taken, including results of completed performance testing as required for approval.

55.59 REQUALIFICATION.

55.59(c)(4)(iv)

....After the provisions of 55.45(b) have been implemented at a facility, the simulation facility must be used to comply with this paragraph.