FINAL RULE REGULATORY ANALYSIS

REVISION OF 10 CFR PART 55 - OPERATORS' LICENSES
Operator License Eligibility and the Use of Simulation Facilities in Operator Licensing

Proposed Action

The Nuclear Regulatory Commission (NRC) is amending 10 CFR Part 55, "Operators' Licenses" to

(1) Allow applicants for operator and senior operator licenses to fulfill a portion of the experience prerequisites by manipulating a plant-referenced simulator as an alternative to manipulation of the controls of the actual nuclear power plant,

(2) Remove current requirements for facility licensee certification of their simulation facilities, and

(3) Eliminate the necessity for routine submittal of reports to the NRC for review that identify any uncorrected performance test failures and a schedule for correction.

In conjunction with supporting the above objectives, the final rule also revises two definitions in 10 CFR Part 55, and adds clarity to the regulations by relocating language relating to the use of a simulation facility to a new Section 55.46 dedicated to "Simulation Facilities."

Statement of the Problem and Objective (Regulatory Issue)

Section 55.31(a)(5) requires that five significant control manipulations that 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.

The current revision of the national standard, American National Standards Institute/American Nuclear Society (ANSI/ANS) 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 current 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 their present form, have become an impediment to facility licensees that 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.

For the past several years, simulators have been in an update and maintenance phase, 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 are then made a function of the discrepancy reporting and resolution practice, resulting in a large number of discrepancies being identified by the trainees.

Background (Existing Regulatory Framework)

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 that 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.

As a result of the revisions to §55.45(b) published in 1987, facility licensees began to develop simulators for certification in accordance with 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. Facility 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 the industry's standard through the issuance of 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 impediment to change.

How The Regulatory Problem Will Be Addressed By Rulemaking

The final rule will promote an alternative method of providing effective plant operating experience for initial license applicants by allowing use of the simulation facility in lieu of the actual plant to satisfy the license eligibility requirement for performance of the required control manipulations that affect reactivity or power level. In addition, the distinction between "cold" and "hot" facility licenses will be deleted from the control manipulations requirement.

The rulemaking effort will also 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. The final rule will clarify minimum simulator capabilities in place of the existing requirements for simulator certification and prescheduled, stand-alone performance testing. The final rule is expected to expedite implementation of the national standard.

The final rule will directly reduce unnecessary regulatory burden by eliminating the current requirement for submittal of certification and performance test reports on a quadrennial basis. Facility licensees will be able to voluntarily adjust their simulator performance test programs consistent with user needs as defined by their accredited training programs or voluntarily conform existing simulator programs to current 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.

Identification and Analysis of Alternative Approaches

A regulatory analyses of the following options were considered by the NRC staff.

Option 1 - Status Quo

The existing rule could be left as is and facility licensees could continue to conduct all experience prerequisites for license eligibility using the actual plant and could continue to test and report on simulator fidelity. Option 1 does not bring facility licensee simulator programs into conformance with the industry's current national standard. Because there are no new benefits or costs derived from maintaining the status quo, no analysis was performed regarding this option.

Option 2 - Delete Current Requirements

The final rule deletes current requirements, that are considered to be unnecessarily burdensome on a case-by-case basis. Although Option 2 would provide immediate relief from recurring performance testing and reporting requirements associated with the certification and approval of the simulation facility, it would not address the Commission's previously expressed

concerns about ensuring sufficient testing to prevent negative training. This option would increase the possibility of negative training and would also fail to address the suitability of the simulator for satisfying an operating experience requirement. Therefore, no analysis was performed regarding this option.

Option 3 - Integrated Rulemaking

Option 3 supports amending 10 CFR Part 55 by allowing applicants for operator and senior operator licenses to fulfill a portion of the experience prerequisites for license eligibility with the performance of five significant control manipulations on a plant-referenced simulator as an alternative to use of the actual plant. In addition, Option 3 would remove current requirements for certification of simulation facilities and routine submittal of simulator performance test reports to the NRC for review. The staff considered separate rulemaking activities but opted for an integrated approach because the issues are closely related. The net effect is a reduction in unnecessary regulatory burden while maintaining safety in the area of operators' licensing. In addition, the regulatory analysis indicates that the industry as a whole is expected to realize net cost savings and schedule flexibility.

Discussion

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. The final rulemaking 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 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 the 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 decisionmaking processes a decade ago are of significantly less concern.

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

The assumptions in the proposed rule regulatory analysis remain and with minor changes that have been made to the regulatory analysis to prorate the cost and benefit of the final rule over the average remaining years of the operating life of the facility. The 4-year simulation facility performance testing cycle required by the current regulation is no longer required by the final rule.

Since the proposed rulemaking notice, the staff has determined that it is not necessary to revise and update NUREG-1262, "Answers to Questions at Public Meetings Regarding Implementation of Title 10, Code of Federal Regulations, Part 55 on Operator's Licenses" and NUREG-1258, "Evaluation Procedure for Simulation Facilities Certified Under 10 CFR 55." If clarifications to the final rule are necessary, answers to questions will be posted on the NRC's home page at <WWW.NRC.GOV> in the Nuclear Reactors icon under Principal Reactor Programs under Operator Licensing Program. In addition, it is expected that the public workshop concerning this final rulemaking may lead to questions which will be posted on the website. Therefore, the Option 3 NRC cost associated with the NUREG's have been eliminated and the calculations revised accordingly.

Backfit Rule Concerns

The NRC has determined that the backfit rule does not apply to this final rule; therefore, a backfit analysis is not required for this final rule because these amendments do not involve any provisions that would impose backfits as defined in 10 CFR 50.109(a)(1). Although facility licensees will not be required by this rulemaking to change existing programs or to adopt new regulatory guidance, the final rule will allow applicants to perform the required control manipulations at either the facility or a plant-referenced simulator and will eliminate certification of simulation facilities and submittal of quadrennial test reports and schedule information. Finally, the final rule will add criteria on simulator fidelity assurance in order to support the final changes permitting control manipulations and would clarify that the requirements of §55.46(d) apply to all planned uses of the simulation facility.

The changes of the final rule entail costs on the part of both the NRC and the industry for one-time revision of existing programs. However, the cost/benefit analysis suggests that industry could recover these costs and the final rule would have a long-term positive net value.

All of these changes constitute either permissible relaxations from current requirements or provide a new alternative to compliance with the existing requirements of the rule. Accordingly, the final rule's provisions do not constitute a backfit, and a backfit analysis was not performed.

Regulatory Impact - Costs and Benefits

The regulatory analysis consists of the results of a value-impact (benefit-cost) quantitative assessment of the final rule, using estimated data and stated assumptions.

The regulatory analysis considered direct values and impacts for NRC and facility licensees. It also considered indirect costs that are borne by the NRC and by the larger nuclear "industry," such as the cost of changes to an existing accreditation program. Values and impacts are presented for the first (implementation) year and subsequently for the average

remaining years of life of the plants, for example, assuming 15 years without license renewal. The analysis assumes that all plants voluntarily opt to change existing programs, including adoption of ANSI/ANS-3.5-1998, 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 the industry in the analysis. The regulatory analysis considered both one-time implementation costs and recurring costs.

Option 3 Values (Benefits)

The following NRC and facility licensee values (benefits) are considered in the regulatory analysis:

NRC

Reduced Review for Routine (Quadrennial) Reports - The NRC staff will realize savings in the form of reduced review time for routine reports by the deletion of the quadrennial test reporting requirement. The value of the change is based on an assumed 4 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 (RG) 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations" and is not changed by the final rule or the revised regulatory guide.

Reduced Recordkeeping - Recordkeeping costs associated with reduced staff review for routine (quadrennial) reports, including administrative and archival costs, are assumed to be 20 percent of the cost of the associated activity.

Facility Licensee

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 electrical grid, assuming that the nuclear power plant is being brought down from full power. A power reduction of 10 percent 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 northeastern 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 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-3.5-1998, as endorsed by RG 1.149, and is not changed by the final rule or the revised regulatory guide.

Reduced Duplicate Testing - The analysis assumes that facility licensee simulator support programs adopt ANSI/ANS-3.5-1998 and change to scenario-based testing, that is a function of the accredited training program. One hundred and sixty simulator support staff

hours per year are assumed to be saved by elimination of redundant testing as a result of improved coordination between the simulator support and user organizations.

Reduced Recordkeeping - Recordkeeping costs associated with reduced facility licensee duplicate testing, including administrative and archival costs, are assumed to be 20 percent of the cost of the associated activity.

Reduced Number of Discrepancies - The regulatory analysis assumes that adoption of ANSI/ANS-3.5-1998 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 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 as a result of 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 and Backshift Testing - The regulatory analysis assumes that adoption of ANSI/ANS-3.5-1998 provides a benefit that is measurable in a reduction in the need for overtime and backshift testing as a result of 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 10 percent of the reductions in routine test reporting and duplicate testing.

Option 3 Impacts (Costs)

The following NRC and facility licensee impacts (costs) are considered in the regulatory analysis:

NRC

Revise Regulatory Guidance (RG 1.149) - RG 1.149 will be revised to endorse ANSI/ANS-3.5-1998. This is a one-time NRC cost based on a 0.3 full time equivalent (FTE) position in the first year only.

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 final rule. This is a one-time NRC cost based on an assumed 1-month (160- hour) effort. This effort is expected to occur after implementation, in the second year of the 4-year cycle. However, the 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 - The NRC will incur one-time costs associated with preparation for and conduct of a 1-week (40-hour) implementation workshop for facility licensees. A four-to-one preparation-execution ratio is assumed.

Train Examiners - The NRC will realize a recurring cost associated with training examiners. The analysis assumes 4 hours of training each for 50 examiners in the first year and 1 hour per year of refresher training in the out-years.

Increased Application Review Time for Reactivity Manipulations - The NRC 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 - The NRC will realize increased cost per scheduled examination related to confirmation of simulator acceptability. 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.

Facility Licensee

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 a period of 4 years, two core model modifications are assumed. An effort of 6 weeks (240 hours) of development and 2 weeks (80 hours) of testing/validation per simulation facility is assumed.

Develop and 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 10 scenarios per facility. An effort of 10 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 3 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 1 month (160 hours) per facility is assumed.

Implementation Workshop - Facility licensees will incur one-time costs associated with participation in a 1-week (40 hour) implementation workshop. Participation by two persons (one simulator support staff member and one training staff member) 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 12 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 - The nuclear industry will realize a one-time cost in the first year associated with development and promulgation of appropriate accreditation criteria for integration of reactivity manipulation scenarios with existing accredited training programs. An effort consisting of a six-person task group for 3 months (480 hours) each and 80 hours of review per facility is assumed.

ASSUMPTIONS USED FOR COST-BENEFIT ESTIMATES

ITEM	VALUES
Full-time equivalent (FTE) (hr/yr)	1,460
Number of simulators	70
Examinations per year	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
Recordkeeping and administrative (% task)	0.2
Discrepancy resolution (hrs/discrepancy)	8
Proposed 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

OPTION 3 VALUE IMPACT ANALYSIS
(In Thousands of Dollars)

VALUES (BENEFITS)	YEAR 1	ANNUAL VALUE YEARS 2-15	3 % DISCOUNT (Note 1)	7% DISCOUNT (Note 1)	
NRC Savings					
	10	7			Reduced review for routine (4-yr) reports
	2	2			Reduced record keeping
Total NRC Savings	12	9	114	87	
Licensee Savings	6,875	5,156			Reduced replacement power demand
	4,704	3,528			Reduced routine (quadrennial) reporting
	1,568	1,176			Reduced duplicate testing
	941	706			Reduced record keeping
	392	294			Reduced number of discrepancies
	449	337			Reduced examination preparation time
	627	470			Reduced overtime & backshift testing
Total Licensee Savings	15,556	11,667	150,310	114,959	
Total NRC and Licensee Savings	15,568	11,676	150,424	115,046	(Years 1 through 15)

Note 1: The summation of the first year value with the discounted flow of funds for years 2 through 15.

OPTION 3 VALUE IMPACT ANALYSIS
(In Thousands of Dollars)

IMPACTS (COSTS)	YEAR 1	ANNUAL VALUE YEARS 2-15	3 % DISCOUNT (Note 1)	7 % DISCOUNT (Note 1)	
NRC Cost					
	327				Rulemaking
	61				Revise RG 1.149
	22				Revise NUREG-1021 (exam standards)
	28				Implementation workshop
	39	29			Increase review for manipulations
	3	2			Increase examination preparation for simulator review
	53	5			Train NRC examiners
Total NRC Cost	533	36	956	845	

Note 1: The summation of the first year value with the discounted flow of funds for years 2 through 15.

OPTION 3 VALUE IMPACT ANALYSIS (CONTINUED)
(In Thousands of Dollars)

IMPACTS (COSTS)	YEAR 1	ANNUAL VALUE YEARS 2-15	3 % DISCOUNT (Note 1)	7 % DISCOUNT (Note 1)	
Licensee Cost					
	3,136	784			Create cycle-specific core model
	980				Develop and validate reactivity scenarios
	1,568				Revise simulator configuration management
	4,704				Revise simulator test program
	1,568				Revise administrative procedures
	3,136				Revise training program
	784				Implementation workshop
	706	133			Train licensee instructors
	1,187				Develop scenario accreditation criteria
	3	2			Increase examination preparation for simulator review
Total Licensee Cost	17,772	919	28,387	25,602	
Total NRC and Licensee Cost	18,305	955	29,343	26,447	
Net Value Calculation (Years 1-15)			120,081	88,599	(Years 1 through 15)

Note 1: The summation of the first year value with the discounted flow of funds for years 2 through 15.

Decision Rationale (Recommended Option)

On the basis of the analysis, it is recommended that Option 3, "Integrated Rulemaking" rather than Option 1 or Option 2 be adopted because it reduces unnecessary burden and provides significant savings for the industry while maintaining NRC's reasonable assurance of simulator fidelity and eligibility of operator and senior operator applicants. Option 3 also provides the greatest operating flexibility to facility licensees in structuring simulator support programs to support changing training objectives and revised industry standards. Although the implementation of Option 3 would entail costs on the part of both NRC and the industry for one-time revision of existing programs, the regulatory analysis suggests that the industry could recover these costs in the immediate following years for a net gain.

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

Implementation

This action is being enacted through a final rule, with implementation to begin immediately following enactment. No impediments to implementation of the recommended alternative, that is, Option 3, have been identified. The final rule will be implemented after it is published in the *Federal Register* notice.

References

1. U.S. Nuclear Regulatory Commission, "Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations," Regulatory Guide 1.149, Revision 2, Washington, D.C., April 1996.

2. U.S. Nuclear Regulatory Commission, Draft Regulatory Guide DG-1080 (Proposed Revision 3 of Regulatory Guide 1.149) "Nuclear Power Plant Simulation Facilities for Use in Operator License Examinations," Draft DG-1080, Revision 1, Washington, D.C., August 1999.

3. U.S. Nuclear Regulatory Commission, "Qualification and Training of Personnel for Nuclear Power Plants," Regulatory Guide 1.8, Revision 3, Washington, D.C., May 2000.

4. U.S. Nuclear Regulatory Commission, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission," NUREG/BR-0058, Revision 3, Washington, D.C., June 2000.

5. U.S. Nuclear Regulatory Commission, "Operator Licensing Examination Standards for Power Reactors," NUREG-1021, Revision 8, Washington, D.C., April 1999.

6. U.S. Nuclear Regulatory Commission, "Rulemaking Plan for Changes to 10 CFR Part 55 to Reduce Unnecessary Regulatory Burden Associated With the Use of Simulation Facilities in Operator Licensing," SECY-99-225, Washington, D.C., September 1999.

7. U.S. Nuclear Regulatory Commission, "Proposed Rule: Revision of 10 CFR Part 55, "Operators' Licenses," Regarding the Use of Simulation Facilities in Operator Licensing," SECY-00-0083, Washington, D.C., April 2000.

8. American National Standard Institute/ American Nuclear Society, "Nuclear Power Plant Simulators for Use in Operator Training," ANSI/ANS-3.5-1981.

9. American National Standard Institute/ American Nuclear Society, "Nuclear Power Plant Simulators for Use in Operator Training," ANSI/ANS-3.5-1985.

10. American National Standard Institute/ American Nuclear Society, "Nuclear Power Plant Simulators for Use in Operator Training and Examination," ANSI/ANS-3.5-1993.

11. American National Standard Institute/ American Nuclear Society, "Nuclear Power Plant Simulators for Use in Operator Training and Examination," ANSI/ANS-3.5-1998.