United States Nuclear Regulatory Commission

Protecting People and the Environment

NUREG-1021, Rev. 12

Operator Licensing Examination Standards for Power Reactors

Final Report

Office of Nuclear Reactor Regulation

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Errata

NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," published September 2021

In ES-3.3 Page 14 of 17, part of a sentence was inadvertently repeated in the third sentence of the second paragraph of section C.2. The second paragraph of ES-3.3 C.2 should read as follows:

> Use objective performance standards that include clear boundary conditions for when a CT must be accomplished. Boundary conditions ensure that examiners have agreed on limits for what is acceptable for task completion and what constitutes task failure. When bounding CTs, in addition to asking what constitutes how the task is met, it can be helpful to ask how an applicant or operator could fail the task. For example, "if pressure falls below 1,400 pounds per square inch (psi), start pump XYZ," is not objective because there is not a lower bound for system pressure after which the operator performance would be considered deficient. The operator performing this task could start the pump when pressure reaches 0 psi and still not violate the performance standard, even though the operator is expected to start the pump sooner.

In ES-3.6, Page 4 of 28, the words "or involve" was inadvertently deleted from section B.4.a.i in the description of a Significant Performance Deficiency. The description should read as follows:

- PDs that either cause an automatic reactor protection system (RPS)/engineered safety feature (ESF) actuation or that warrant or involve a manual RPS/ESF actuation that should have been avoidable had the applicant responded to the event as expected

In ES-5.1, Page 6 of 20, Section G, "Determine Quality of Submitted Examination," Step (2), an incorrect reference to ES-2.3, Section C.4, "Ensure Adequate Balance of Coverage," was made. The correct reference is ES-2.3, Section C.3, "Review Operating Test and Written Examination." The passage in Step (2) should read as follows:

> To determine the total percentage of unsatisfactory operating test items, total the number of JPMs and scenario events that were marked unsatisfactory following the operating test review performed in ES-2.3, Section C.3, and divide by the total number of JPMs and scenario events (i.e., 4 of 15 JPMs were marked unsatisfactory (U), and 3 of 33 scenario events were marked U, resulting in 7 of 48 or 14.6 percent).

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NUREG-1021, Rev. 12

Operator Licensing Examination Standards for Power Reactors

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ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) publishes NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," to establish the policies, procedures, and practices for examining licensees and applicants for reactor operator and senior reactor operator licenses at power reactor facilities. These standards are in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' licenses." The agency intends these examination standards to help NRC examiners and facility licensees better understand the processes associated with initial and NRC-conducted requalification examinations. The standards also ensure the equitable and consistent administration of examinations for all applicants. The purpose of the standards is stated in 10 CFR 55.40, "Implementation":

> The Commission shall use the criteria in NUREG-1021 … in effect six months before the examination date to prepare the written examinations required by [10 CFR] 55.41 and [10 CFR] 55.43 and the operating tests required by [10 CFR] 55.45. The Commission shall also use the criteria in NUREG-1021 to evaluate the written examinations and operating tests prepared by power reactor facility licensees pursuant to paragraph (b) of this section.

The NRC is issuing Revision 12 of NUREG-1021 to (1) streamline information into topic-based sections for ease of use, (2) clarify instructions for the identification and grading of performance deficiencies on the operating test, (3) revise instructions for the selection of critical tasks and the assessment of critical and significant performance deficiencies, and (4) implement changes to support the testing of fundamentals topics on the site-specific initial licensing examination, in the place of a separate generic fundamentals examination.

This NUREG is a rule as defined in the Congressional Review Act (5 U.S.C. 801–808). However, the Office of Management and Budget has not found it to be a major rule as defined in the Congressional Review Act.

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TABLE OF CONTENTS

ABSTRACT iii

BACKFITTING AND ISSUE FINALITY xi

ABBREVIATIONS AND ACRONYMS xiii

1 GENERAL

1.1 USING THE OPERATOR LICENSING EXAMINATION STANDARDS ..... ES-1.1, 1 of 2
- A. Purpose of the Examination Standards ..... ES-1.1, 1 of 2
- B. Format ..... ES-1.1, 1 of 2
- C. How to Use ..... ES-1.1, 2 of 2

1.2 GUIDELINES FOR TAKING NRC EXAMINATIONS ..... ES-1.2, 1 of 6
- A. General Guidelines ..... ES-1.2, 1 of 6
- B. Written Examination Guidelines ..... ES-1.2, 1 of 6
- C. General Operating Test Guidelines ..... ES-1.2, 3 of 6
- D. Walkthrough (Job Performance Measures) Guidelines ..... ES-1.2, 3 of 6
- E. Simulator Test Guidelines ..... ES-1.2, 5 of 6

1.3 EXAMINATION SECURITY ..... ES-1.3, 1 of 8
- A. Background ..... ES-1.3, 1 of 8
- B. Instructions for NRC Regional Management, Supervision, and Designees ..... ES-1.3, 1 of 8
- C. Instructions and Restrictions for Facility Licensee Personnel ..... ES-1.3, 1 of 8
- D. Physical Examination Security Instructions and Guidelines ..... ES-1.3, 4 of 8
- E. Examination Bank Limitations ..... ES-1.3, 5 of 8
- F. Simulator Security Considerations ..... ES-1.3, 5 of 8
- G. Forms ..... ES-1.3, 7 of 8

2 INITIAL PREEXAMINATION ACTIVITIES

2.1 PREPARING FOR OPERATOR LICENSING INITIAL EXAMINATIONS ..... ES-2.1, 1 of 20
- A. Scheduling Examinations ..... ES-2.1, 1 of 20
- B. Examination Preparation Criteria for Facility Licensees ..... ES-2.1, 2 of 20
- C. Examination Preparation Criteria for NRC Regional Management, Supervision, and Designees ..... ES-2.1, 4 of 20
- D. Examination Preparation Criteria for NRC Chief Examiner And Assigned Examiners ..... ES-2.1, 7 of 20
- E. Restrictions for NRC Personnel ..... ES-2.1, 10 of 20
- F. Reference Material for Operator Licensing Initial Examinations ..... ES-2.1, 10 of 20
- G. Guidelines for Freezing Plant Procedures ..... ES-2.1, 13 of 20
- H. Milestones for Plants Under Construction ..... ES-2.1, 14 of 20
- I. Preparatory Site Visit ..... ES-2.1, 15 of 20
- J. Forms and Letters ..... ES-2.1, 16 of 20

2.2 APPLICATIONS, MEDICAL REQUIREMENTS, AND WAIVER AND EXCUSAL OF EXAM AND TEST REQUIREMENTS ..... ES-2.2, 1 of 22
- A. Background ..... ES-2.2, 1 of 22
- B. Eligibility: Qualifications and Training for Applicants ..... ES-2.2, 3 of 22

C. Application ..... ES-2.2, 3 of 22
D. Reapplication ..... ES-2.2, 8 of 22
E. Waivers and Excusals ..... ES-2.2, 8 of 22
F. Deferrals ..... ES-2.2, 15 of 22
G. License Application Audit ..... ES-2.2, 16 of 22
H. Forms and Letters ..... ES-2.2, 16 of 22
2.3 REVIEWING AND APPROVING OPERATOR LICENSING INITIAL EXAMINATIONS ..... ES-2.3, 1 of 19
A. General Guidance for Reviewing Written Examination Questions ..... ES-2.3, 1 of 19
B. Instructions for Facility Licensee Management ..... ES-2.3, 1 of 19
C. Instructions for NRC Chief Examiner ..... ES-2.3, 3 of 19
D. Instructions for NRC Supervisor Review and Approval ..... ES-2.3, 7 of 19
E. Forms and Letters ..... ES-2.3, 8 of 19

3 INITIAL OPERATING TESTS
3.1 OVERVIEW OF THE OPERATING TEST FOR OPERATOR LICENSING INITIAL EXAMINATIONS ..... ES-3.1, 1 of 5
A. Operating Test Structure and Content ..... ES-3.1, 1 of 5
B. General Instructions and Guidelines for Developing Operating Tests ..... ES-3.1, 2 of 5
3.2 DEVELOPING JOB PERFORMANCE MEASURES ..... ES-3.2, 1 of 18
A. General Instructions ..... ES-3.2, 1 of 18
B. Instructions for Selecting Administrative Topic Job Performance Measures ..... ES-3.2, 1 of 18
C. Instructions for Selecting Control Room System and In-Plant System Job Performance Measures ..... ES-3.2, 5 of 18
D. Instructions for Developing Job Performance Measures ..... ES-3.2, 5 of 18
E. Additional Instructions for Developing Alternate Path Job Performance Measures ..... ES-3.2, 9 of 18
F. Forms ..... ES-3.2, 10 of 18
3.3 GENERAL TESTING GUIDELINES FOR DYNAMIC SIMULATOR SCENARIOS ..... ES-3.3, 1 of 17
A. Integrated Scenario Development ..... ES-3.3, 1 of 17
B. Scenario Attributes ..... ES-3.3, 4 of 17
C. Critical Task Methodology ..... ES-3.3, 13 of 17
D. Forms ..... ES-3.3, 15 of 17
3.4 DEVELOPING SCENARIOS ..... ES-3.4, 1 of 10
A. General Instructions ..... ES-3.4, 1 of 10
B. Determining the Number of Scenarios and the Use of Surrogate Operators ..... ES-3.4, 2 of 10
C. Specific Instructions for Developing Scenario Outlines ..... ES-3.4, 3 of 10
D. Specific Instructions for Developing Scenario Guides and Finalizing Scenarios ..... ES-3.4, 7 of 10
E. Forms ..... ES-3.4, 8 of 10
3.5 ADMINISTERING OPERATING TESTS ..... ES-3.5, 1 of 13
A. General Instructions for the NRC Chief Examiner ..... ES-3.5, 1 of 13
B. General Instructions for the NRC Examination Team ..... ES-3.5, 3 of 13
C. Limits on Operating Test Observers ..... ES-3.5, 3 of 13
D. Instructions for the Use of Surrogate Operators during Administration ..... ES-3.5, 4 of 13

E. Instructions for the Use of Followup Questions ..... ES-3.5, 4 of 13
F. Performance of the Simulation Facility during the Operating Test ..... ES-3.5, 6 of 13
G. Specific Instructions for Administering Simulator Scenarios ..... ES-3.5, 6 of 13
H. Specific Instructions for Administering Job Performance Measures ..... ES-3.5, 10 of 13
I. Walkthrough Evaluation Techniques ..... ES-3.5, 12 of 13
3.6 GRADING AND DOCUMENTING OPERATING TESTS ..... ES-3.6, 1 of 28
A. Responsibilities ..... ES-3.6, 1 of 28
B. Grading and Documenting Instructions ..... ES-3.6, 2 of 28
C. Specific Instructions for Documenting Performance Deficiencies ..... ES-3.6, 13 of 28
D. Forms ..... ES-3.6, 14 of 28
3.7 ALTERNATIVES FOR IN-PLANT JOB PERFORMANCE MEASURES AT PLANTS UNDER CONSTRUCTION ..... ES-3.7, 1 of 1
A. Developing Alternative Job Performance Measures ..... ES-3.7, 1 of 1

4 INITIAL WRITTEN EXAMINATIONS
4.1 DEVELOPING WRITTEN EXAMINATION OUTLINES ..... ES-4.1, 1 of 28
A. Responsibilities ..... ES-4.1, 1 of 28
B. Instructions for Preparing Written Examination Outlines ..... ES-4.1, 2 of 28
C. Example of a Random and Systematic Sampling Methodology ..... ES-4.1, 5 of 28
D. Forms ..... ES-4.1, 6 of 28
4.2 DEVELOPING WRITTEN EXAMINATIONS ..... ES-4.2, 1 of 29
A. Responsibilities ..... ES-4.2, 1 of 29
B. Instructions for Preparing Written Examinations ..... ES-4.2, 2 of 29
C. General Guidelines Applicable to All Written Examination Questions ..... ES-4.2, 5 of 29
D. Instructions for Constructing Multiple-Choice Questions ... ES-4.2, 10 of 29
E. Instructions for Developing and Reviewing SRO-Level Questions ..... ES-4.2, 17 of 29
F. Forms ..... ES-4.2, 25 of 29
4.3 ADMINISTERING WRITTEN EXAMINATIONS ..... ES-4.3, 1 of 7
A. Responsibilities ..... ES-4.3, 1 of 7
B. Written Examination Administration Instructions ..... ES-4.3, 2 of 7
C. Postexamination Reviews and Comments ..... ES-4.3, 5 of 7
D. Forms ..... ES-4.3, 6 of 7
4.4 GRADING AND DOCUMENTING WRITTEN EXAMINATIONS ..... ES-4.4, 1 of 7
A. Responsibilities ..... ES-4.4, 1 of 7
B. Instructions for Written Examination Grading and Evaluation ..... ES-4.4, 1 of 7
C. Instructions for NRC Review of Grading and Examination Changes ..... ES-4.4, 4 of 7
D. Instructions for NRC Management Review of Grading and Examination Changes ..... ES-4.4, 7 of 7

5 INITIAL POSTEXAMINATION ACTIVITIES AND OTHER LICENSING ACTIONS
5.1 ISSUING OPERATOR LICENSES AND POSTEXAMINATION ACTIVITIES ..... ES-5.1, 1 of 20
A. Compile Examination Results and Reports ..... ES-5.1, 1 of 20
B. Licensing Action ..... ES-5.1, 2 of 20
C. Issue Licenses ..... ES-5.1, 3 of 20
D. Notify Applicants of Examination Results ..... ES-5.1, 3 of 20
E. Notify Facility Licensee of Examination Results ..... ES-5.1, 5 of 20
F. Special Circumstances for Senior Reactor Operator-Upgrade Applicants ..... ES-5.1, 5 of 20
G. Determine Quality of Submitted Examination ..... ES-5.1, 6 of 20
H. Reference Material ..... ES-5.1, 7 of 20
I. Examination Report and NRC Recordkeeping ..... ES-5.1, 7 of 20
J. Forms and Letters ..... ES-5.1, 7 of 20
5.2 APPLICATION DENIALS AND REQUESTS FOR INFORMAL NRC STAFF REVIEW ..... ES-5.2, 1 of 3
A. Background ..... ES-5.2, 1 of 3
B. Applicant Responsibilities ..... ES-5.2, 1 of 3
C. Facility Licensee Responsibilities ..... ES-5.2, 2 of 3
D. NRC Responsibilities ..... ES-5.2, 2 of 3
5.3 MAINTAINING, CHANGING, AND RENEWING OPERATOR LICENSES ..... ES-5.3, 1 of 12
A. Maintaining an Operator License ..... ES-5.3, 1 of 12
B. Changes to an Operator License ..... ES-5.3, 9 of 12
C. License Renewal ..... ES-5.3, 11 of 12

6 NRC-CONDUCTED REQUALIFICATION EXAMINATIONS
6.1 CONDUCTING NRC REQUALIFICATION EXAMINATIONS ..... ES-6.1, 1 of 34
A. Background ..... ES-6.1, 1 of 34
B. Scope ..... ES-6.1, 2 of 34
C. Examination Preparations ..... ES-6.1, 3 of 34
D. Operator and Program Evaluation Procedures ..... ES-6.1, 6 of 34
E. Unsatisfactory Operator or Program Evaluation ..... ES-6.1, 9 of 34
F. Requalification Program Evaluation Report ..... ES-6.1, 13 of 34
G. Individual Requalification Examination Report ..... ES-6.1, 14 of 34
H. NRC-Conducted Requalification Examination Results ..... ES-6.1, 14 of 34
I. Operator Licensing Renewal Policy ..... ES-6.1, 15 of 34
J. Records Retention ..... ES-6.1, 15 of 34
K. Feedback on Requalification Examination Stress ..... ES-6.1, 16 of 34
L. Forms and Letters ..... ES-6.1, 16 of 34
6.2 REQUALIFICATION WRITTEN EXAMINATIONS ..... ES-6.2, 1 of 24
A. Scope ..... ES-6.2, 1 of 24
B. Examination Development Responsibilities ..... ES-6.2, 2 of 24
C. Guidelines for Developing and Reviewing Open-Reference Examinations ..... ES-6.2, 5 of 24
D. Examination Administration and Evaluations ..... ES-6.2, 15 of 24
E. Forms ..... ES-6.2, 18 of 24
6.3 REQUALIFICATION WALKTHROUGH EXAMINATIONS ..... ES-6.3, 1 of 7
A. Scope ..... ES-6.3, 1 of 7
B. Development of Job Performance Measures ..... ES-6.3, 1 of 7

C. Examination Administration ..... ES-6.3, 4 of 7
D. Forms..... ES-6.3, 6 of 7
6.4 REQUALIFICATION DYNAMIC SIMULATOR EXAMINATIONS .... ES-6.4, 1 of 19
A. Scope ..... ES-6.4, 1 of 19
B. Examination Development..... ES-6.4, 2 of 19
C. Examination Administration ..... ES-6.4, 4 of 19
D. Performance Evaluations..... ES-6.4, 6 of 19
E. Forms..... ES-6.4, 8 of 19

7 FUEL HANDLING EXAMINATIONS
7.1 ADMINISTRATION OF INITIAL EXAMINATIONS FOR SENIOR OPERATORS LIMITED TO FUEL HANDLING ..... ES-7.1, 1 of 25
A. Background..... ES-7.1, 1 of 25
B. Responsibilities..... ES-7.1, 2 of 25
C. Written Examination Instructions ..... ES-7.1, 2 of 25
D. Operating Test Instructions..... ES-7.1, 4 of 25
E. Forms..... ES-7.1, 6 of 25
7.2 ADMINISTRATION OF NRC REQUALIFICATION EXAMINATIONS FOR SENIOR OPERATORS LIMITED TO FUEL HANDLING ..... ES-7.2, 1 of 6
A. Background..... ES-7.2, 1 of 6
B. General Differences..... ES-7.2, 1 of 6
C. Examination Differences..... ES-7.2, 2 of 6
D. Forms..... ES-7.2, 3 of 6

8 GLOSSARY ..... ES-8, 1 of 7

APPENDIX A OVERVIEW OF GENERIC EXAMINATION CONCEPTS..... A-1

APPENDIX B EXAMPLES OF WRITTEN EXAMINATION QUESTIONS..... B-1

BACKFITTING AND ISSUE FINALITY

In NUREG-1021, the U.S. Nuclear Regulatory Commission (NRC) establishes the policies, procedures, and practices for examining licensees and applicants for reactor operator and senior reactor operator licenses at nuclear power reactor facilities under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' licenses." Revision 12 of NUREG-1021 (1) streamlines information into topic-based sections for ease of use, (2) clarifies instructions for the identification and grading of performance deficiencies on the operating test, (3) introduces revised instructions for the selection of critical tasks and the assessment of critical and significant performance deficiencies, and (4) implements changes to support the testing of fundamentals topics on the site-specific initial licensing examination, in place of a separate generic fundamentals examination.

Revision 12 of NUREG-1021 does not represent "backfitting" as that term is defined in 10 CFR 50.109, "Backfitting," and is not inconsistent with the issue finality provisions in 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants." Current holders of operating licenses under 10 CFR Part 50, "Domestic licensing of production and utilization facilities," or combined licenses under 10 CFR Part 52 are not mandated to prepare the written examinations required by 10 CFR 55.41, "Written examination: Operators," and 10 CFR 55.43, "Written examination: Senior operators," and the operating tests required by 10 CFR 55.45, "Operating tests," which must be prepared using the criteria in NUREG-1021 in effect 6 months before the examination date.[1] Because licensees under 10 CFR Part 50 and 10 CFR Part 52 are not required to prepare the 10 CFR 55.41 and 10 CFR 55.43 examinations and 10 CFR 55.45 tests, changes to the criteria used to prepare the examinations and tests are not imposed on them; therefore, these changes do not meet the definition of "backfitting" in 10 CFR 50.109 and are not inconsistent with the finality provisions in 10 CFR Part 52.

Furthermore, licensees know to expect changes to NUREG-1021. The inherent structure of the testing regime in 10 CFR Part 55 involves updating NUREG-1021 to reflect lessons learned and to ensure uniform conditions for licensing individuals applying for operator licenses. The language in 10 CFR 55.40(a)–(b) illustrates that the NRC would make changes to NUREG-1021. By referencing the version of NUREG-1021 that would be "in effect six months before the examination date," the NRC shows that it anticipates that the guidance would be revised and that it could be revised within 6 months of the examination date. Although 10 CFR 55.40, "Implementation," went into effect only in 1999,[2] the NRC has published revisions to NUREG-1021 since October 1983. Because current facility licensees under 10 CFR Part 50 have known of, and have experienced, this regime for more than three decades and because current facility licensees under 10 CFR Part 52 were aware of this regime at the time they received their respective licenses, their regulatory expectations include the possibility of changes. Thus, the policies underlying 10 CFR 50.109 and the issue finality provisions in 10 CFR Part 52, and the backfitting and issue finality provisions themselves, do not apply to these licensees.

Backfitting or issue finality regulations do not appear in 10 CFR Part 55, and the backfitting provisions in 10 CFR 50.109 and the finality provisions in 10 CFR Part 52 do not protect power

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[1] See 10 CFR 55.40(a)–(b).

[2] See "Initial Licensed Operator Examination Requirements; Final Rule," in Volume 64, Number 78, of the *Federal Register*, pages 19868–19878, dated April 23, 1999.

reactor operator licensees because neither 10 CFR 50.109 nor 10 CFR Part 52 applies to power reactor operator licensees under 10 CFR Part 55.

Revision 12 of NUREG-1021 could be applied to applications for 10 CFR Part 50 operating licenses, 10 CFR Part 52 combined licenses, or 10 CFR Part 55 operator licenses. Such action would not constitute backfitting, as defined in 10 CFR 50.109, or would not otherwise be inconsistent with the applicable issue finality provisions in 10 CFR Part 52, because such applicants are not within the scope of entities protected by 10 CFR 50.109 or by the relevant issue finality provisions in 10 CFR Part 52. The exception to this principle is a combined license applicant under 10 CFR Part 52 that references an already issued design certification or early site permit, but this exception does not apply to the requirements in 10 CFR Part 55.

ABBREVIATIONS AND ACRONYMS

ABWR	advanced boiling-water reactor
AC	alternating current
ADAMS	Agencywide Documents Access and Management System (NRC)
ADM	administrative JPM
ADS	automatic depressurization system
AFW	auxiliary feedwater
ANS	American Nuclear Society
ANSI	American National Standards Institute
AO	auxiliary operator
AOP	abnormal operating procedure
AP1000®	Westinghouse AP1000® pressurized-water reactor
APE	abnormal plant evolution
APRM	average power range monitor
ARP	alarm (or annunciator) response procedure
ATC	at the controls (operator)
ATWS	anticipated transient without scram
BOP	balance of plant (operator)
BW	Babcock and Wilcox pressurized-water reactor
BWR	boiling-water reactor
C	Celsius
CAL	confirmatory action letter
CCW	component cooling water
CD-ROM	compact disk, read-only memory
CE	Combustion Engineering
CFR	*Code of Federal Regulations*
COL	combined license
CPD	critical performance deficiency
CRD	control rod drive
CS	core spray
CSF	critical safety function
CT	critical task
CTMT	containment
CVCS	chemical and volume control system
DAS	dominant accident sequence
DC	direct current
DG	diesel generator
E	excused
E/APE	emergency/abnormal plant evolution
ECA	emergency contingency action (procedure)
ECCS	emergency core cooling system
EDG	emergency diesel generator
EIE	Electronic Information Exchange
EOP	emergency operating procedure
EPIP	emergency plan implementing procedure
ES	examination standard

ESF	engineered safety feature
ESFAS	engineered safety feature actuation system
F	Fahrenheit
FR	*Federal Register*
GE	General Electric boiling-water reactor
gpm	gallon(s) per minute
GUI	graphical user interface
HCL	higher cognitive level
HPCI	high-pressure coolant injection
HPCS	high-pressure core spray
HPSI	high-pressure safety injection
HVAC	heating, ventilation, and air conditioning
IC	initial condition
I/C	instrument and component, instrumentation and control
ID	identification
INPO	Institute of Nuclear Power Operations
IP	inspection procedure
IPE	individual plant examination
IR	importance rating
IRM	intermediate range monitor
JPM	job performance measure
JTA	job task analysis
K/A	knowledge and ability
LAN	local area network
LCO	limiting condition for operation
LER	licensee event report
LOCA	loss-of-coolant accident
LOD	level of difficulty
LOK	level of knowledge
LOOP	loss of offsite power
LPCI	low-pressure coolant injection
LPCS	low-pressure core spray
LPRM	local power range monitor
LSRO	limited senior reactor operator (senior operator limited to fuel handling)
mmHg	millimeter of mercury
MCR	main control room
MSIV	main steam isolation valve
N/A	not applicable
NANT	National Academy for Nuclear Training
NEI	Nuclear Energy Institute
NNAB	National Nuclear Accrediting Board
N/O	not observed

NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation (NRC)
NUREG	NRC technical report designation
ODCM	offsite dose calculation manual
OLA	operator licensing assistant
OLMC	operator licensing manual chapter
OMB	Office of Management and Budget (U.S.)
OPLS	offsite power low signal
PCIS	primary containment isolation system
PCS	pressure control system
PD	performance deficiency
PORV	power-operated relief valve
PRA	probabilistic risk assessment
PRT	pressurizer relief tank
PRTS	pressurizer relief tank system
psi	pounds per square inch
psia	pounds per square inch, absolute
psig	pounds per square inch, gauge
PWR	pressurized-water reactor
PZR	pressurizer
RBMS	rod block monitor system
RCIC	reactor core isolation cooling
RCP	reactor coolant pump
RCS	reactor coolant system
RF	rating factor
RG	regulatory guide (NRC)
RHR	residual heat removal
RMCS	reactor manual control system
RO	reactor operator
RPIS	rod position indication system
RPS	reactor protection system
RPV	reactor pressure vessel
RWST	refueling water storage tank
S, SAT	satisfactory
SAT	systems approach to training
SG	specific gravity
SGTR	steam generator tube rupture
SI	safety injection
SIM	simulator
SLC	standby liquid control
SPD	significant performance deficiency
SR	surveillance requirement
SRO	senior reactor operator
SRO-I	senior reactor operator-instant
SRO-only	senior reactor operator-only
SRO-U	senior reactor operator-upgrade
SRV	safety relief valve

SSC	structure, system, and component
STA	shift technical advisor
STAR	stop-think-act-review
TDAFWP	turbine-driven auxiliary feedwater pump
T/F	true-false (statement/question)
TPA	temporary plant alteration
TRM	technical requirements manual
TS	technical specification(s)
U, UNSAT	unsatisfactory
UPS	uninterruptible power supply
U.S.C.	*United States Code*
V	volt(s)
W	waived
W	Westinghouse
W/T	in-plant systems walkthrough or JPM

1.1 USING THE OPERATOR LICENSING EXAMINATION STANDARDS

A. Purpose of the Examination Standards

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' licenses," establishes procedures and criteria for the issuance of licenses to reactor operators (ROs) and senior reactor operators (SROs) of utilization facilities, provides for the terms and conditions upon which the Commission will issue or modify these licenses, and provides for the terms and conditions to maintain and renew these licenses.

The regulations in 10 CFR 55.33, "Disposition of an initial application," states that the Commission will approve an initial application for a license if the Commission finds, among other things, that the applicant has passed the requisite written examination and operating test. The regulations mandate that the licensing examinations must be developed and administered in accordance with 10 CFR 55.41, "Written examination: Operators," and 10 CFR 55.45, "Operating tests," for ROs or 10 CFR 55.43, "Written examination: Senior operators," and 10 CFR 55.45 for SROs. The regulation at 10 CFR 55.40(a) states the following:

> The Commission shall use the criteria in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," in effect six months before the examination date to prepare the written examinations required by [10 CFR] 55.41 and [10 CFR] 55.43 and the operating tests required by [10 CFR] 55.45. The Commission shall also use the criteria in NUREG-1021 to evaluate the written examinations and operating tests prepared by power reactor facility licensees….

Pursuant to 10 CFR 55.40(b), power reactor facility licensees may prepare, proctor, and grade the written examinations required by 10 CFR 55.41 and 10 CFR 55.43 and may prepare the operating tests required by 10 CFR 55.45 as long as, among other things, they prepare the required examinations and tests in accordance with the criteria in NUREG-1021.

NUREG-1021 establishes the policies, procedures, and guidance for the development, administration, and grading of written examinations and operating tests used for examining RO and SRO licensees and applicants at power reactor facilities. It also provides procedures and guidance for maintaining operators' licenses and for the U.S. Nuclear Regulatory Commission (NRC) to conduct requalification examinations when necessary. These standards describe the provisions of the Atomic Energy Act of 1954, as amended, and the regulations on which the operator licensing program is based. They also ensure the equitable and consistent administration of examinations to all applicants and licensed operators at all licensee facilities that are subject to the regulations.

B. Format

Each section of the examination standards (ES) explains the policies, procedures (referred to as instructions), and guidance (or guidelines) for an element of the operator licensing program. For ease of reference, each standard is assigned a single-digit number, and related standards are grouped together such that standards beginning with the same digit apply to related aspects of the program, as follows:

ES-1.X: General
ES-2.X: Initial Preexamination Activities

ES-3.X: Initial Operating Tests
ES-4.X: Initial Written Examinations
ES-5.X: Initial Postexamination Activities and Other Licensing Actions
ES-6.X: NRC-Conducted Requalification Examinations
ES-7.X: Fuel Handling Examinations
ES-8 Glossary

The appendices to NUREG-1021 provide additional guidance and background information that users of NUREG-1021 may find helpful.

C. How to Use

The instructions in NUREG-1021 for developing operator licensing initial examinations are to be used in conjunction with the applicable knowledge and ability (K/A) catalogs, which are vendor or technology specific. The NRC has made a complete list of the applicable K/A catalogs available on the NRC's Operator Licensing public Web site (https://www.nrc.gov/reactors/operator-licensing.html). The latest revision of the applicable K/A catalog available at the time the facility licensee requests the written examination outline (up to 18 months before the examination date based on typical initial operator licensing class length) should be used.

NUREG-1021 contains procedures and guidance for use by NRC and facility licensee staff and operator license holders and applicants. Procedures must be followed and are in the form of instructions and restrictions. Guidance and guidelines are based on best practices for examinations and should be followed. Information is identified as either procedure or guidance in the introductory paragraph or the title of the section/subsection/step that contains the information.

The instructions within an examination standard do not have to be performed in the exact order listed, and some of the steps may be performed multiple times if necessary. The NRC regional office must consult the Office of Nuclear Reactor Regulation (NRR) operator licensing program office if the instructions in NUREG-1021 cannot be met. The NRC regional office must also obtain program office approval before undertaking any initiative that could undermine examination consistency among the NRC's regions.

All users of NUREG-1021 should be familiar with the terms in the glossary (ES-8) to use the examination standards properly.

The format of the sample letters in NUREG-1021 can be adjusted as necessary.

Sections in NUREG-1021 reference guidance documents that are used in conjunction with these examination standards. Regulatory guides, NUREG-series reports (with the exception of the applicable K/A catalogs), industry guidance documents, and industry standards do not constitute requirements, except as specified in Commission orders or as committed to by the facility licensee. NRC examiners and licensees should consult the appropriate revisions of these guidance documents as referenced in each facility's final safety analysis report or approved training program, as applicable.

The NRC has posted a comprehensive list of regulations and guidance documents applicable to operator licensing on the NRC's Operator Licensing public Web site (https://www.nrc.gov/reactors/operator-licensing.html).

1.2 GUIDELINES FOR TAKING NRC EXAMINATIONS

Facility licensees are encouraged to familiarize their applicants and examinees with these guidelines and distribute a copy of these guidelines to every applicant or examinee before the examination begins. All items apply to both initial and NRC-conducted requalification examinations, except as noted.

A. General Guidelines

1. [Read Verbatim] Cheating on any part of the examination will result in a denial of your application or action against your license.

2. If you have any questions concerning the administration of any part of the examination, do not hesitate to ask them before starting that part of the test.

3. Senior reactor operator (SRO) applicants will be tested at the level of responsibility of the senior licensed shift position (i.e., shift supervisor, senior shift supervisor, or whatever the title of the position may be).

4. You must pass every part of the examination to receive a license or to continue performing licensed duties. Any applicant who demonstrates deficiencies in required knowledge and abilities during the examination may require additional training before performing licensed operator duties.

5. The U.S. Nuclear Regulatory Commission (NRC) examiner is not allowed to reveal the results of any part of the examination until NRC management has reviewed and approved them. Grades provided by the facility licensee are preliminary until approved by the NRC. You will be informed of the official examination results about 30 days after all the examinations are complete.

6. Do you have any questions?

B. Written Examination Guidelines

1. [Read Verbatim] After you complete the examination, sign the statement on the cover sheet, in ink, indicating that the work is your own and you have not received or given assistance in completing the examination.

2. To pass the examination, you must achieve an overall grade of 80 percent or greater, with 70 percent or greater on the SRO-only items, if applicable. If you only take the SRO portion of the examination (as a retake or with an upgrade waiver of the reactor operator (RO) examination), you must achieve an overall grade of 80 percent or greater to pass. Grades will not be rounded up to achieve a passing score. Every question is worth 1 point.

3. For the initial examination, the nominal time limit for completing the examination is 6 hours for the RO examination, 3 hours for the 25-question SRO-only examination, 9 hours for the combined RO/SRO examination, and 4 hours for the examination for the senior operator limited to fuel handling (LSRO). The times allotted for taking each examination noted above shall not be extended except for unavoidable situations (e.g., loss of power, building evacuation, emergency response). The applicant is

responsible for ensuring his or her physical capability to complete the examination in the allotted time.

[For a NRC-conducted requalification examination, the time limit for completing both sections of the examination is 3 hours. The allotted time may be extended for unavoidable situations (e.g., loss of power, building evacuation, emergency response). If both sections are administered in the simulator during a single 3-hour period, you may return to a section of the examination that you already completed or retain both sections of the examination until the allotted time has expired.]

4. You may bring pens, pencils, and calculators into the examination room; however, programmable memories must be erased. Applicants shall not bring tablets, cell phones, or other communications or electronic devices or recorders into the examination room.

5. Print your name in the blank provided on the examination cover sheet and the answer sheet. You may be asked to provide the examiner with some form of positive identification.

6. Mark your answers on the answer sheet provided, and do not leave any question blank. Use only the paper provided, and do not write on the back side of the pages. If you are recording answers on a machine-gradable form, mark your answer using ink or pencil as directed by the examination proctor. If you are using ink and decide to change your original answer, draw a single line through the error, enter the desired answer, and initial the change. If you are using pencil and decide to change your original answer, ensure that your previous choice is completely erased or indicate the change as described in the previous sentence. If you are recording your answers on a machine-gradable form that offers more than four answer choices (e.g., “a” through “e”), be careful to mark the correct column.

7. If you have any questions concerning the intent or the initial conditions of a question, do not hesitate to ask them before answering the question. The questions that you asked during the examination and the answers you were given are documented and taken into consideration during the grading process. Only ask questions to the NRC examiner or the designated facility instructor. A dictionary is available if you need it.

8. When answering a question, do not make assumptions about conditions that are not specified in the question unless they occur as a consequence of other conditions that are stated in the question. For example, you should not assume that any alarm has activated unless the question so states or the alarm is expected to activate as a result of the conditions that are stated in the question. Similarly, you should assume that no operator actions have been taken, unless the stem of the question or the answer choices specifically state otherwise. Finally, answer all questions based on actual plant operation, procedures, and references. If you believe that the answer would be different based on simulator operation or training references, you should answer the question based on the actual plant.

9. Restroom trips are permitted, but only one applicant at a time will be allowed to leave. Avoid all contact with anyone outside the examination room to eliminate even the appearance or possibility of cheating.

10. When you complete the examination, assemble a package that includes the examination questions, examination aids, answer sheets, and scrap paper and give it to the NRC examiner or proctor. Remember to sign the statement on the examination cover sheet indicating that the work is your own and you have neither given nor received assistance in completing the examination.

11. After turning in your examination, leave the examination area as defined by the NRC examiner or proctor. If you are found in this area while the examination is still in progress, your license may be denied or revoked.

12. Do you have any questions?

C. General Operating Test Guidelines

1. If you are asked a question or directed to perform a task that is unclear, you should not hesitate to ask for clarification.

2. The examiner will take notes throughout the test to document your performance, and the examiner may sometimes take a short break for this reason. The amount of note-taking does not reflect your level of performance. The examiner is required to document both satisfactory and less-than-satisfactory performance.

3. The operating test is considered "open reference." The reference materials normally available to operators in the facility and control room (including calibration curves, previous log entries, piping and instrumentation diagrams, calculation sheets, and procedures) are also available to you during the operating test. However, you should know from memory certain automatic actions, setpoints, interlocks, operating characteristics, and the immediate actions of emergency and other procedures, as appropriate to the facility. If you desire to use a reference, you should ask the examiner whether it is acceptable to do so for the task or question under consideration.

4. Applicants shall not use personal cell phones or electronic devices during the operating test.

5. During job performance measures (JPMs) and during any followup question periods, you may not solicit from or provide technical information to any other person.

6. To maintain test integrity and fairness, you must not discuss any aspect of your operating test with, or in the presence of, any other examinee who has not completed the applicable portion of the operating test (i.e., the administrative topics JPMs, the control room and in-plant systems JPMs, or the simulator test).

7. Do you have any questions?

D. Walkthrough (Job Performance Measure) Guidelines

1. The walkthrough test covers control room systems, local system operations, and administrative requirements. The examiner will evaluate these areas using JPMs and specific followup questions, as necessary.

2. The walkthrough for the initial examination consists of 15 JPMs for RO and SRO-instant applicants and 10 JPMs for SRO-upgrade (SRO-U) and LSRO applicants. Except for

LSROs, most of the JPMs will be conducted in the control room or simulator, and the remainder will be conducted in the plant.

3. [The requalification walkthrough test consists of a total of five JPMs, with at least two in the control room/simulator and at least two in the plant.]

4. The examiner may not be familiar with this facility. When you enter the plant, you are asked to assist the examiner as necessary to ensure that he or she complies with safety, security, and radiation protection procedures.

5. You should not operate plant equipment without appropriate permission from the operating crew. Nothing the examiner says or asks will be intended to violate this principle. If the JPM task requires the opening of panel doors, check with your examiner before opening the door; the examiner will let you know if the operating crew has given permission.

6. Before beginning each JPM, the examiner will describe the initial conditions, explain the task to be completed, indicate whether the task is time critical, and explain which steps are to be simulated or discussed. You should perform or simulate the required actions as if directed by plant procedures or shift supervision. Do not assume that the examiner will accept an oral description of the required action unless the examiner indicates otherwise.

7. Time-critical JPMs have been validated by your facility and must be completed within the predetermined time interval to obtain a satisfactory grade for that JPM.

   You will be permitted to take whatever time is necessary to complete those JPMs that are not time critical provided that you are making reasonable progress toward achieving the task standard. If the examiner believes that you are not making reasonable progress, he or she will ask you to explain what remains to be done and how long it should take before stopping the task. You will be permitted at least twice the validated time to complete the JPM, whether you are making progress or not.

8. When performing JPMs, you are expected to make decisions and take actions based on the facility's procedural guidance and the indications available. Some of the tasks that the examiner asks you to perform will require implementation of an alternative method directed by plant procedures.

9. If your facility licensee's procedures and practices require the use of procedure readers or peer checks, you may ask the NRC examiner to perform those functions. However, because the NRC examiner must evaluate your individual performance without assistance from others, he or she will simply acknowledge your request and proposed actions regardless of their accuracy or correctness or inform you that a peer-checker is not available.

10. As part of the examination, the examiner may ask followup questions to evaluate your knowledge of an administrative topic, system, or task. There is no specific time limit for answering any question; however, you may be evaluated as unsatisfactory on a question if you are unfamiliar with the subject or reference material and are unable to answer the question in a reasonable period of time. You will not be permitted to conduct unlimited searches of the plant reference material during the examination.

11. To facilitate the examination and better enable the examiner to assess your level of understanding, please verbalize your actions and observations while performing the JPMs. Also, please inform the examiner when you consider your performance of each JPM and your answer to each question to be complete.

12. If you need a break during the test, you should ask the examiner.

13. Do you have any questions?

E. Simulator Test Guidelines

1. Your primary responsibility is to operate the simulator as if it were the actual plant. If you believe that the simulator is not responding properly, you should make decisions and recommendations on the basis of the indications available unless directed otherwise by the examiner.

2. In general, the examiner will not ask you questions while a simulator scenario is in progress. If the examiner asks you a question, you should answer it *only* if doing so will not interfere with simulation facility operations.

3. Teamwork and communications are evaluated. You can enhance the evaluation process by vocalizing your observations, analyses, and the bases for your actions.

   [Requalification examinations evaluate the crew's ability to safely operate the plant and the performance of both the individuals and the crew.]

4. If you recognize, but fail to correct, an erroneous decision, response, answer, analysis, action, or interpretation made by the operating team or crew, the examiner may conclude that you agree with the incorrect item.

   Members of the operating team or crew (whether applicants or surrogates) should perform peer checks in accordance with the facility licensee's procedures and practices; noncrew members and NRC examiners will not perform this function. However, if you begin to make a performance deficiency that someone else corrects, you will be held accountable for the performance deficiency as if it occurred.

5. You should keep a rough log during each scenario that would be sufficient to complete necessary formal log entries; the examiner may consider these notes when evaluating your performance.

6. A designated facility instructor will act as the auxiliary operators, radiation health and chemistry technicians, maintenance supervisors, plant management, and anyone else needed outside the control room.

7. A facility staff member (or examiner) will provide a shift turnover briefing before the scenario begins. The briefing will cover present plant conditions, power history, equipment that is out of service, abnormal conditions, surveillances that are due, and instructions for the shift.

8. Control board switches may be purposely cleared, tagged, or administratively controlled and reported on the preshift brief to enhance a scenario or transient where appropriate. If a switch is misaligned, it will be tagged or otherwise highlighted as appropriate to the

facility and will be noted during the shift turnover briefing. If you find something misaligned during your initial board walkdown that was not part of the shift turnover briefing then bring it to the attention of the lead examiner. The examiners will not misalign switches during the scenario.

9. Time compression may be used to expedite the sequence of events in some scenarios, but it will not preclude you from performing the actions that you would typically be required to perform in response to the events. If time compression is used, you will be informed during the scenario.

10. You will be given sufficient time (normally about 5 to 10 minutes) to familiarize yourselves with plant conditions before starting each simulator scenario.

11. The operating test for initial licensing will normally consist of two or three scenarios each lasting approximately 1 to 1.5 hours. [The requalification test will normally consist of two scenarios lasting about 1 hour each.]

12. SRO-U applicants who fill the role of a RO or balance-of-plant operator during a scenario will be evaluated on their ability to manipulate the controls even though an examiner may not be assigned to directly monitor their performance.

13. Do you have any questions?

1.3 EXAMINATION SECURITY

This examination standard (ES) contains instructions, restrictions, guidelines, and considerations for maintaining examination security and integrity for operator licensing initial examinations.

A. Background

The NRC examination team and facility licensee personnel must be attentive to examination security measures to ensure compliance with applicable NRC regulations.

Pursuant to 10 CFR 55.40(b)(2), facility licensees that elect to prepare their own examinations must establish, implement, and maintain procedures to control examination security and integrity.

In accordance with 10 CFR 55.49, "Integrity of examinations and tests," applicants, licensees, and facility licensees shall not engage in any activity that compromises the integrity of any application, test, or examination required by 10 CFR Part 55, "Operators' licenses." The integrity of a test or examination is considered compromised if any activity, regardless of intent, affected, or, but for detection, would have affected the equitable and consistent administration of the test or examination. This includes activities related to the preparation and certification of license applications and all activities related to the preparation, administration, and grading of the tests and examinations required by 10 CFR Part 55.

The NRC Enforcement Policy, available on the NRC's public Web site at http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html, addresses possible enforcement actions against parties subject to the requirements in the regulation (i.e., 10 CFR Part 55 applicants and licensees and licensees under 10 CFR Part 50, "Domestic licensing of production and utilization facilities," and 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants").

B. Instructions for NRC Regional Management, Supervision, and Designees

Once examination arrangements are confirmed with a facility licensee, NRC regional managers ensure that an NRC examiner reviews the facility licensee's security procedures and briefs the facility licensee contact on the examination security instructions in Section C of this examination standard.

If there is an indication that an examination may have been compromised, the responsible supervisor will act as necessary to ensure and restore the security and integrity of the examination process. Actions may include not giving the examination; making changes to the examination; voiding the results if the examination has already been given; revoking, suspending, or modifying, in whole or in part, a license pursuant to 10 CFR 55.61(b); and possibly imposing enforcement action in accordance with the Enforcement Policy. The supervisor shall keep NRC regional management and the NRR operator licensing program office informed of any concerns about examination security and integrity.

C. Instructions and Restrictions for Facility Licensee Personnel

All facility licensee and contractor personnel involved with an examination are covered by and subject to 10 CFR 55.49. This section provides instructions and restrictions for these personnel.

Questions on these instructions and restrictions should be resolved with the NRC chief examiner before granting an individual access to the licensing examination.

1. Access to Examinations

Although there is no specific upper limit on the number of facility licensee personnel who have access to the NRC licensing examination, access should be limited to only those personnel with a need to know. Additionally, each person's access should be limited to only those portions of the examination for which the individual bears responsibility (e.g., the individuals who prepare the simulator scenarios may not require access to the written examinations).

Facility licensees are responsible for the integrity and security of examinations prepared for them by contractor personnel.

2. Examination Security Agreement

All facility licensee personnel, including contractors, who will receive detailed knowledge of any portion of the NRC licensing examination, including the examination outline, must acknowledge their responsibilities with respect to examination security by reading and signing column "Signature (1)" of Form 1.3-1, "Examination Security Agreement," before they obtain detailed knowledge and again by signing column "Signature (2)" after the examinations are complete.

The facility licensee submits the examination security agreement forms to the NRC regional office for retention after the examinations are complete.

3. Prohibited Activities for Personnel on Examination Security Agreements

Prohibited activities for facility licensee personnel who have detailed knowledge of any portion of the NRC licensing examination include the following examples:

- the design and administration of any classroom and simulator instruction, including scheduled sessions, individual coaching, and remedial training, specifically for license applicants
  - Simulator booth operation is acceptable if the individual does not select the training content or provide direct or indirect feedback. Continued participation in requalification training for groups including SRO-U applicants is also acceptable as long as this is documented on Form 1.3-1 and is limited to areas in which the instructor has no examination knowledge.
- all on-the-job training, practice, coaching, and signoffs
- the preparation, review, grading, and evaluation of periodic quizzes, examinations, and simulator exercises
  - Signers of the examination security agreement may prepare and grade the audit examination, subject to an NRC review for test item duplication.
- development and addition of questions to the facility common question bank (used to create both NRC and non-NRC examinations and quizzes) if these questions are to be included in the NRC examination under development

– If questions are being developed to expand the size of the question bank, they are treated as any other bank item and subject to the other criteria in NUREG-1021 (e.g., repetition from the audit exam).

The license applicants should not be able to predict or narrow the possible scope or content of the licensing examination based on the facility licensee's examination practices (other than those authorized by the NRC's regulations, in NUREG-1021, or in writing by the NRC). In other words, the facility licensee personnel must not provide information to the applicants or licensed operators about examination content that would allow the test takers to either specifically or generally "predict" what test items will, or will not, be covered on the examination (e.g., the facility licensee personnel should not specify a certain exam bank to study if there is more than one version of the bank, or should not make general statements, such as "Exam B will not overlap with Exam A"). This restriction is not intended to limit facility licensee personnel from discussing the general aspects related to an initial license examination, such as overall examination construction as described in these examination standards. However, facility licensee personnel must not disclose specific attributes of the examination's content (e.g., how many JPMs or scenarios come directly from the bank, how many alternate path JPMs are on the examination, how many technical specification calls are in the scenarios).

4. Supervisor and Manager Interactions with Applicants

Supervisors and managers who have knowledge of the examination content may continue their general oversight of the training program for the license applicants, including the review of examinations, quizzes, and remedial training programs, as well as the counseling of applicants concerning nontechnical issues. Those supervisors and managers may not provide any technical guidance, training, or other direct feedback on the content of those examinations, quizzes, or programs in a manner that might compromise the integrity of the licensing examination, as defined in 10 CFR 55.49.

5. Examination Validation

The NRC discourages the use of certain individuals, such as the applicant's supervisors or coworkers, to validate the NRC examination.

6. Audit Examinations

Implement appropriate controls to keep the comprehensive audit or screening examination that is given at or near the end of the license training class from compromising the integrity of the operator licensing initial examination. This also applies to any practice exams and quizzes created after beginning work on the licensing examination. Some examples of acceptable control measures include the following:

- Prepare the audit examination using a systematic and random sampling process that is similar to that used to prepare the NRC's licensing examination as discussed in ES-4.1, "Developing Written Examination Outlines."

- Prepare and finalize the audit examination (and any practice exams and quizzes) before receiving the licensing written examination outline from the NRC.

- Develop the audit (as well as any practice exams and quizzes) and the licensing examinations using independent examination teams.

- Certify, as part of the examination submittal, that there is no question duplication between the facility licensee's audit and the NRC's licensing examinations.

Other methods might also be acceptable but will have to be reviewed and approved on a case-by-case basis.

D. Physical Examination Security Instructions and Guidelines

1. The NRC expects that facility licensee personnel are aware of the facility licensee's physical examination security measures and requirements (as documented in the facility licensee's approved procedures); sign the NRC's examination security agreement; and understand their security responsibilities, including the limits on their interaction with the license applicants (as discussed in Section C), before they are given knowledge or custody of any examination materials.

2. The examination outlines and final examinations shall be positively and continuously controlled and protected as sensitive information (i.e., under lock and key or in the custody of someone who has signed the examination security agreement). The number of copies of outlines and examinations should be limited, and each should be uniquely identified and controlled (e.g., with sign-out custody) at all times. Drafts, copies, and waste materials shall also be controlled and disposed of properly.

3. The NRC staff recommends that facility licensees consider implementing additional security measures when they are developing, storing, or printing examinations using a computer network to which license applicants or other persons who have not signed the examination security agreement could gain access. This includes any examination material that may have been stored on the simulator process computer, such as sequence of events data. Although the use of passwords should provide adequate security if normal computer security practices (e.g., selecting and changing passwords) are observed, special cases may need additional consideration. For example, if an applicant has extended access to the local area network (LAN) in his normal position, additional security measures may be appropriate.

4. When physically submitting examination material to the NRC regional office, the examination material should be placed in a double envelope, with the inner envelope marked "FOR OFFICIAL USE ONLY" and "TO BE OPENED BY ADDRESSEE ONLY." Include a cover letter stating that the materials must be withheld from public disclosure until after the examinations are complete. Finally, the sender should verify with the NRC chief examiner that the package was received.

5. When electronically submitting examination material to the NRC, a secure means must be used, such as the NRC's internal LAN in the resident inspector's office, secure file sharing tools, or e-mail with password-protected electronic files. The password should be provided to the NRC chief examiner separately by mail, fax, or telephone. The password should NOT be e-mailed with the files.

   The NRC has a checklist that NRC staff and facility licensees can use to assist in secure transmittals: "Checklist for Transmitting and Receiving NRC Exam Material over the Internet," available at https://www.nrc.gov/reactors/operator-licensing/regs-guides-comm.html.

6. The NRC expects the facility licensee to report immediately to the NRC chief examiner any indications or suggestions that examination security may have been compromised, even if the situation is identified and corrected before the examination is submitted to the NRC for review and approval. The NRC will evaluate such situations on a case-by-case basis and determine the appropriate course of action.

7. The facility licensee and the NRC shall determine whether examination security problems were noted in the past and ensure that corrective actions have been taken to preclude their recurrence.

8. The facility licensee and the NRC chief examiner shall review the simulator security considerations in Section F to ensure that the instructor station features programmer's tools, and external interconnections do not compromise examination integrity. The primary objective is to ensure that the examination material cannot be read or recorded at other unsecured consoles, and that examination materials are either physically secured or electronically protected when not in use by individuals listed on the security agreement.

E. Examination Bank Limitations

The facility licensee and the NRC chief examiner shall ensure that written examinations and operating tests conform to the instructions in this NUREG on the use of items taken directly from the examination bank, modified items, and new items.

If the facility licensee has an open bank, it shall not place any new or modified test items (i.e., written questions, JPMs, or simulator scenarios) that will be used on the examination in its examination bank until after the last examination has been administered.

F. Simulator Security Considerations

Simulators present a unique set of integrity concerns during the development and administration of operating tests. NRC examiners and facility licensees should be aware of the simulator's vulnerabilities and take appropriate measures to ensure that operating test security is maintained during use of (1) the instructor station, (2) the programmer's tools, and (3) the external interconnections. Because facility licensees are more familiar than NRC examiners with their simulator's unique capabilities, limitations, and vulnerabilities, the NRC expects that facility licensees will take responsibility for determining and implementing whatever measures might be necessary to ensure the integrity of the operating tests.

1. Instructor Station Features

Most of the instructor station features can be checked through the interface provided at the instructor's console. The programmer's tools and the external interconnections are not generally apparent to the instructor or the examiner. The simulator staff should be consulted to determine the status of those items. A typical instructor station has the following features:

- Snapshots. All simulators have snapshot capability. Initial conditions (ICs) are recorded for future recall.

- Backtrack. Backtrack files are snapshots that are automatically recorded at predetermined intervals (usually up to 1 hour of operation at intervals as frequent as

1 minute). Backtrack files are usually only accessible through the BACKTRACK feature. The files typically can be overwritten by real-time operation but cannot be erased.

- Replay/Playback. The replay/playback feature steps through a series of snapshots and displays the output status (lights and meters) for each sequentially. Often, the replay feature uses the backtrack files, although separate replay file storage may be provided.

- Scripts/Computer-Assisted Exercises. Many simulators have a feature that allows preprogrammed implementation of malfunctions and remote functions based on time or logical conditions (or both). The simulator staff may use scripts to facilitate scenario administration and can typically store scripts for future use. Stored scripts can also be selected for review and editing from the instructor station.

- IC Summary. Snapshots are usually labeled on the IC menu of the instructor station with date/time recorded, pertinent plant parameter status, and instructor's comments. Even if the comment field has been changed to indicate that a snapshot is available for reuse, the data (scenario initialization) may still be representative of test conditions until the snapshot is overwritten or updated.

- Malfunction Summary. Malfunction summary menus display the status of selected malfunctions, both active and inactive. The malfunction summary is usually IC dependent and, therefore, depicts the malfunctions that were active or staged when an IC (such as a scenario validation) was stored.

- Monitored Parameters. Instructors are afforded the capability to define individual or groups of parameters for display or printout. The monitored parameter group assignments can be recalled for review and editing. If used to facilitate scenario validation or examination administration, the monitored parameters can provide insight into the focus of the examination.

- Trend Recording. Groups of parameters can be defined and assigned to trend recorders. The recorders may be, but are not necessarily, located at the instructor station. The recording may also be in file format for presentation on the instructor station screens. Recording sessions are typically activated or deactivated at the instructor station.

- Student Performance Monitoring. Special groups of parameters and simulated plant operating conditions can often be assigned to a tracking and recording function that plots an individual student's performance during training exercises. Recording sessions are typically activated or deactivated at the instructor station.

- Video and Audio Recording. Many simulators are equipped with video- and audio-recording capability in the control room. Video and audio controls are typically located at the instructor station.

- Sequence of Event Files. Many simulators have the capability to monitor and record the sequence of events during simulator scenarios. These files may stay in place and remain accessible until deleted or overwritten by subsequent scenario runs provided that examination security is maintained.

2. Programmer's Tools

Programmer's tools include the following:

- Software Terminals. Simulator engineers have access to real-time monitoring and control of simulator and model conditions through software support terminals. These terminals may be located in other work areas.

- Independent Executive Programs. The conditions for scenarios can sometimes be replicated offline using independent executive programs. These programs should not be in communication with the input/output. Independent executive programs and their associated initialization files may provide an indication of planned exercises if they have been used to resolve problems during scenario validation.

- Graphical User Interfaces (GUIs). Instructor station GUIs often display simulated plant conditions and performance in real time. At remote locations, such as a programmer's desk, the GUI could display the full scenario.

3. External Interconnections

External interconnections include the following:

- Engineered Safety Feature Feeds. Many simulators have data links to the engineered safety feature and the operations management offices for emergency planning drills. These links can display the simulated plant condition to observers outside the simulated control room during scenario validation or examinations.

- Remote Plant Process Computer and Instructor Station Screens. Repeater screens in the training area can display scenarios in real time to observers outside the simulated control room.

- Modems and Remote Simulator Support Systems. Many simulators are equipped with modems from the instructor station or simulation computers for outside monitoring and control of simulator status and activities by parties off site.

G. Forms

Form 1.3-1 Examination Security Agreement

Form 1.3-1 Examination Security Agreement

(1) Preexamination

I acknowledge that I have acquired specialized knowledge about the U.S. Nuclear Regulatory Commission (NRC) licensing examinations scheduled for the week(s) of _____ as of the date of my signature. I agree that I will not knowingly divulge any information about these examinations to any persons who have not been authorized by the NRC chief examiner. I understand that I am not to instruct, evaluate, or provide performance feedback to those applicants scheduled to be administered these licensing examinations from this date until the completion of examination administration, except as specifically noted below or authorized by the NRC. Furthermore, I am aware of the physical security measures and requirements (as documented in the facility licensee's procedures) and understand that violation of the conditions of this agreement may result in cancellation of the examinations, an enforcement action by the NRC against me or the facility licensee, or both. I will immediately report to facility licensee management or the NRC chief examiner any indications or suggestions that examination security may have been compromised.

(2) Postexamination

To the best of my knowledge, I did not divulge to any unauthorized persons any information concerning the NRC licensing examinations administered during the week(s) of _____. From the date that I entered into this examination security agreement until the completion of examination administration, I did not instruct, evaluate, or provide performance feedback to those applicants who were administered these licensing examinations, except as specifically noted below or authorized by the NRC.

	Print Name	Job Title	Signature (1)	Date	Signature (2)	Date	Note
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							
12.							
13.							

NOTES:

2.1 PREPARING FOR OPERATOR LICENSING INITIAL EXAMINATIONS

This examination standard (ES) describes activities for U.S. Nuclear Regulatory Commission (NRC) staff and facility licensee personnel to prepare for operator licensing initial examinations (written examinations and operating tests) at power reactor facilities. This standard includes instructions for scheduling and coordinating examination development, assigning NRC examiners and facility licensee personnel, and obtaining reference and examination materials from the facility licensee.

A. Scheduling Examinations

Planning and scheduling operator licensing examinations includes the following steps:

1. The NRC issues an annual letter soliciting estimated operator licensing needs, including estimated numbers of applicants, examination dates, and the facility licensee's intended level of participation in developing all parts of the examination.

2. The facility licensee should also notify the NRC regional office if its examination requirements change significantly from those stated in its response to the annual letter.

3. The NRC regional office schedules the NRC's operator licensing initial examinations and arranges for the development, administration, and grading of those examinations.

   Note: Examinations for fewer than three applicants will only be scheduled under extenuating circumstances, such as a shortage of licensed operators at the facility or in the event of a retake examination. If a facility licensee has fewer than three applicants, the examinations may be delayed until there are more applicants.

   Note: If the facility licensee prepares the written examinations or operating tests in conjunction with another facility, the two examinations/tests must be administered at the same time.

4. Each NRC regional office will prepare at least one examination per calendar year to certify new examiners, if necessary, and to maintain the proficiency of existing examiners. This will at a minimum consist of the entire written examination and the outlines for the job performance measures (JPMs) and simulator scenarios.

5. The NRC regional office and the facility licensee should discuss and confirm the examination date and expected number of applicants. The NRC regional office issues a letter confirming the arrangements no later than 210 days before the examination begins. This timeline does not apply to retake examinations. The letter should be addressed to the person at the highest level of corporate management who is responsible for plant operations (e.g., Vice President of Nuclear Operations). Letter 2.1-1, "Sample Corporate Notification Letter," in this examination standard is an example of such a letter; the exact wording may be modified as necessary to reflect the situation.

6. In addition, the Commission may exercise its discretion and reject a facility licensee's election to prepare, proctor, or grade all or portions of the examinations (e.g., outline, written examination, operating test). In such a case, the Commission shall prepare, proctor, and grade the required written examinations and operating tests for that facility

licensee. This may occur if the NRC regional office does not have confidence that a facility licensee will develop adequate examinations or if the region has concerns with examination security or quality.

7. To maintain uniform conditions, the operating test and written examination should be administered within 30 days of one another. Under certain circumstances, such as a weather or health emergency, this may not be possible. The NRC regional office must obtain concurrence from the Office of Nuclear Reactor Regulation (NRR) operator licensing program if more than 30 days will elapse between the completion of one portion and the start of the other.

B. Examination Preparation Criteria for Facility Licensees

Form 2.1-1, "Examination Preparation Checklist," should be used to track the examination preparations. As noted on the form, target due dates can be adjusted as necessary to accommodate a given situation.

Before developing an operator licensing initial examination, facility licensees are encouraged to review the examination security considerations in Examination Standard (ES)-1.3, "Examination Security."

Examination preparation for facility licensees includes the following steps:

Note: Items identified with an asterisk (*) DO NOT apply to NRC-authored examinations.

1. Designate a point of contact to work with the NRC chief examiner and assign additional personnel as required to ensure that the examinations are developed, reviewed, administered, and graded in accordance with the applicable examination standards. The facility licensee may use contractors or other outside assistance to develop the examinations, but the licensee bears full responsibility for the product, including conformance with the examination criteria and maintenance of examination security and integrity.

2. *When ready to begin developing the written examination, and no more than 18 months before the scheduled examination date, the facility licensee may request the NRC regional office to prepare the written examination outline (ES-4.1, "Developing Written Examination Outlines"). The NRC will use the knowledge and abilities (K/A) catalog that has been reviewed and approved by the NRC at the time of this request to create the outline; this determines the revision of the catalog to be used for examination development (i.e., the applicable K/A catalog). The 18-month limit allows use of the current revision of the applicable K/A catalog if a revision to it is in process.

3. Review the NRC-provided examination outline(s) and submit comments for any necessary changes.

4. Submit the required reference materials (Section F), examination outlines, and examinations, as applicable, based on the level of facility licensee participation.

5. If the facility licensee determines that it is appropriate for the purposes of operator training and examination, "freeze" the plant procedures at a specific revision number or date to facilitate examination development. If used, discuss this option with the NRC

chief examiner in advance and refer to Section G of this examination standard for additional guidance on plant procedure freezes.

6. *Submit proposed outlines for all portions of the operating test (simulator and walkthrough) at all license levels relevant to the applicants (reactor operator (RO), senior reactor operator (SRO), and senior operator limited to fuel handling (LSRO)) to be tested.

7. Ensure that a facility supervisor or manager independently reviews the proposed examination outline(s) and the proposed examination(s) before they are submitted to the NRC regional office. Perform this review using the instructions in ES-2.3, "Reviewing and Approving Operator Licensing Initial Examinations."

8. *Ensure that an authorized representative of the facility licensee has approved the required written examinations and operating tests before they are submitted to the NRC regional office for review and approval. Submit the facility licensee-approved written examinations and operating tests to the NRC regional office with a cover letter signed by the facility licensee representative. The materials must be complete and ready to use to facilitate a thorough review by the NRC region.

9. If the NRC staff prepared any portion of the examination, the NRC regional office will provide a copy of the applicable examination portions to the facility licensee reviewers after they sign the security agreement (Form 1.3-1, "Examination Security Agreement"). The facility licensee reviewers should make their comments directly on the examination(s), use the review worksheets in ES-2.3, or employ another method to document their comments. The reviewers should then give their comments to the NRC chief examiner and ensure that he or she understands their comments and recommendations. Simple editorial changes that do not change the intent of the question require no justification; however, *every* substantive change (e.g., deleting a question, replacing a distractor, or revising an answer) must be supported by approved facility reference material. The facility licensee reviewers may retain a copy of the applicable marked-up examination, subject to the physical security considerations in ES-1.3.

10. If the facility licensee has significant concerns with the content or difficulty of the NRC-prepared examination, the changes that the NRC has directed the facility licensee to make in its proposed examination, or the general implementation of the instructions and guidelines in this standard, communicate those concerns to the NRC and, if appropriate, request a meeting with the NRC to address the concerns. The NRC chief examiner is normally the first point of contact for resolving any concerns about the examination. If the concerns are not resolved, contact NRC regional management and, if necessary, the NRR operator licensing program office Branch Chief.

11. Make the simulation facility available, typically during normal business hours, for NRC examiners to prepare for, validate, and administer the operating tests. The NRC will make reasonable efforts to minimize the impact on other training activities. Facility licensees should plan to dedicate the simulator entirely to the initial licensing examination for the extent of operating test administration, except for administrative JPMs. Running requalification training or simulator tests during examination week should be avoided. If an examination week is cancelled due to simulator availability, the NRC cannot guarantee that the examination will be rescheduled within the 30-day limit for time between parts of the examination.

12. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 55.46(c)(1)(i) and 10 CFR 55.46(d), ensure sufficient simulator fidelity to allow conduct of the evolutions listed in 10 CFR 55.45(a)(1)–(13), as applicable to the design of the reference plant. Provide the results of any uncorrected performance deficiencies that may exist at the time of operating test administration for NRC review. In addition, give the NRC a list of significant differences between the simulator facility and the reference plant.

13. Before administering the first operator licensing examination at a cold plant, the NRC may perform an inspection using Inspection Procedure 41502, "Nuclear Power Plant Simulation Facilities," to verify conformance with the simulator requirements specified in 10 CFR 55.46, "Simulation facilities," and to assess the adequacy of the facility licensee's simulation facility for use in operator licensing examinations as well as for applicant experience requirements as described in 10 CFR 55.31(a)(5).

14. Meet with the NRC (normally the NRC chief examiner) to review and discuss all substantive comments from the quality reviews of the examination outlines and proposed examinations. These meetings will normally be conducted by telephone but, with approval from NRC regional management and agreement of both parties, may be conducted in the regional office or at the facility. These meetings may be supported by securely sharing electronic documents.

15. *Make any necessary changes as agreed upon with the NRC; however, the NRC retains final authority to approve the examinations.

16. Submit waiver and excusal requests as early in the process as possible (ideally more than 60 days before the examination) using a preliminary NRC Form 398, "Personal Qualification Statement—Licensee." Early submittal of preliminary waiver and excusal requests allows the NRC to better plan resources for evaluating requests and resolve any issues before receipt of the final, signed application.

17. Submit the license applications along with a letter requesting the administration of licensing examinations. Preliminary applications are due approximately 30 days before the examination and final, signed applications are due 14 days before the examination.

18. Develop a schedule for administering the operating test to optimize the efficient administration of the examination, given the number of examiners and the mix of RO and SRO applicants. The schedule should identify the crews for the simulator scenarios, state the number of scenarios that must be created to accommodate the crew complement, prescribe the timing of JPMs, and propose examiners by position to evaluate each applicant (i.e., Examiner 1, Examiner 2). Follow the guidance in ES-3.4, "Developing Scenarios," for use of surrogates, number of applicants in a crew, and other considerations.

C. Examination Preparation Criteria for NRC Regional Management, Supervision, and Designees

Examination preparation for NRC regional management includes the following steps:

1. Approximately 7 months before the scheduled examination, the NRC regional office will assign the required number of examiners to develop, prepare for, and administer the examination. The NRC regional office will also designate an NRC chief examiner to coordinate the examination project with the facility licensee and other examiners

assigned to the examination. When making assignments, the regional office should consider each examiner's certification status, other examination commitments, possible conflicts of interest (as discussed in Section E of this examination standard), and general availability.

2. Once the facility licensee has begun preparing the examination, the NRC regional office will avoid changing the assigned NRC chief examiner unless necessary. If a change is unavoidable, the responsible supervisor will attempt to minimize the impact on the facility licensee.

3. Regional management should assign enough examiners so that no examiner will have to administer more than four complete simulator operating tests per week.

4. Approximately 7 months before the scheduled examinations, the NRC regional office will discuss the following examination arrangements, as applicable, with the facility licensee during the examination kick-off call:

   a. anticipated examination dates

   b. expected number and type of applicants

   c. expected dates for the items listed on Form 2.1-1

      Note: The NRC regional office may agree to earlier due dates with the facility licensee contact but should refrain from advancing the dates if it is unlikely that the review will begin promptly after the regional office receives the material. The regional office should inform the facility licensee contact of the dates by which the regional office expects to provide its comments on the material.

   d. requirements and considerations for examination security and integrity

   e. guidance related to freezing plant procedures

   f. the instructions and guidelines for developing, administering, and grading the written examination and operating test, including the effective revision of examination standards

   g. for NRC-developed examinations, the need for the facility licensee to provide the necessary reference materials for the NRC to develop the examination (see Section F)

   h. the need for the NRC to provide the licensee with the written examination outline as early in the process as possible provided security requirements are in place (only applicable to licensee-developed examinations)

   i. the need for the facility licensee to review the NRC-provided examination outline(s) and submit comments for any necessary changes; the NRC will make any changes to the outlines for NRC-prepared examinations

   j. expectations for deviating from the approved written examination outline and selecting replacement K/As to prevent re-work

k. the 10 CFR 55.40(b)(3) requirement that an authorized representative of the facility licensee must approve the proposed examination outlines and examinations before they are provided to the NRC as a formal submittal (including cover letter) for review and approval

l. dates and simulator availability for validating examination materials on site; these materials should include all the operating test components (JPMs and simulator scenarios), and the facility licensee must make the simulator available to examiners for an ample amount of time during the validation visit

m. the need to ensure simulator fidelity in accordance with 10 CFR 55.46(c)(1)(i) and to have the simulator available during onsite validation and operating test administration

Note: A list of uncorrected performance deficiencies and deviations from the reference plant must be made available during onsite validation and again at the beginning of administration of the operating tests.

n. the option to submit some sample test items (e.g., 5 to 10 written questions, 1 scenario, and 1 to 2 JPMs) for preliminary NRC review and comment (this presubmittal sample could increase the efficiency of the examination review process by promoting early identification and correction of generic examination development concerns)

Note: As long as changes from this review are incorporated, resulting in acceptable test items, these sample test items do not count as "unsatisfactory" when calculating the quality of the submitted examination in accordance with ES-5.1, "Issuing Operator Licenses and Postexamination Activities."

o. the requirements and guidelines for submitting the license applications

Note: This discussion should include a justification for waiver and excusal requests, noting that waiver and excusal requests should be submitted as early in the process as possible (ideally more than 60 days before the examination) using a preliminary NRC Form 398. The NRC's final decision on whether to grant a waiver or excusal request will be made on the official (not preliminary) NRC Form 398 submitted for the applicant.

p. whether any individual applying to take the examination has previously failed an initial operator licensing examination operating test at any facility

5. The responsible regional supervisor reviews the examination outlines and the draft examinations and evaluates any recommended changes and corrections noted during the chief (and other) examiner's review. ES-2.3 contains guidance on examination reviews.

6. If regional management determines that additional time is needed for examination development or that there is a need to delay the examination administration to address other scheduling concerns, regional management may delay either part (written examination or operating test) of an examination for up to 30 days. It is *not* appropriate to delay one part of an NRC examination based on applicant performance on another part of an NRC examination that has already been administered or based on applicant

performance on licensee-administered audit examinations. However, the entire NRC examination may be delayed for these reasons as agreed upon by the regional office. The regional office must consult the NRR operator licensing program office about any delay and notify the facility licensee in writing of the reasons for delaying the examination(s).

7. Upon receiving the preliminary license applications, the NRC regional office reviews the applications and evaluates any waiver and excusal requests in accordance with ES-2.2, "Applications, Medical Requirements, and Waiver and Excusal of Examination and Test Requirements." The regional office will communicate any errors or missing information noted during the preliminary application review to the facility licensee to ensure that it has an opportunity to make corrections before the final, signed applications are submitted 14 days before the examination date. This process helps prevent unnecessary delays in approving the examination for administration.

8. Examinations are reviewed and approved in accordance with ES-2.3.

9. The region prepares and sends the examination approval letter (Letter 2.3-1, "Sample Examination Approval Letter") approximately 7 days before the examination to notify the facility licensee that the NRC has completed its review of the license applications and to confirm that both the NRC and the facility licensee agree that the examination meets the guidelines of NUREG-1021. This letter also authorizes the facility licensee to administer the written examinations, if applicable.

10. Approximately 7 days before the examination, the responsible NRC supervisor shall query the facility licensee management counterpart about the licensee's views on the examination. The following subjects should be considered for discussion, and corrective measures shall be implemented when necessary:

    a. whether the NRC test item comments were justified and clearly explained

    b. the facility licensee's assessment of the significant test item changes

    c. whether any of the examination changes are believed to render the test items or the examination unfair, and whether this concern was shared with the NRC chief examiner

    d. whether the facility licensee requested and was permitted to defer the correction of test item flaws that were identified as minor in nature

D. Examination Preparation Criteria for NRC Chief Examiner and Assigned Examiners

Examination preparation for NRC chief examiners and assigned examiners includes the following steps:

1. When assigned to administer operating tests for the first time at a particular facility, the examiner should inform the NRC chief examiner and the responsible supervisor so that arrangements can be made to ensure participation in onsite validation activities as described in Section I. If the examiner is unable to attend validation activities, the NRC chief examiner and responsible supervisor should determine whether a site orientation trip to the facility is appropriate.

2. Examiners not involved in test development are expected to research and study the topics and systems to be examined on the operating test so that they are prepared to ask whatever performance-based followup questions might be necessary to determine applicant competence.

3. NRC examiners monitor and ensure the integrity of the examination process, but they are not expected to sign onto the facility licensee's examination security checklist. If they perceive that a compromise has occurred, caused by either facility licensee or NRC personnel, they shall immediately report it to the responsible regional supervisor so that the necessary actions can be taken to restore the security and integrity of the examination. ES-1.3 contains the examination security and integrity requirements and guidance that examiners should note when reviewing the procedures that the facility licensee has established pursuant to 10 CFR 55.40(b)(2), as applicable.

4. After examination arrangements are confirmed, an NRC examiner reviews the facility licensee's security procedures and briefs the facility contact on the examination security items in ES-1.3. This may occur as part of the discussion with the facility licensee in step 4 of Section C above.

5. The assigned examiners review and inventory the reference materials received from the facility licensee. The purpose of this review is to determine whether the materials are complete and adequate to enable the NRC regional office to review or develop the examinations, as applicable. The reviewer(s) will inform the NRC chief examiner if the materials are incomplete or inadequate, and the responsible supervisor will request that the facility licensee send any additional materials that might be required. If necessary, an examiner may review and select additional reference materials during a site orientation trip.

6. The NRC chief examiner works with the assigned examiners and the designated facility licensee contact, as applicable, to ensure that the examination outlines and examinations are developed in accordance with the applicable examination standards, considering comments received from the facility licensee pertaining to the NRC-provided outlines. The NRC chief examiner should adapt the level of oversight and coordination based on the experience of the individuals who are preparing the examinations.

7. The NRC chief examiner ensures that the examination outlines, written examinations, and operating tests are independently reviewed using the instructions and guidance in ES-2.3.

8. The NRC chief examiner shall note and review necessary changes and forward the outlines, written examinations, and operating tests to the responsible supervisor for review and comment before resolving any deficiencies with the author or facility licensee contact.

9. If the NRC staff authored any portion of the examination, the NRC regional office will provide a copy of the applicable written examination(s), operating test(s), and outlines to the facility licensee reviewers after these reviewers sign the security agreement. If the facility licensee reviewers have significant disagreements with the NRC chief examiner, the NRC chief examiner will inform the responsible regional supervisor so that the disagreements can be resolved before the examinations are administered.

10. After receiving approval from the responsible NRC supervisor, generally about 7 weeks before the examinations are scheduled to be given, the NRC chief examiner will review the NRC comments on the written examinations and operating tests with the facility licensee.

    The NRC chief examiner may conduct the examination review by telephone. The review may also be conducted in the regional office or at the facility with approval from NRC regional management and the agreement of both parties. These meetings may be supported by securely sharing electronic documents.

11. After examination corrections have been made, the NRC chief examiner verifies that the changes are appropriate and routes the examinations and the marked-up drafts to the responsible supervisor for final approval.

12. As soon as possible after the responsible supervisor has approved the operating tests for administration, the NRC chief examiner will ensure that the approved scenarios and JPMs are made available to the other assigned examiners so that they can familiarize themselves with those materials and be better prepared to further evaluate the applicants' potential deficiencies if required.

13. The NRC chief examiner should review the facility licensee's schedule for administration of the operating test. The schedule should be optimized for efficient administration, given the number of examiners and the mix of RO and SRO applicants. The schedule will identify crews for the simulator scenarios and the timing of JPMs and will propose which examiners will evaluate which applicants. The NRC chief examiner may elect to change the facility licensee's proposed schedule, including crew assignments, examiner assignments, or the order of administration of the JPMs, with justification. However, if changes to crew assignments are required, the NRC chief examiner must identify these changes as early as possible and generally will not make changes less than 2 weeks before the examination start date to allow some time for affected applicants to adapt to working as a crew before they take the simulator operating test.

14. The written examinations may be administered as soon as they and the final license applications (including any applicable waiver or excusal requests) have been approved. If the facility licensee will administer the written examinations, the NRC chief examiner reviews the instructions in ES-4.3, "Administering Written Examinations" (e.g., proctoring and responding to applicant questions), and confirms the applicants' status (i.e., examination type and waivers or excusals) on Form 2.2-1, "List of Applicants," with the facility licensee contact before the examinations are given.

15. The operating test will be administered within 30 days of the applicants taking the corresponding written examination. Concurrence should be obtained from the NRR operator licensing program office before exceeding 30 days between the completion of the written examination/operating test and the start of the operating test/written examination.

16. If the examination schedule must be changed on short notice, the NRC chief examiner will work with his or her supervisor and the designated facility licensee contact to reschedule the examinations to a time when examiners are available and other examinations are not affected.

E. Restrictions for NRC Personnel

- An examiner shall not be assigned to evaluate any portion of a retake operating test for an applicant if that examiner participated in the determination of either of the following for that same applicant:

  – a failure of a previous operating test
  – a denial of a request to be excused from reexamination of any portion of the operating test (i.e., the examiner was involved in the decision to deny the excusal)

- The licensing decision associated with the retake operating test for an applicant shall be made by a supervisor other than the supervisor who made the previous determination for an operating test failure.

- If an examiner was previously employed by a facility licensee (or by one of its contractors) and was significantly involved in training any of the current license applicants, the regional office shall not assign that examiner any direct responsibilities for developing, administering, or grading written examinations or operating tests for that facility. Regional management shall control other in-office examination activities concerning the facility, such as technical consultation and quality reviews of examinations.

- If an examiner is assigned to an examination that might appear to present a conflict of interest, the examiner shall inform his or her immediate supervisor of the potential appearance of conflict. Such notifications must include the following information:

  – the nature and extent of previous personal and professional relationships with the applicants

  – issues that could affect the administration, performance, evaluation, or results of the examination

  – anything that could create the appearance of a conflict of interest

F. Reference Material for Operator Licensing Initial Examinations

The NRC expects facility licensees to provide reference materials for each NRC operator licensing initial examination. The NRC regional office will customize the list of reference materials to support the specific examination assignment. The regional office shall consider the administrative burden it places on the facility licensee and will request only those materials that are necessary for the NRC examiners to prepare for the examinations. The regional office may request additional materials later, if necessary, to ensure the accuracy and validity of the examinations.

1. Determine Need

In determining the need for reference materials, the NRC regional office will consider the facility licensee's level of participation in the examination development process. If the facility licensee will prepare the examinations, it may be sufficient to obtain only those references necessary to

review and validate the items that appear on the examination, plus a set of key procedures and other documents required to prepare for the operating tests.

2. Use Approved Reference Material

All reference materials provided for the examinations should be approved, final issuances and should be marked as such, and personal, proprietary, sensitive, or safeguards information should be marked and submitted in a separate enclosure. If any of the material is expected to change before the scheduled examination date, the facility licensee should reach agreement with the NRC chief examiner about changes before the examinations are administered.

For plants under construction (i.e., cold plants), the facility licensee may use plant-specific terminology (e.g., "Operational Draft" or "Draft") to designate procedures as approved and ready for use, before they are turned over to the Operations Department, or before the facility is required to implement technical specifications in accordance with the license. Regardless of the terminology chosen by the plant to designate the procedure status, procedures used to support examination material should receive (1) an administrative review to verify that the procedure meets the facility licensee's writer's guide requirements and satisfies all technical specifications and final safety analysis report requirements, and (2) a technical review to verify that the procedure is correct for proper operations of plant systems and equipment. Additionally, the facility licensee's management should approve the procedures provided to the NRC for each examination in accordance with the facility licensee's administrative procedure requirements.

3. Format

Licensees can submit reference material either electronically or in hardcopy. All procedures and reference materials should contain appropriate indices or tables of contents so that they can be used efficiently, and a master table of contents should be provided for all materials sent. Also, all electronic documents should be text searchable. Failure to provide complete and indexed/text searchable reference materials may prompt the NRC to return the materials to the person at the highest level of corporate management responsible for plant operations. The NRC will include a cover letter with the returned reference materials explaining the deficiencies in the materials and the basis for postponing or canceling the examinations, as appropriate.

4. Specific Reference Material to Provide

Unless otherwise instructed by the NRC regional office, the facility licensee is expected to provide the following reference materials for each NRC operator licensing initial examination:

a. materials used by the facility licensee to ensure operator competency:

(1) Materials used to train applicants for initial RO and SRO licensing. Materials should be complete, comprehensive, and of sufficient detail to support the development of accurate and valid examinations without being redundant. Such materials include the following:

- learning objectives, student handouts, and lesson plans
- system descriptions, drawings, and diagrams of all operationally relevant flowpaths, components, controls, and instrumentation

- material used to clarify and strengthen understanding of normal, abnormal, and emergency operating procedures (EOPs) (including severe accident management guidelines)

- complete, operationally useful descriptions of all safety system interactions and, where available, balance-of-plant system interactions under emergency and abnormal conditions, including consequences of anticipated operator errors, maintenance errors, and equipment failures, as well as plant-specific risk insights based on a probabilistic risk analysis and individual plant examination

(2) questions and answers specific to the facility training program that may be used in the written examinations or operating tests

(3) copies of facility licensee-generated simulator scenarios that expose the applicants to abnormal and emergency conditions, including degraded pressure control, degraded heat removal capability, and containment challenges, during all modes of operation, including low-power conditions (a description of the scenarios used for the training class may also be provided)

(4) all JPMs used to ascertain the competence of the operators in performing tasks within the control room complex and outside the control room (i.e., local operations), as identified in the facility licensee's job task analysis (JPMs should evaluate operator responsibilities during normal, abnormal, and emergency conditions and events, and during all modes of operation, including cold shutdown, low power, and full power)

b. complete index of procedures (including all categories sent)

c. all administrative procedures applicable to reactor operation or safety or that support a written question or operating test item

d. all integrated plant procedures (normal or general operating procedures)

e. all emergency procedures and their bases (emergency instructions and abnormal or special procedures)

f. standing orders (important orders that are safety related and that may modify the regular procedures)

g. surveillance procedures that are run frequently (i.e., weekly) or that can be run on the simulator

h. fuel handling and core loading procedures (if SRO applicants will be examined)

i. all annunciator and alarm procedures

j. radiation protection manual (radiation control manual or procedures)

k. emergency plan implementing procedures

l. technical specifications or similar technical requirements documents (and interpretations, if available) and their bases for all units for which licenses are sought

m. system operating procedures

n. technical data book and plant curve information used by operators, as well as the facility precautions, limitations, and setpoints document

o. information pertaining to the simulation facility:

(1) a list of all initial conditions

(2) a list of all malfunctions with identification numbers and cause-and-effect information, including a concise description of the expected result or range of results that will occur upon initiation and an indication of which annunciators will be actuated because of the malfunction

(3) a description of the simulator's failure capabilities for valves, breakers, indicators, and alarms

(4) the range of severity of each variable malfunction (e.g., the size of a reactor coolant or steam leak, or the rate of a component failure such as a feed pump, turbine generator, or major valve)

(5) a list of modeling conditions (e.g., simplifications, assumptions, and limits) and problems that may affect the examination

(6) a list of any known performance test discrepancies not yet corrected

(7) a list of significant differences between the simulator facility and the reference plant

(8) the simulator instructor's manual

p. additional plant-specific material that the NRC examiners have requested to develop examinations that meet the guidelines of these standards and the regulations

G. Guidelines for Freezing Plant Procedures

The NRC recognizes that facility licensees may wish to train and examine their license applicants to the same version of plant procedures. At their discretion, facility licensees may "freeze" plant procedures to a particular revision for purposes of applicant training and examination development (either for facility licensee-prepared examinations or as reflected in the reference materials submitted for NRC-prepared examinations).

- To limit gaps between training/testing and current plant operations, freezing procedures later during the training process is preferred. Alternatively, facility licensees could choose not to freeze procedures at all but rather track any procedure changes and adjust the training and examinations as required. However, depending on the nature and volume of changes, this alternative could impose a significant additional burden on the facility licensee and NRC examiners to ensure that procedure revisions affecting test items are reconciled before examination administration.

- Applicants will be exposed to the current version of the procedures when they spend time in the control room. Therefore, freezing procedures for the examination has the

potential to confuse applicants by testing them on a different version of procedures than the version that they have seen in the control room. Such confusion has contributed to applicants' failure on the written examination because the applicants based their answers on the wrong version of procedures. If the procedures are frozen, the applicants must be informed of the date of the procedure freeze, such that they have a complete understanding of which versions of the procedures the NRC examination is based upon. Note that freezing different procedures at different times will likely add to the applicants' confusion.

- Examination authors and NRC reviewers need to consider the implications of the freeze during examination development; for example, the plausibility and correctness of a distractor should not hinge on a procedure change that the frozen version of the procedure does not yet incorporate. Another consideration is whether the simulator will support the implementation of both procedure versions—the new one for license holders and the old one for the applicants.

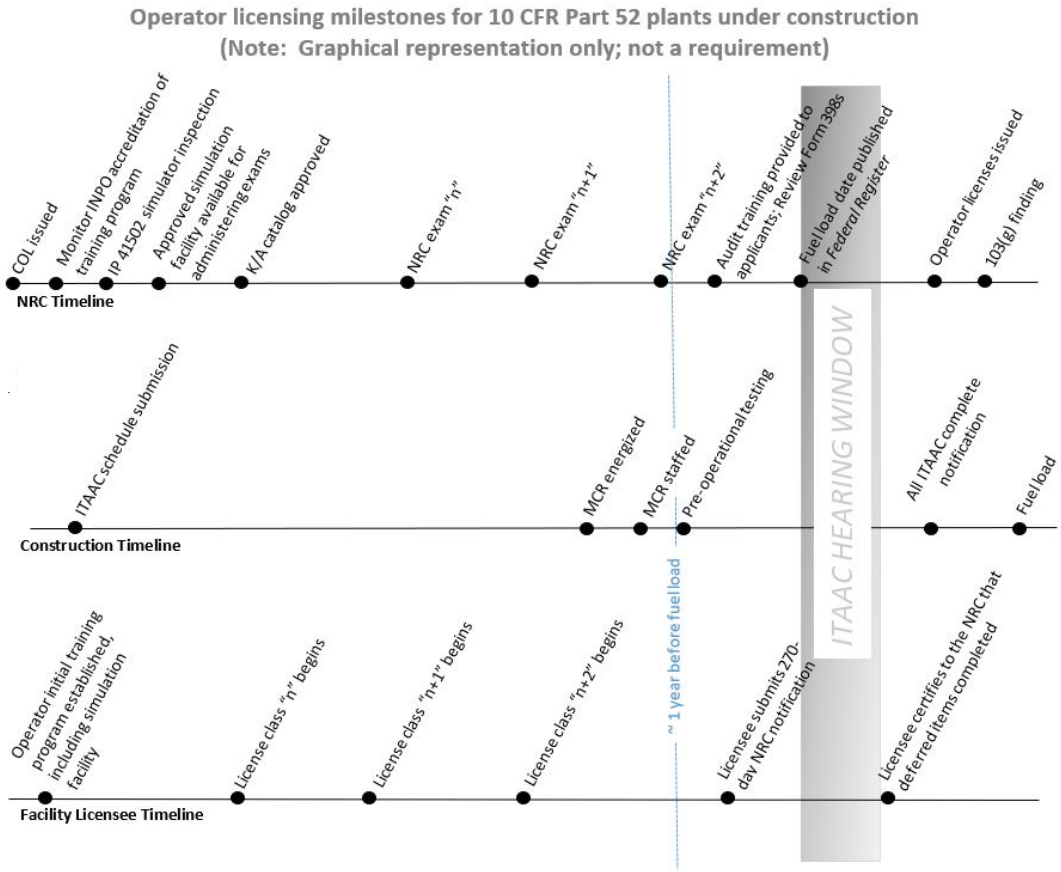
- If changes in the procedures occur after the freeze and before the licensing date, the NRC expects the facility licensee to provide training to fill the gap; if the changes are significant, the NRC could request more information about the nature of such training and testing. In at least one instance, applicants were trained and tested on a new version of the EOPs that had not yet been implemented in the plant; this eliminated the need to retrain the applicants but prompted the NRC to delay their licensing until the new EOPs went into effect.

- Facility licensee contacts should discuss the details of, and the basis for, their plan to freeze procedures with their NRC contact when confirming the examination arrangements. The NRC chief examiner, in consultation with the regional operator licensing supervisor (and the NRR operator licensing program office, if deemed necessary), will review the facility licensee's proposal and negotiate a mutually acceptable plan and freeze date.

H. Milestones for Plants Under Construction

Figure 1, "NRC and Facility Licensee Training Program Timelines and Milestones," contains a suggested sequence of milestones for planning operator licensing activities for cold plants under construction under 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants."

Figure 1 NRC and Facility Licensee Training Program Timelines and Milestones



I. Preparatory Site Visit

The NRC examination preparatory site visit, also known as preparation week or validation week, occurs before the operating test is administered at a facility licensee site. In addition to operating test validation, the preparatory site visit can also be used for examiner orientation, retrieving additional reference material, auditing license applications in accordance with ES-2.2, and verifying simulator fidelity under 10 CFR 55.46(c)(1)(i).

- The facility licensee must make the simulator available to examiners for an ample amount of time during the validation visit. The purpose of this visit is for the NRC examination team to review and validate the proposed operating test materials.

- The facility licensee must have available during onsite validation a list of significant differences between the simulator facility and the reference plant and a list of known uncorrected simulator performance deficiencies and deviations from the reference plant.

- The examiners will identify important plant parameters and their intervals to monitor for each simulator scenario. If available, they will review the facility licensee's list of standard recorded parameters to determine whether additional parameters need to be recorded for simulator scenario administration. The NRC chief examiner will ask the facility licensee to record selected parameters.

- The NRC chief examiner will update Form 2.3-3, “Operating Test Review Worksheets,” if any issues are discovered during validation with an operating test developed by a facility licensee.

- All assigned examiners should attend onsite validation activities if possible. This is the most efficient and effective means for examiners to become familiar with examination materials and to provide the chief examiner with feedback on the quality of each component of the operating tests. It also serves to orient new examiners with the facility, or to refresh examiners who have previously visited the facility, with site-specific details such as plant layout and simulator operation.

- Under some circumstances, such as the retake of operating tests, validation activities can be conducted on site just before the scheduled examination administration date. This alternative to a separate validation/preparatory week minimizes agency costs and the impact on facility licensee training activities.

- For those assigned examiners who are unable to participate in onsite validation activities, the NRC regional office should determine whether a separate preparatory site visit is necessary and appropriate. When making this determination, the regional office should carefully weigh the costs and benefits associated with each additional trip to the facility. The regional office should also consider such factors as the experience of the assigned examiners, the quality of the facility licensee’s examinations (if applicable), and the status of the simulation facility (e.g., whether it is new or has been recently upgraded).

J. Forms and Letters

Form 2.1-1 Examination Preparation Checklist
Letter 2.1-1 Sample Corporate Notification Letter

Form 2.1-1 Examination Preparation Checklist

Facility: _____ Date of Examination: _____

Developed by: Written: Facility ☐ NRC ☐ // Operating: Facility ☐ NRC ☐

Target Date*	Task Description	Chief Examiner's Initials
-240	1. Examination administration date confirmed (A.1-5). For NRC-prepared examinations, arrangements are made for the facility licensee to submit reference materials (B.4, C.4.g and F).	
-210	2. NRC examiners and facility licensee contact assigned (B.1 and C.1-3).	
-210	3. Facility licensee contact briefed on examination security and other requirements (D.4). As applicable, the facility licensee contact submits to the NRC any prescreened K/As for elimination from the written examination outline, with a description of the facility licensee's prescreening process (ES-4.1 A.1.a and ES-4.1 B.2).	
-210	4. Reference material due for NRC-prepared examinations (F).	
-210	5. Examination kick-off call held (C.4). The NRC sends the corporate notification letter (A.5).	
-195	6. Written examination outline developed by the NRC and sent to the facility licensee contact (must be on the examination security agreement) (B.2, ES-4.1 A.1.b and ES-4.1 A.2.a).	
-150	7. Operating test outlines and checklists due: Forms 1.3-1, 2.3-1, 3.2-1, 3.2-2, 3.3-1, and 3.4-1, as applicable (B.6). Facility licensee provides a draft operating test administration schedule to the NRC (B.18).	
-136	8. Operating test outlines reviewed by the NRC and feedback provided to the facility licensee (ES-2.3).	
-100	9. NRC-prepared examinations approved by the NRC supervisor and forwarded for facility licensee review (ES-2.3).	
-75	10. Proposed examinations (written, JPMs, and scenarios, as applicable) and outline forms; quality checklists and supporting documentation (including Forms 2.3-2 and 2.3-4 and any Form 2.3-1, 1.3-1, and 3.4-1 updates); and reference materials due.	
-60	11. Preliminary waiver/excusal requests due (ES-2.2 E.1).	
-50	12. Written examination and operating test reviews completed (ES-2.3). The NRC supervisor's authorization to proceed with the facility review granted (ES-2.3 D).	
-50	13. Examination review results discussed between the NRC and the facility licensee (B.14).	
-35	14. Examination preparatory week conducted by the NRC and the facility licensee (I).	
-30	15. Preliminary license applications, including any waiver/excusal requests, due (ES-2-2 C.1).	
-14	16. Final license applications, including any waiver/excusal requests, due and Form 2.2-1 prepared (ES-2.2 C and E).	
-7	17. Written examinations and operating tests approved by the NRC supervisor (C.9)	
-7	18. Facility licensee management feedback on the examination requested by the NRC supervisor (C.10).	
-7	19. Final applications reviewed; 10% of applications audited to confirm qualifications/eligibility (ES-2.2 G); and examination approval letter (Letter 2.3-1) and waiver/excusal letters sent.	
-7	20. Written examination administration guidelines reviewed with the facility licensee (D.14).	
-7	21. Approved scenarios and job performance measures distributed to NRC examiners (D.12).	

* Target dates are based on facility licensee-prepared examinations and the examination date identified in the corporate notification letter. These dates are for planning purposes and may be adjusted in coordination with the facility licensee.

Letter 2.1-1 Sample Corporate Notification Letter

NRC Letterhead

(Date)

(Name, Title)
(Name of Facility)
(Address)
(City, State ZIP Code)

Dear (Name):

In a telephone conversation on (date) between Mr./Ms. (Name, Title) and Mr./Ms. (Name, Title), arrangements were made for the administration of operator licensing examinations at (facility name) during the week(s) of (date).

As agreed upon during the telephone conversation, [your staff] [[the staff of the U.S. Nuclear Regulatory Commission (NRC)]] will prepare the examinations based on the guidelines in Revision 12 to NUREG-1021, "Operator Licensing Examination Standards for Power Reactors." [The NRC's regional office will discuss with your staff any changes that might be necessary before the examinations are administered.] [[Your staff will be given the opportunity to review the examinations during the week of (date).]]

[To meet the above schedule, it will be necessary for your staff to furnish the operating test outlines by (date). The NRC staff will provide the written examination outline by (date)/The written examination outline was provided to your staff on (date). The written examinations, operating tests, and supporting reference materials identified in NUREG-1021, Examination Standard (ES)-2.1, "Preparing for Operator Licensing Initial Examinations," will be due by (date). Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 55.40(b)(3), an authorized representative of the facility licensee shall approve the examinations and tests before they are submitted to the NRC for review and approval. All materials shall be complete and ready to use.]

We request that any personal, proprietary, sensitive unclassified, or safeguards information in your response be contained in a separate enclosure and appropriately marked. Delays in receiving the required materials, or the submittal of inadequate or incomplete materials, may cause the examinations to be cancelled or rescheduled.

To conduct the requested written examinations and operating tests, your staff will need to provide adequate space and accommodations and to make the simulation facility available on the dates noted above. In accordance with ES-3.5, "Administering Operating Tests," your staff should retain the original simulator performance data (e.g., system pressures, temperatures, and levels) generated during the dynamic operating tests until the NRC takes licensing action on all the applications and any adjudicatory actions on any hearing demands are complete.

ES-1.2, "Guidelines for Taking NRC Examinations," contains a number of NRC guidelines for the written examinations and operating tests as they are being administered.

To permit timely NRC review and evaluation, your staff should submit preliminary reactor operator and senior reactor operator waiver or excusal requests (if any) (Office of Management and Budget (OMB) control number 3150-0090) at least 60 days before the first examination date (if possible). Contact Mr./Ms. (Name, typically the chief examiner) to determine the method for

submission of the waiver or excusal requests. Preliminary reactor operator and senior reactor operator license applications (OMB control number 3150-0090) and medical certifications (OMB control number 3150-0024) should be submitted at least 30 days before the first examination date. If the NRC does not receive the preliminary applications at least 30 days before the examination date, a postponement may be necessary. Final, signed applications certifying that all training has been completed and requesting any waivers or excusals, as applicable, should be submitted at least 14 days before the first examination date.

Although the guidelines for waiver or excusal requests call for their receipt at least 30 days before the first examination date (preliminary) and 14 days before the first examination date (final), the requests should be submitted as early as possible in the process (see the 60-day guideline above). Resolutions resulting from verbal inquiries by the facility licensee to the NRC are not binding. Submittals addressing waivers or excusals, or both, should be in writing (i.e., using NRC Form 398 or as directed by Mr./Ms. (Name) when contacting (him or her) to determine the method for submission). The NRC will document its final decision on whether to grant a waiver or excusal on the final (not preliminary) NRC Form 398 submitted for the applicant. The NRC will not provide its decision until the final application is submitted to the agency.

Paperwork Reduction Act Statement

This letter contains information collection requirements that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). These information collections were approved by the OMB, approval number 3150-0018.

The burden to the public for these [voluntary][[mandatory]] information collections is estimated to average [2,250 hours per examination or response] [[400 hours per examination or response]], including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collections. Send comments regarding this information collection to the FOIA, Library, and Information Collections Branch (T6-A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555 0001, or by e-mail to Infocollects.Resource@nrc.gov, and to the OMB reviewer at: OMB Office of Information and Regulatory Affairs (3150-0018), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street, NW Washington, DC 20503; e-mail: oira_submission@omb.eop.gov.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

In accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter and its enclosures will be available electronically for public inspection through the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible on the NRC's Web site at http://www.nrc.gov/reading-rm/adams.html.

Thank you for your cooperation in this matter. (Name) has been advised of the policies and guidelines referenced in this letter. If you have any questions about the NRC's examination procedures and guidelines, please contact (name of regional contact) at (telephone number) or (name of responsible regional supervisor) at (telephone number).

Sincerely,

(Appropriate regional representative,
Title)

Docket No.: 50-(number) or 52-(number)
Distribution: Public
NRC Document Control System
Regional Distribution

[ ] Include only for examinations to be prepared by the facility licensee.
[[ ]] Include only for examinations to be prepared by the NRC.

2.2 APPLICATIONS, MEDICAL REQUIREMENTS, AND WAIVER AND EXCUSAL OF EXAMINATION AND TEST REQUIREMENTS

This examination standard (ES) provides instructions for preparing and reviewing initial license applications and reapplications. It provides guidance on medical requirements and waivers and excusals of examination and test requirements.

A. Background

This ES addresses the following regulations from Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' licenses":

- Subpart C—Medical Requirements
  - 55.21 Medical examination
  - 55.23 Certification
  - 55.25 Incapacitation because of disability or illness
  - 55.27 Documentation

- Subpart D—Applications
  - 55.31 How to apply
  - 55.33 Disposition of an initial application
  - 55.35 Re-applications

- Subpart E—Written Examinations and Operating Tests
  - 55.47 Waiver of examination and test requirements

The U.S. Nuclear Regulatory Commission (NRC) staff, facility licensees, and license applicants should refer to these regulations as necessary when preparing and reviewing license applications. These regulations include the following requirements.

In accordance with 10 CFR 55.31(a)(4), a license applicant shall do the following:

> Provide evidence that the applicant has successfully completed the facility licensee's requirements to be licensed as an operator or senior operator and of the facility licensee's need for an operator or a senior operator to perform assigned duties. An authorized representative of the facility licensee shall certify this evidence on Form NRC-398. This certification must include details of the applicant's qualifications, and details on courses of instruction administered by the facility licensee, and describe the nature of the training received at the facility, and the startup and shutdown experience received. In lieu of these details, the Commission may accept certification that the applicant has successfully completed a Commission-approved training program that is based on a systems approach to training [SAT] and that uses a simulation facility acceptable to the Commission under [10 CFR] 55.45(b)….

As stated in the Statement of Considerations for the 1987 final rule amending 10 CFR Part 55 (Volume 52 of the *Federal Register* (FR), page 9456 (52 FR 9456); March 25, 1987), subject to continued Commission endorsement of the industry's accreditation process under the Final Policy Statement on Training and Qualification of Nuclear Power Plant Personnel (50 FR 11147; March 20, 1985), a facility licensee's training program would be considered a "Commission-approved training program" if it is accredited by the National Nuclear Accrediting

Board (NNAB). To be accredited by the NNAB, a facility licensee's training program must, among other things, implement the National Academy for Nuclear Training (NANT) education and experience guidelines (e.g., ACAD 10-001, "Guidelines for Initial Training and Qualification of Licensed Operators"). The NRC, through a memorandum of agreement with the Institute of Nuclear Power Operations, dated December 1, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20125A374), reviews changes to these guidelines and the accreditation objectives and criteria. The NRC has posted a publicly available summary of the most recent NRC-reviewed NANT operator license eligibility guidelines (i.e., ACAD 10-001) on the agency's Web site at https://www.nrc.gov/reactors/operator-licensing/licensing-process.html.

Cold licensing of operators is a facility licensee's method for operations personnel to acquire the knowledge and experience required for licensed operator duties during the unique conditions of new plant construction and initial operation. It provides a consistent method for operations personnel to gain the knowledge and experience required for licensed operator duties up to the first refueling outage. Nuclear Energy Institute (NEI) 06-13A, "Template for an Industry Training Program Description," describes a cold licensing process. The NRC has determined that this is an acceptable method for use in combined operating license applications for proposed new plants. The NRC documented its endorsement of this method in a safety evaluation attached to NEI 06-13A, Revision 2, issued March 2009 (ADAMS Accession No. ML090910554). Facility licensees may also seek alternative methods for the cold licensing of operators.

When an individual applies for an operator (RO) or senior operator (SRO) license, his or her health must be sufficient to meet the minimum standards in 10 CFR 55.33(a)(1) for an unconditional license or 10 CFR 55.33(b) for a conditional license. The regulations are intended to prevent the manipulation of the controls by an operator whose medical condition and general health would cause operational errors endangering public health and safety. When an applicant requests a conditional license, the NRC will consider the recommendations and supporting evidence of the facility licensee and of the examining physician. The NRC will also use applicable guidance (American National Standards Institute (ANSI)/American Nuclear Society (ANS) 3.4, "Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants," as endorsed by Regulatory Guide 1.134, "Medical Assessment of Licensed Operators or Applicants for Operator Licenses at Nuclear Power Plants," and may consult a qualified medical expert to review the medical evidence submitted by the applicant to determine whether the agency should issue a conditional license.

In accordance with 10 CFR 55.35, "Re-applications," an applicant may ask to be excused from a written examination or an operating test requirement. Specifically, the NRC may excuse an applicant from reexamination on the portions of the written examination or operating test that the applicant had passed in support of his or her immediately preceding application.

In accordance with 10 CFR 55.47, "Waiver of examination and test requirements," an applicant may request waiver of a written examination or an operating test requirement. Specifically, the NRC may waive any or all of the examination and test requirements if it determines that the applicant has presented sufficient justification.

Under 10 CFR 55.31(b), the Commission may at any time after an application has been filed require further information under oath or affirmation to enable it to determine whether to grant or deny the application.

B. Eligibility: Qualifications and Training for Applicants

Eligibility refers to the necessary qualifications and training for applicants seeking an operator license. Qualifications include education, experience, and other requirements to meet job performance criteria. Training refers to an instructional program designed to develop or improve job performance.

The NRC understands that NNAB-accredited training programs adhere to the NANT guidelines for qualification and training. Therefore, when a facility licensee certifies that an applicant has completed an operator training program accredited by the NNAB on NRC Form 398, "Personal Qualification Statement—Licensee," the facility licensee is also certifying that the applicant meets or exceeds the NANT guidelines for qualification and training. The NRC cannot alter or waive education and experience requirements that are part of the NNAB-accredited facility licensee training program. However, an applicant may ask to defer such requirements in order to take the NRC examination. Substitutions or determinations allowed by NANT guidelines for qualification and training do not require NRC approval. However, the NRC may ask to review objective quality evidence to confirm that a substitution or determination meets the requirements of the NANT guidelines and thus the NNAB-accredited facility licensee's training program requirements. For example, if the applicant is documenting military reactor experience in a position equivalent (or superior) to a licensed RO (e.g., propulsion plant watch officer, RO, engineering officer of the watch, propulsion plant watch supervisor, or engineering watch supervisor) as allowed by NANT guidelines, the NRC may ask to review objective quality evidence to confirm the duration that the applicant was actually in such a position and not just the duration of the applicant's overall military service time.

Facility licensees should document any deferrals of, or alternatives to, the NANT guidelines in the "Comments" section of NRC Form 398.

Facility licensees seeking to use alternatives to NNAB accreditation should submit their initial licensing training program to the NRC operator licensing program office for review and acceptance as a "Commission-approved training program," as that term is used in 10 CFR 55.31(a)(4).

Appendix A, "Cold License Training Plan," to NEI 06-13A, Revision 2, is one acceptable method of showing licensed operator eligibility at cold plants.

Neither 10 CFR Part 55 nor Section 107 of the Atomic Energy Act of 1954, as amended, requires operator license applicants to be citizens of the United States; therefore, noncitizens may apply for an operator license.

C. Application

To apply for an operator license in accordance with 10 CFR 55.31, "How to apply," an applicant must submit NRC Form 398 and NRC Form 396, "Certification of Medical Examination by Facility Licensee." The application is not complete until both forms are filled out, signed by the appropriate personnel, and received by the NRC. Each form comes with detailed instructions for its completion. The agency has posted the current versions of NRC Forms 398 and 396 on the NRC's operator licensing Web site at https://www.nrc.gov/reactors/operator-licensing/licensing-process.html.

The following instructions provide details about applications for applicants and facility licensees and the activities that the NRC regional offices perform related to applications.

1. Preliminary Application

The facility licensee should submit preliminary, unsigned operator license applications for review by the NRC regional office at least 30 days before the examination date.

The NRC regional office will review preliminary applications as soon as possible once they are received. This gives the regional office ample time to process the medical certifications; evaluate any waiver, deferral, or excusal requests; and obtain any additional information that might be necessary to support the final eligibility determinations after the final, signed applications are received.

2. Medical Certification and Medical Review

Before licensing, every operator license applicant must have a complete medical examination certified on NRC Form 396. The names and license numbers of all medical practitioners (but not laboratory technicians) who were substantially involved in the examination should be entered on NRC Form 396.

Regulatory Guide 1.134 describes methods acceptable to the NRC staff for complying with those portions of the Commission's regulations associated with approval or acceptance of the medical assessment of an applicant for an operator license.

Consistent with 10 CFR 55.33(b), if an applicant's or operator's general medical condition does not meet the minimum standards under 10 CFR 55.33(a)(1), the NRC may include conditions in the license to accommodate the medical defect. The NRC will consider the recommendations and supporting evidence of the facility licensee and the examining physician provided on or with NRC Form 396 in determining the appropriate license condition. The NRC may consult a qualified medical expert to review the submitted medical evidence to determine whether a conditional license should be issued.

In accordance with 10 CFR 55.31(c), an applicant whose application has been denied because of a medical condition or general health may submit a further medical report at any time as a supplement to the application. Any such supplement should be made by submitting updated NRC Forms 396 and 398.

Licensed operators must have medical examinations every 2 years. Licensed ROs or limited senior reactor operators (LSROs) who apply to upgrade their licenses to SRO licenses do not need an additional medical examination if their medical status as licensed ROs or LSROs is up to date at the time of their application, including a complete medical examination within the past 2 years.

If the time since the applicant's last complete medical examination is expected to exceed 2 years (use the anniversary month) before the licensing action is completed, the applicant must be reexamined by a physician and the facility licensee must recertify the applicant's medical fitness on NRC Form 396.

The NRC staff's practice when it receives a new NRC Form 396 has been to send the information for review to a qualified medical expert, except for minor medical items explained below, using NRC Form 396A, "Transmittal of NRC Form 396 for Medical Review." The form instructs the medical reviewer to evaluate facility license condition requests and medical

evidence for ANSI standard compliance and to indicate concurrence, recommendations, disqualifications, or requests for additional medical evidence. In response, the medical reviewer may find that, among other things, the applicant's medical status is satisfactory for licensing with no restrictions or conditions, the applicant's medical status is satisfactory for licensing with specific restrictions or conditions, or the identified medical condition disqualifies the applicant from receiving a license. The medical reviewer documents his or her review and provides it to the NRC staff via NRC Form 396A.

For medical certifications, the NRC regional office shall forward the applicant's NRC Form 396 and supporting medical evidence to the medical reviewer if any of the following is true:

- The examining physician recommends that the NRC issue a conditional license to the applicant (except for corrective lenses, hearing aids, and continuous positive airway pressure machine therapy).
- The examining physician recommends that the NRC grant the applicant a waiver (exception) of any requirement in the applicable ANSI/ANS standard.
- The examining physician recommends that the NRC change an existing restriction (by checking applicable boxes on NRC Form 396).

If, on the date of the licensing examination, the NRC is still reviewing an applicant's medical certification, the applicant may take the examination, with the understanding that the NRC will not approve the license application (i.e., issue a license) until the health finding of 10 CFR 55.33(a)(1) is made.

3. Significant Control Manipulations

Under 10 CFR 55.31(a)(5), an applicant must provide the number of significant control manipulations affecting reactivity or power level that the applicant has performed. This is documented in the "Significant Control Manipulations" block on NRC Form 398. At a minimum, the applicant must have performed five significant control manipulations on the facility for which the license is sought or on a plant-referenced simulator.

The glossary (ES-8) defines a significant control manipulation as "An operation (excluding those required for fuel handling) of an apparatus or mechanism that directly affects the reactivity or power level of a critical reactor by an amount of sufficient magnitude to allow for the observation of clear effects on the plant by the operator."

Applicants should perform diverse significant control manipulations. The significant control manipulations must follow station-approved procedures. RO and SRO-instant applicants may perform significant control manipulations in either the at-the-controls or balance-of-plant position. For SRO-instant applicants, reactivity manipulations while they are in a supervisory position (i.e., supervising another operator performing the manipulations) do not count towards the five required significant control manipulations.

For ROs applying for an SRO license (i.e., SRO-upgrade applicants), documentation of significant control manipulations on NRC Form 398 is not required; instead, certification that the operator has successfully operated the controls of the facility as a licensed operator is sufficient.

Significant control manipulations performed on the plant-referenced simulator may be chosen from a representative sampling of the control manipulations and plant evolutions described in

10 CFR 55.59(c)(3)(i)(A–F), (R), (T), (W), and (X), as applicable to the design of the plant for which the license application is submitted. Power changes (Items (E) and (F)) performed on the simulator must be 10 percent or greater in magnitude. For significant control manipulations on a plant-referenced simulator to count towards the five required manipulations, the plant-referenced simulator must meet the requirements of 10 CFR 55.46(c).

4. Certification and Submittal

The facility licensee's senior management representative on site (i.e., an authorized representative of the facility licensee, such as the plant manager or site vice president) must certify when an applicant has completed all the facility licensee's requirements and commitments for the desired license level (e.g., experience, significant control manipulations, training, medical). This certification is made in the "Senior Management Representative on Site" block on NRC Form 398. The senior management representative on site must also sign the "Facility Certification" block on NRC Form 396.

Consistent with 10 CFR 55.5, "Communications," NRC Forms 398 and 396 are submitted to the NRC by mail; in person; or, where practicable, by using the Electronic Information Exchange (EIE) or on CD-ROM. Electronic submissions must be made in a manner that enables the NRC to receive, read, authenticate, distribute, and archive the submission and process and retrieve it one page at a time. Detailed guidance on making electronic submissions for operator licensing documents can be obtained by visiting the NRC's Operator Licensing public Web site at https://www.nrc.gov/reactors/operator-licensing.html; calling the NRC's Electronic Filing Help Desk at (866) 672-7640; contacting the NRC at https://www.nrc.gov/site-help/e-submittals/contact-us-eie.html; or writing to the Office of the Chief Information Officer, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. When submitting NRC Forms 398 and 396, and the transmittal letter and supporting medical documentation to the NRC via EIE, please use the portal for 10 CFR Part 55 submissions, which is https://eie.nrc.gov/eie/PART55/app.eie. When sending these forms via EIE, facility licensees are encouraged to follow up with a phone call or e-mail message to the operator licensing assistant in the NRC regional office to ensure that the forms are received. The NRC Web site for electronic submissions contains a link to the General Submissions form. The General Submissions form should not be used as it is not integrated with the Operator Digital Docket.

Under 10 CFR 55.31(a)(3), an applicant must submit a written request that the written examination and operating test be administered to the applicant. This request must come from an authorized representative of the facility licensee that will employ the applicant. One acceptable method for satisfying this requirement is the submittal of NRC Forms 398 and 396 that include the signature of the senior management representative on site and a cover letter from the facility licensee listing the applicants who are scheduled to take the licensing examinations.

Upon receiving the final, signed license application, the NRC regional office will review the data on NRC Form 398 to ensure that it is complete. The Commission may, at any time after the application has been filed, require further information under oath or affirmation to enable it to determine whether to grant or deny the application.

The regional reviewer will determine whether the applicant meets the requirements to take the NRC examination, check the appropriate block on NRC Form 398, and sign and date the form. The applicant will not be permitted to take the licensing examination until the regional office

determines that the applicant meets the requirements (with the exception of the health requirement, as discussed above).

If the applicant meets the requirements, the reviewer will enter the applicant's name, docket number, and examination requirements on Form 2.2-1, "List of Applicants." The reviewer must ensure that the list accurately reflects any examination waivers or excusals that have been granted.

The NRC regional office will send the finalized Form 2.2-1 to the facility licensee separately from the examination approval letter. Form 2.2-1 will include docket numbers for individuals who were not previously assigned a docket number.

If the NRC finds that an application does not comply with the requirements of the Atomic Energy Act of 1954, as amended, and the Commission's regulations, then, as required by 10 CFR 2.103(b), the NRC will issue a notice of denial of the application and inform the applicant in writing of (1) the nature of any deficiencies or the reason for the denial and (2) the right of the applicant to demand a hearing within 20 days from the date of the notice or such longer period as may be specified in the notice (Letter 2.2-1, "Sample Initial Application Denial from Region"). The applicant is responsible for exercising his or her right to demand a hearing; hearings do not occur absent a demand for a hearing. The regional licensing authority will discuss denials with the Office of Nuclear Reactor Regulation (NRR) operator licensing program office.

Before entering the applicants' data in the Reactor Program System—Operator Licensing, the NRC regional office shall verify that none of the applicants' names appear on the list of "Escalated Enforcement Actions Issued to Individuals." The regional office shall check with the appropriate contact in the Office of Enforcement to determine whether any escalated enforcement action disqualifies an applicant from receiving a license.

5. Application Withdrawal

If an applicant wishes to withdraw an application, the NRC expects the applicant to inform the NRC regional office promptly in writing. For this situation, the NRC considers that the application is denied as a result of the failure to pass the written examination, operating test, or both, and the applicant must comply with the time limits of 10 CFR 55.35(a) for the filing of a new application. The NRC regional office will issue an application withdrawal response letter (see Letter 2.2-3, "Sample Application Withdrawal Response Letter") if an applicant withdraws his or her application in writing before completing all applicable portions of the written examination or operating test (or both) required to complete the licensing process.

If a facility licensee withdraws its request in writing that the written examination or operating test (or both) be administered to an applicant, the application is incomplete and will not be evaluated further by the NRC. Because the NRC did not deny the application for a license because of failure to pass the written examination or operating test (or both), the application is considered incomplete, and the applicant may not reapply using the provisions of 10 CFR 55.35(a) as it does not apply in this situation. The NRC regional office will notify the applicant if the facility licensee withdrew its request to administer the written examination or operating test (or both) to the applicant by sending an application withdrawal notification letter to the applicant (see Letter 2.2-2, "Sample Application Withdrawal Notification Letter").

D. Reapplication

If the applicant is reapplying under 10 CFR 55.35 following a license denial, the applicant must complete and submit a new NRC Form 398. The applicant may file the second application 2 months after the date of denial of the first application; the third application 6 months after the date of denial of the second application; and successive applications 2 years after the date of each subsequent denial. Each new NRC Form 398 shall describe in detail the extent of the applicant's additional qualifications and training since the denial and shall include a certification by the facility licensee that the applicant is ready for reexamination.

Section E of this ES contains information about requests to be excused from a written examination or an operating test requirement upon reapplication.

A new NRC Form 396 is not required if the date of the original medical examination is within 2 years of the anticipated licensing date (use the anniversary month) and the "Comments" section of NRC Form 398 certifies that the applicant has not developed any physical or mental condition that would be reportable under 10 CFR 55.25, "Incapacitation because of disability or illness." Otherwise, a physician shall reexamine the applicant, and the facility licensee shall recertify the applicant's medical fitness on NRC Form 396. Licensed ROs or LSROs who are reapplying to upgrade their licenses to SRO licenses do not need an additional medical examination if their medical status as licensed ROs or LSROs is up to date at the time of their application, including a complete medical examination within the past 2 years.

E. Waivers and Excusals

The following instructions explain the process for submitting, reviewing, and granting or denying waivers and excusals.

1. How To Submit a Waiver or Excusal Request

The facility licensee should submit preliminary waiver and excusal requests to the NRC regional office at least 60 days before the examination date to allow the NRC ample time to review the substantiating information provided and request additional information if necessary. The facility licensee should contact the NRC chief examiner or regional office to determine the method of submission and whether the request requires advance submittal. Failure to allow adequate time for the NRC to review the justification could result in the denial of the waiver or excusal.

An applicant may request a waiver or excusal of license requirements by checking the appropriate block on NRC Form 398. The applicant should provide the "category" of the waiver or excusal being requested. For the written examination, the available categories are RO-level questions, SRO-only questions, or ALL. For the operating test, the available categories are administrative topic job performance measures (JPMs), control room system JPMs, in-plant system JPMs, simulator operating test, or ALL.

The applicant should explain the basis and justification for requesting the waiver or excusal in the "Comments" section of NRC Form 398 and attach any supporting documentation.

Although the NRC will begin to review waiver or excusal requests upon receipt of the preliminary request, it will make a final determination on a waiver or excusal request only in response to a final, signed application.

If multiple applicants from the same facility request an identical waiver or excusal, the applicants may refer to a joint justification letter on their individual NRC Forms 398. Such group requests will be resolved in the same manner as individual requests.

If the NRC requires additional information to reach a decision on a waiver or excusal request, the NRC regional office will generally ask the facility licensee for the necessary information.

2. Common Types of Waivers of Examination and Test Requirements (10 CFR 55.47)

The NRC will waive any or all of the requirements to take a written examination and operating test if it finds that an applicant meets the criteria specified in 10 CFR 55.47.

The NRC regional office must consult the NRR operator licensing program office for all 10 CFR 55.47 requests.

Comparable facilities are those facilities that have units designed by the same nuclear steam supply system vendor and that are operated at approximately the same power level, with a training program designed to evaluate training needs for differences between the units. Facility licensees for comparable facilities may request multiunit licensing for their operators at the time of initial licensing. A waiver is not required for multiunit licensing when the applicant is trained on all applicable units and the request is made at the time of initial licensing. For multiunit licensing, the applicant should request the specific units on NRC Form 398.

Note: Individuals will not be examined on or issued concurrent licenses for noncomparable units, except for LSROs.

The information in *a–d* below assists the NRC in making 10 CFR 55.47(a)(1), (a)(2), and (a)(3) determinations for some common waiver request types.

a. Examination Waiver for Operator Previously Licensed at Comparable Facility

One commonly requested waiver is a waiver of licensing examinations for an operator previously licensed at a comparable facility.

- For this type of waiver request, the NRC has previously found that 520 hours of operating experience as a licensed operator at a comparable facility in the previous 2 years is “extensive” under 10 CFR 55.47(a)(1). This number of hours is equivalent to the unit familiarity time period used in initial licensing training programs.

- Concerning the applicant’s past performance, the following information is potentially relevant to the 10 CFR 55.47(a)(2) determination that the applicant has discharged his or her responsibilities competently and safely and is capable of continuing to do so:

  – An authorized representative of the applicant’s previous employer makes such a certification.

  – If a certification is used, it must describe the applicant’s operating experience, including an approximate number of hours the applicant operated the controls of the facility, the duties performed, and the extent of the applicant’s responsibility.

- Concerning the applicant's current qualifications, certification from an authorized representative of the to-be-added facility licensee is potentially relevant to the 10 CFR 55.47(a)(3) determination that the applicant has learned the operating procedures for and is qualified to competently and safely operate the facility designated in the application.

b. Multiunit Examination Waiver

Waiver of examination and test requirements under 10 CFR 55.47 can also be applied when construction of a subsequent unit is completed *after* an operator has received a license on an existing comparable unit at the same location. In support of this type of waiver request, the facility licensee should identify, analyze, and incorporate differences between the existing unit and the new unit(s) at the same site in its Commission-approved SAT-based training program. As part of meeting the requirements in 10 CFR 55.31, the applicant and facility licensee will complete NRC Form 398, describing the applicant's qualifications and training or certifying that the applicant has successfully completed the facility licensee's SAT-based training program, as required by 10 CFR 55.31(a)(4). The NRC staff will review the differences between the existing and new units and how these differences were analyzed and incorporated in the facility licensee's SAT-based training program to determine whether examination requirements can be waived.

- For this type of waiver request, the NRC has previously found that 520 hours of operating experience as a licensed operator at a comparable unit in the previous 2 years is "extensive" under 10 CFR 55.47(a)(1). This number of hours is equivalent to the unit familiarity time period used in initial licensing training programs.

- Concerning the applicant's past performance, the following information is potentially relevant to the 10 CFR 55.47(a)(2) determination that the applicant has discharged his or her responsibilities competently and safely and is capable of continuing to do so:

  – An authorized representative of the facility licensee makes such a certification.

  – If a certification is used, it must describe the applicant's operating experience, including an approximate number of hours the applicant operated the controls of the facility, the duties performed, and the extent of the applicant's responsibility.

- Concerning the applicant's current qualifications, the following information is potentially relevant to the 10 CFR 55.47(a)(3) determination that the applicant has learned the operating procedures for and is qualified to competently and safely operate the facility designated in the application:

  – details of the facility licensee training program, including how the applicant was trained on differences between the comparable units at the site

  – a summary of difference training for the following subjects, as applicable:

    ➢ facility design and systems relevant to control room personnel

    ➢ technical specifications

    ➢ procedures (primarily abnormal and emergency operating)

- control room design and instrument location
- operational characteristics
- administrative procedures related to conduct of operations at a multiunit site (e.g., shift staffing and response to accidents and fires)
- the expected method of rotating personnel between units and the familiarization training to be conducted before an operator assumes responsibility on a new unit

– statement that the applicant passed a comprehensive "differences" written examination

– statement that the applicant passed JPMs that tested the applicant on differences in operating equipment for the comparable units

– statement that the simulator supports training on the additional unit(s)

For multiunit sites, the "authorized representative of the facility licensee or of a holder of an authorization by which the applicant was previously employed" (10 CFR 55.47(b)) and the "authorized representative of the facility licensee or of a holder of an authorization where the applicant's services will be utilized" (10 CFR 55.47(c)) could be the same individual.

c. Waiver of Reactor Operator Portion of Written Examination for Senior Reactor Operator-Upgrade Applicants

If an individual is currently licensed as an RO at a facility and applies for an SRO license at the same facility, the NRC may waive the requirement for the applicant to take the RO portion of the SRO written examination based on the following considerations:

- The requirement in 10 CFR 55.47(a)(1) for extensive actual operating experience within the previous 2 years would be satisfied if the SRO-upgrade applicant maintained an active RO license for at least 12 of the 24 months preceding the date of the application.

- Concerning the applicant's past performance, the following information is potentially relevant to the 10 CFR 55.47(a)(2) determination that the applicant has discharged his or her responsibilities competently and safely and is capable of continuing to do so:

  – An authorized representative of the facility licensee makes such a certification.

  – If a certification is used, it must describe the applicant's operating experience, including an approximate number of hours the applicant operated the controls of the facility, the duties performed, and the extent of the applicant's responsibility.

- Concerning the applicant's current qualifications, the following information is potentially relevant to the 10 CFR 55.47(a)(3) determination that the applicant has learned the operating procedures for and is qualified to competently and safely operate the facility designated in the application:

– The applicant passed his or her most recent requalification examination and was up to date in the facility licensee's requalification training program at the time that he or she entered the SRO-upgrade training program.

d. Waiver of Examination Requirements for an Operator Previously Licensed at the Same Facility

If an applicant was previously licensed at a facility and later reapplies for a license at that same facility at the same or lower license level, the NRC may, under 10 CFR 55.47, waive any or all of the requirements for a written examination and operating test based on the following considerations:

- The requirement in 10 CFR 55.47(a)(1) for extensive actual operating experience within the previous 2 years would be satisfied if the applicant terminated participation in the facility licensee's requalification program less than 2 years before the date of the license application.

- Concerning the applicant's past performance, the following information is potentially relevant to the 10 CFR 55.47(a)(2) determination that the applicant has discharged his or her responsibilities competently and safely and is capable of continuing to do so:

  – An authorized representative of the facility licensee makes such a certification.

  – If a certification is used, it must describe the applicant's operating experience, including an approximate number of hours the applicant operated the controls of the facility, the duties performed, and the extent of the applicant's responsibility.

- Concerning the applicant's current qualifications, the following information is potentially relevant to the 10 CFR 55.47(a)(3) determination that the applicant has learned the operating procedures for and is qualified to operate competently and safely the facility designated in the application:

  – The applicant successfully completed additional training under 10 CFR 55.59(b) and a written examination and operating test prepared by the licensee that ensure that the applicant is up to date in the licensed operator requalification training program (including generic fundamental topics).

  – Before being assigned to licensed duties, the applicant will successfully complete at least 40 hours of shift functions under the direction of an operator or senior operator, as appropriate, and in the position to which the applicant will be assigned. (This is required in 10 CFR 55.53(f)(2) for an applicant who was not actively performing the functions of an operator or senior operator.)

3. Common Types of Excusals

The information in *a–b* below assists the NRC in reviewing common types of excusal requests.

a. Reapplication with Excusal

If an applicant failed *only one* of the following portions of the site-specific licensing examination, the NRC regional office may excuse the applicant from reexamination for those examination areas that the applicant passed: the written examination overall, the SRO-only section of the

written examination, the simulator operating test, the walkthrough overall, or the administrative topics portion of the walkthrough. This excusal is applicable only to those portions of the licensing examination that the applicant passed as part of his or her immediately prior application, not as part of earlier applications.

The facility licensee should follow its SAT-based training program to remediate applicants before a retake examination and include remediation on deficiencies identified in the portions of the examination that the applicant passed, as well as the portions of the examination that the applicant failed.

The applicant/facility licensee should request the excusal in writing by completing the "EXCUSAL" section of NRC Form 398 and including supporting documentation such as the following to justify the excusal request:

- a statement in the "Comments" section of NRC Form 398 affirming that the applicant was fully remediated in accordance with the facility licensee's Commission-approved, SAT-based training program
- documentation showing the content and scope of remediation and retraining efforts completed by the applicant since the previous examination failure
- the content of the testing and evaluations that the applicant has completed since the previous examination failure, including his or her results
- evidence of the applicant's participation in the facility licensee's licensed operator requalification training program since the previous examination failure, including the results of any evaluations of the applicant

The applicant/facility licensee should describe on NRC Form 398 (and in supporting documentation) the extent of the applicant's additional qualifications and training since the denial and include a certification by the facility licensee that the applicant is ready for reexamination. Additional training should include training on weaknesses identified in any portion of the NRC examination and is not limited only to training on the failed portion of the examination.

The NRC regional office evaluates the request for the following:

- Sufficient justification is presented for approving the excusal request.
- The request indicates that the applicant has taken additional training and shows that the facility licensee made a reasonable effort to remediate the deficiencies that caused the applicant to fail the previous examination.
- Training on weaknesses identified on the passed portions of the examination ensures that the knowledge has been retained and justifies an excusal of those portions of the examination.

The office should excuse the applicant from reexamination on the portions of the examination or test that he or she passed with sufficient evidence of remediation, retesting, and retraining on all identified deficiencies, performed in accordance with the facility licensee's SAT-based training program.

For example, an *SRO-instant* applicant who passed the operating test and achieved a score of 80 percent on the RO portion of the written examination, 76 percent on the SRO-only questions, and 79 percent overall would *not* be eligible for an excusal from the RO portion because the overall 80-percent cut score was not achieved.

However, an *SRO-upgrade* applicant who passed the operating test and achieved a score of 80 percent on the RO portion of the written examination, 76 percent on the SRO-only questions, and 79 percent overall *would* be eligible for a waiver of the RO portion if the applicant meets the three requirements for this type of waiver specified above.

b. SRO-Instant Applicant to RO Applicant

An SRO-instant applicant who passed everything except the SRO-only portion of the written examination may, upon accepting the denial of his or her SRO-instant application, submit a new application for an RO license and ask the NRC to consider his or her passing of the SRO operating test and written examination, with the exception of the SRO-only portion of the written examination to satisfy the requirement in 10 CFR 55.33, "Disposition of an initial application," that the applicant pass an RO written examination and operating test. The NRC's review of the request will determine whether the new application does the following:

- satisfies 10 CFR 55.31 with respect to an RO license (including the applicant's eligibility for an RO license)
- demonstrates that the applicant satisfies the "health" requirement in 10 CFR 55.33
- states that the operating test that was passed provided evidence of the applicant's control board competence and administrative duties to satisfy the requirements in 10 CFR 55.45, "Operating tests," for an RO operating test
- states that the portions of the written examination that the applicant passed satisfy the requirements in 10 CFR 55.41, "Written examination: Operators"

The NRC regional office must obtain concurrence from the NRR operator licensing program office before approving this type of excusal request.

4. Approval or Denial of Waiver or Excusal Request

If the NRC regional office finds that an applicant does not satisfy the requirements for waiver or excusal of examination requirements, then the region must obtain concurrence from the NRR operator licensing program office before denying the applicant's request.

The NRC regional office shall document the disposition of every waiver or excusal request, whether it is approved or denied, in the block designated "For NRC Use" on the applicant's final, signed NRC Form 398 and by entering the data in the Reactor Program System—Operator Licensing.

The NRC regional office shall promptly notify the applicant in writing if the waiver or excusal request is approved or denied and explain a denial. If there is insufficient time to notify the applicant in writing before the examination date, the regional office shall notify the facility licensee training representative by telephone concerning the approval or denial of the waiver or excusal request and provide a followup written notification to the applicant.

The region tracks all approved waivers and excusals using Form 2.2-1.

F. Deferrals

The following instructions explain the process for submitting, reviewing, and approving or denying deferrals.

1. How to Submit

Deferrals allow an applicant to complete some license application requirement(s) at a later time and still take the licensing examinations. The applicant must complete any deferred requirements before the NRC will issue a license to the applicant. An applicant may ask to defer a license requirement by checking the appropriate block on NRC Form 398.

If multiple applicants from the same facility request an identical deferral, the applicants may refer on their individual NRC Forms 398 to a joint justification letter. Such group requests will be resolved in the same manner as individual requests.

2. Specific Deferrals

The NRC regional office will evaluate deferral requests on a case-by-case basis and use the criteria discussed below for approving specific deferral types. For all other deferrals, the regional office shall consult with the NRR operator licensing program office before approving or denying the request.

a. Deferral of Significant Control Manipulations

If, before taking the licensing examination, an applicant is unable to perform the five significant control manipulations required by 10 CFR 55.31(a)(5), the regional office may process the application, administer the licensing examination to the applicant, and delay any issuance of the license to the applicant until the facility licensee certifies that the required manipulations have been completed successfully.

b. Deferral of Specific Eligibility Items

The NRC regional office may grant an applicant's request to defer completion of the specific eligibility items until after the licensing examinations are passed.

For cold plant operator license applicants, the NRC regional office may approve an applicant's request to defer completion of a portion or all of the practical and meaningful work assignments detailed in NEI 06-13A.

The NRC regional office may administer a license examination to an applicant who has not satisfied the applicable education or experience requirements at the time of the examination but is expected to complete them.

3. Denial of Deferral Request

The NRC regional office shall obtain concurrence from the NRR operator licensing program office before denying an applicant's request to defer license application requirements until after taking the examination.

G. License Application Audit

While on site, the NRC regional office shall audit a sample (approximately 10 percent) of the license applications (i.e., NRC Forms 398) to confirm that they accurately reflect the subject applicants' qualifications. The review should focus primarily on the applicants' experience and on-the-job training, including reactivity manipulations, to ensure that they comply with 10 CFR Part 55 and the facility's licensing-basis documents and licensed operator training program description. For trending purposes, the regional office should inform the NRR operator licensing program office of application deficiencies found during this audit.

When a facility licensee's licensed operator training program description or licensing-basis documents contain education and experience requirements that are more restrictive than the current set of NRC-reviewed NANT guidelines (for NNAB-accredited training programs), the most restrictive requirements will continue to apply, pending the initiation of action by the facility licensee to amend these requirements.

H. Forms and Letters

Form 2.2-1	List of Applicants
Letter 2.2-1	Sample Initial Application Denial from Region
Letter 2.2-2	Sample Application Withdrawal Notification Letter
Letter 2.2-3	Sample Application Withdrawal Response Letter

Form 2.2-1 List of Applicants

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Facility:	Written Examination Date: Operating Test Dates:

Applicant Name	Docket No.	Exam Level	Written		Operating Test		
			RO	SRO	Adm.	Sys.	Sim.

Instructions: For each approved applicant, enter the exam level (RO, SRO-I, or SRO-U) and an "X," "E," or "W" to indicate whether each portion of the examination is to be administered, excused, or waived.

Note: This form is provided separately to the facility licensee following examination approval.

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Letter 2.2-1 Sample Initial Application Denial from Region

NRC Letterhead

(date)

(Applicant's Name)
(Street Address)
(City, State ZIP Code)

Dear (Mr./Ms. Applicant's Name):

This letter is to inform you that your application, dated (date), for a (reactor operator, senior reactor operator, or limited senior reactor operator) license, submitted in connection with (facility name), is hereby denied.

(Region to discuss deficiencies and which part of 10 CFR 55.31, ES-2.2, or the NRC-approved facility training program was involved.) When you have met the requirements, you may submit another application.

Under Title 10 of the *Code of Federal Regulations* (10 CFR) 2.103(b)(2), you may demand an adjudicatory hearing about this denial of your application within 20 days after the date of this letter. Under 10 CFR 2.307(a), you may request an extension of this time limit if you can show good cause.

A demand for a hearing shall be filed in accordance with 10 CFR Part 2, "Agency rules of practice and procedure," which is accessible electronically on the U.S. Nuclear Regulatory Commission's (NRC's) Web site at http://www.nrc.gov/reading-rm/doc-collections/cfr/. Generally, a demand for a hearing should explain why you believe that the NRC denied your application in error and why you believe that you have, in fact, satisfied the requirements.

[Consult with the Office of the General Counsel/regional counsel for the most up-to-date E-Filing language.]

A demand for a hearing must be filed in accordance with the NRC's E-Filing rule (Volume 72 of the *Federal Register*, page 49139; August 28, 2007). The E-Filing process requires participants to submit and serve all adjudicatory documents over the Internet or, in some cases, to mail copies on electronic storage media. Detailed guidance on making electronic submissions may be found in the Guidance for Electronic Submissions to the NRC and on the NRC Web site at https://www.nrc.gov/site-help/e-submittals.html. Participants may not submit paper copies of their filings unless they seek an exemption in accordance with the procedures described below.

To comply with the procedural requirements of E-Filing, at least 10 days before the filing deadline, the participant should contact the Office of the Secretary by e-mail to hearing.docket@nrc.gov or by telephone to 301-415-1677 to (1) request a digital identification (ID) certificate, which allows the participant (or its counsel or representative) to digitally sign submissions and access the E-Filing system for any proceeding in which it is participating and (2) advise the Secretary that the participant will be submitting a demand for a hearing. Based on this information, the Secretary will establish an electronic docket for the hearing in this proceeding if the Secretary has not already done so.

Information about applying for a digital ID certificate is available on the NRC's public Web site at https://www.nrc.gov/site-help/e-submittals/getting-started.html. Once a participant has obtained

a digital ID certificate and a docket has been created, the participant can then submit a demand for a hearing. Submissions must be in Portable Document Format (PDF). Additional guidance on PDF submissions is available on the NRC's public Web site at https://www.nrc.gov/site-help/electronic-sub-ref-mat.html. A filing is considered complete at the time the document is submitted through the NRC's E-Filing system. To be timely, an electronic filing must be submitted to the E-Filing system no later than 11:59 p.m. eastern time on the due date. Upon receipt of a transmission, the E-Filing system time-stamps the document and sends the submitter an e-mail notice confirming receipt of the document. The E-Filing system also distributes an e-mail notice that provides access to the document to the NRC's Office of the General Counsel and any others who have advised the Office of the Secretary that they wish to participate in the proceeding, so that the filer need not serve the document on those participants separately. Therefore, applicants and other participants (or their counsel or representative) must apply for and receive a digital ID certificate before adjudicatory documents are filed so that they can obtain access to the documents through the E-Filing system.

A person filing electronically using the NRC's adjudicatory E-Filing system may seek assistance by contacting the NRC's Electronic Filing Help Desk through the "Contact Us" link located on the NRC's public Web site at https://www.nrc.gov/site-help/e-submittals.html, by e-mail to MSHD.Resource@nrc.gov, or by a toll-free call to 1-866-672-7640. The NRC Electronic Filing Help Desk is available between 9 a.m. and 6 p.m. eastern time, Monday through Friday, excluding Government holidays.

Participants who believe that they have a good cause for not submitting documents electronically must file an exemption request, in accordance with 10 CFR 2.302(g), with their initial paper filing stating why there is good cause for not filing electronically and requesting authorization to continue to submit documents in paper format. Such filings must be submitted by (1) first class mail addressed to the Office of the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Rulemaking and Adjudications Staff, or (2) courier, express mail, or expedited delivery service to the Office of the Secretary, 11555 Rockville Pike, Rockville, MD 20852, Attention: Rulemaking and Adjudications Staff. Participants filing adjudicatory documents in this manner are responsible for serving the document on all other participants. Filing is considered complete by first-class mail as of the time of deposit in the mail, or by courier, express mail, or expedited delivery service upon depositing the document with the provider of the service. A presiding officer, having granted an exemption request from using E-Filing, may require a participant or party to use E-Filing if the presiding officer subsequently determines that the reason for granting the exemption from use of E-Filing no longer exists.

Documents submitted in adjudicatory proceedings will appear in the NRC's electronic hearing docket, which is available to the public at https://adams.nrc.gov/ehd, unless excluded pursuant to an order of the Commission or the presiding officer. If you do not have an NRC-issued digital ID certificate as described above, click "cancel" when the link requests certificates and you will be automatically directed to the NRC's electronic hearing dockets where you will be able to access any publicly available documents in a particular hearing docket. Participants are requested not to include personal privacy information, such as social security numbers, home addresses, or personal phone numbers in their filings, unless an NRC regulation or other law requires submission of such information. For example, in some instances, individuals provide home addresses to demonstrate proximity to a facility or site. With respect to copyrighted works, except for limited excerpts that serve the purpose of the adjudicatory filings and would constitute a Fair Use application, participants are requested not to include copyrighted materials in their submission.

If you have any questions, please contact (name) at (telephone number).

Sincerely,

(Regional Branch Chief or above)

Docket No. 55-(number)

cc: (Facility representative who signed the applicant's NRC Form 398)

CERTIFIED MAIL—RETURN RECEIPT REQUESTED

Letter 2.2-2 Sample Application Withdrawal Notification Letter

NRC Letterhead

(Date)

(Applicant's Name)
(Street Address)
(City, State ZIP Code)

Dear (Mr./Ms. Applicant's Name):

The purpose of this letter is to inform you that the facility licensee has withdrawn its request that the written examination/operating test for a (reactor operator/senior reactor operator/limited senior reactor operator) license be administered to you; therefore, your application is incomplete and will not be evaluated further by the U.S. Nuclear Regulatory Commission (NRC). This is not considered a denial under Title 10 of the *Code of Federal Regulations* (10 CFR) 55.35(a) because your application is not being denied because of failure to pass the written examination or operating test, or both. Therefore, you may file a new application at any time.

[Additionally, you passed the (written examination or operating test) and have not yet taken the (operating test or written examination). Though you did not actually fail the (written examination or operating test), for the purposes of 10 CFR 55.35(b), which provides the NRC the ability to excuse portions of an examination that have been passed, the NRC considers you to have failed the (operating test or written examination) that you have not yet taken. Therefore, in any new application that you file with the NRC, you may request to be excused from reexamination on the portions of the examination or test that you have passed. The NRC may, in its discretion, grant this request if it determines that you have presented sufficient justification.]

If you have any questions, please contact (name) at (telephone number).

Sincerely,

(Name and title of licensing official)

Docket No. 55-(XXXXX)

cc: (Facility representative who signed the applicant's NRC Form 398)

[ ] Use only for applicants who have passed either the written examination or operating test.

Letter 2.2-3 Sample Application Withdrawal Response Letter

NRC Letterhead

(Date)

(Applicant's Name)
(Street Address)
(City, State ZIP code)

Dear (Mr./Ms. Applicant's Name):

In your letter received by this office on [date], you specified that you are withdrawing your application for a (reactor operator/senior reactor operator/limited senior reactor operator) license.

[For the purposes of Title 10 of the *Code of Federal Regulations* (10 CFR) 55.35(a), the U.S. Nuclear Regulatory Commission considers that your application is denied as a result of the failure to pass the written examination, operating test, or both. Therefore, you must comply with the time limits of 10 CFR 55.35(a) for the filing of a new application.]

[[You passed the (written examination or operating test) and have not yet taken the (operating test or written examination). For the purposes of Title 10 of the *Code of Federal Regulations* (10 CFR) 55.35(a), the U.S. Nuclear Regulatory Commission (NRC) is considering your application as having been denied because of the failure to pass the (operating test or written examination). Therefore, you must comply with the time limits of 10 CFR 55.35(a) for the filing of a new application.

However, since the NRC is considering you to have failed the (operating test or written examination) that you have not yet taken, pursuant to 10 CFR 55.35(b), you may, in any new application that you file, request to be excused from reexamination on the portions of the examination or test that you have passed. The NRC may, in its discretion, grant this request if it determines that you have presented sufficient justification.]]

If you have any questions, please contact (name) at (telephone number).

Sincerely,

(Name and title of licensing official)

Docket No. 55-(XXXXX)

cc: (Facility representative who signed the applicant's NRC Form 398)

[ ] Use if the applicant has taken neither the written examination nor the operating test.
[[ ]] Use if the applicant has passed either the written examination or the operating test.

2.3 REVIEWING AND APPROVING OPERATOR LICENSING INITIAL EXAMINATIONS

Pursuant to 10 CFR 55.40(a)–(b)(1), power reactor facility licensees that elect to prepare the required written examinations and operating tests shall prepare the required examinations and tests in accordance with the criteria in NUREG-1021 in effect 6 months before the examination date. Pursuant to 10 CFR 50.40(b)(3), an authorized representative of the power reactor facility licensee shall approve the required examinations and tests before they are submitted to the Commission for review and approval. Pursuant to 10 CFR 55.40(b)(4), power reactor facility licensees that elect to prepare examinations and tests must receive Commission approval of their proposed written examinations and operating tests.

This examination standard (ES) contains instructions for reviewing and approving written examinations and operating tests.

A. General Guidance for Reviewing Written Examination Questions

When reviewing written examination questions, reviewers should try to put themselves in the position of examination applicants by attempting to answer the questions with only the information available at the time of the examination and without referring to the answer key.

Reviewers of the written examination can assist examination authors by checking the technical content, level of difficulty, psychometrics, and editorial quality. The reviewer should consider each of these four areas separately and in this order. If an item needs revision during one stage of the review, the changes should be made before performing the next round of evaluation for the other review criteria because the changes at each stage may affect the subsequent reviews. For example, a criticism that appears to affect only one distractor may ultimately lead to changes in other parts of the item, so time spent reviewing the item for grammar and punctuation may be wasted.

There are also some advantages associated with having the written questions reviewed for clarity, grammar, expression, spelling, and punctuation by someone who is not familiar with the area being tested. Such a reviewer can determine whether an item can be answered correctly by a person without knowledge of the field.

The examination author and reviewers should ask the following types of questions:

- Will the examinees clearly understand the prompt of the question?
- Do they have all the information they need to work with?
- Does answering the question correctly depend on certain assumptions that must be stated?

B. Instructions for Facility Licensee Management

These instructions provide additional detail for associated steps for review and approval listed in ES-2.1, “Preparing for Operator Licensing Initial Examinations.”

1. Review Outlines and Examinations/Tests

a. Pursuant to 10 CFR 55.40(b)(1) and (3), power reactor facility licensees may prepare the written examinations required by 10 CFR 55.41, "Written examination: Operators," and 10 CFR 55.43, "Written examination: Senior operators," and may prepare the operating tests required by 10 CFR 55.45, "Operating tests," in accordance with the criteria in NUREG-1021 as described in 10 CFR 55.40(a). In addition, an authorized representative of the power reactor facility licensee shall approve the required examinations and tests before they are submitted to the Commission for review and approval. The NRC recommends that a facility supervisor or manager familiar with the examination standards in this NUREG independently review the following items and submit feedback to the NRC regional office if any changes are necessary:

- the proposed written examination outline and operating test outline
- the proposed operating test before it is approved by the authorized representative of the facility licensee for submittal to the NRC regional office for review and approval
- the proposed written examination before it is approved by the authorized representative of the facility licensee for submittal to the NRC regional office for review and approval

b. If the facility licensee developed the written examination or operating test, then, as required by 10 CFR 55.40(b)(2), pursuant to 10 CFR 55.49, "Integrity of examinations and tests," the facility licensee shall establish, implement, and maintain procedures to control examination security and integrity. The NRC chief examiner is expected to use his or her best judgment and take reasonable measures, including selective review of reference materials and past tests, to verify these attributes.

c. The facility licensee should review the final written examination outline and operating test outline using the criteria on Form 2.3-1, "Examination Outline Quality Checklist."

d. The facility licensee should review the operating test using the criteria on Form 2.3-2, "Operating Test Quality Checklist."

e. The facility licensee should review the written examination using the criteria on Form 2.3-4, "Written Examination Quality Checklist."

f. As a final check of the written examination's technical accuracy, facility licensee management should consider administering the examination (under security agreements) to one or more licensed personnel who were previously uninvolved in developing the examination. Any comments and problems identified during the trial administration should be discussed with the NRC chief examiner and resolved before the examination is administered to the license applicants. The review is intended to identify and correct deficiencies that may affect the technical accuracy of the examination.

g. The facility licensee should sign all review forms and include them (as applicable) in the outline and examination submittal package. The outline and examination package should be submitted to the NRC for review and approval in accordance with the timeline established (refer to Form 2.1-1).

h. The facility licensee is responsible for ensuring that contractor-prepared examinations meet the specified criteria and is encouraged to verify the origins of the questions used to construct the examination.

2. Meet with the NRC to Discuss Reviews

Facility licensee management should meet with the NRC chief examiner to review and discuss all substantive comments from the quality reviews of the examination outlines and proposed examinations. These meetings will normally be conducted by telephone, but, with approval from NRC regional management and agreement of both parties, they may be conducted in the NRC regional office or at the facility.

C. Instructions for NRC Chief Examiner

The following instructions provide additional detail for associated steps for review and approval listed in ES-2.1, "Preparing for Operator Licensing Initial Examinations."

1. Conduct Prompt and Independent Reviews

a. Ensure that the examination outlines, written examination, and operating test are independently reviewed for quality in accordance with the applicable checklists included in this examination standard.

Note: If the NRC chief examiner wrote any portion of the outline or examination, another NRC examiner will perform the independent review of that portion(s).

b. Notify the regional supervisor if any of the facility-developed examination materials (written, walkthrough, or simulator) require substantive changes (see D.1) and cannot be made to conform with the examination standards by the time the examination is scheduled to begin.

c. Follow review timeline targets established in Form 2.1-1 or the dates established during the kick-off call. Review the examination as soon as possible after receipt so that supervisory approval can be obtained before the examination review comments are shared with the facility licensee, which is normally scheduled about 7 weeks before the administration date.

d. Consolidate the comments from other NRC reviewers and create one set of comments.

2. Review Outlines

a. Ensure that the examination outlines are reviewed before the facility licensee begins examination development and then again before approving the written examination and operating test for administration. Use Form 2.3-1.

- Conduct a timely review (i.e., within 5 working days) to minimize the potential for significant problems with the examination during its development.
- Document any necessary changes.
- Indicate completion of this review by signing the bottom of Form 2.3-1.

b. Forward the outlines and review comments to the responsible NRC supervisor for review and comment before resolving any deficiencies with the author or facility licensee contact.

c. Document NRC chief examiner review/concurrence, as applicable, by signing the bottom of the form.

3. Review Operating Test and Written Examination

a. Operating Test

- Review the facility licensee's list of differences between the simulator and the reference plant and the list of uncorrected simulator deficiencies and confirm that any uncorrected deficiencies will not interfere with the conduct of the proposed operating test.

- Review each test item using Form 2.3-3 to document the NRC's review of each test item and subsequent comment resolution. Account for any changes between the original submittal and the final approved version of the operating test and the reason for the changes as follows:

  – For test items originally marked as unsatisfactory, include the following information:

    1. how the attribute(s) was not being met

    2. what actions the facility licensee took to fix or replace the unsatisfactory test item

  – For test items originally marked as needing enhancements, include information about the nature of the enhancements.

  – For minor editorial changes that do not impact the intent or framework of the test item, include a comment such as "minor editorial changes required."

- Check the items listed on Form 2.3-2.

- Review and document any changes that need to be made and forward the operating test and completed Form 2.3-3 to the responsible NRC supervisor for review and comment in accordance with Section D before reviewing the operating test with the facility licensee.

- Upon NRC supervisor approval of the changes that need to be made, review the operating test with the facility licensee.

- After reviewing the operating test with the facility licensee, ensure that all comment and recommendation resolutions are documented and that the necessary revisions to the test are made. Update Form 2.3-3 to reflect how the comments/recommendations were resolved. Inform the NRC supervisor if unable to resolve operating test comments with the facility licensee.

- Sign Form 2.3-2 and forward the operating test package to the NRC supervisor for final approval after the necessary changes have been made and the test is finalized.

b. Written Examination

- For NRC-developed written examinations, independently review or assign an independent reviewer to review every written examination question against the criteria in ES-4.2, "Developing Written Examinations," for written examination question development. Form 2.3-5, "Written Examination Review Worksheet," may be helpful to use for tracking purposes. Reviewers can only review the portions of the examination that they were not directly involved in developing; the NRC chief examiner may perform the independent review if he or she was not directly involved in the development of the questions reviewed.

- For facility licensee-developed written examinations, review each written examination question using Form 2.3-5 to document the NRC's review of each question and subsequent comment resolution. Account for any changes between the original submittal and the final approved version of the written examination and the reasons for the changes as follows:

  – For questions originally marked as (U) or unsatisfactory, include the following information:

    1. how the psychometric attributes were not being met

    2. what actions the facility licensee took to fix or replace the unsatisfactory question

  – For questions originally marked as needing enhancements, include information about the nature of the enhancements. For example, if the enhancement involves a single implausible distractor, then a comment related to how the distractor does not meet the credible distractor attribute should be recorded, along with a summary of the resolution to the implausibility concern.

  – For minor editorial enhancements (i.e., question format, bulleting, punctuation, grammar, and wording changes that do not significantly impact the intent or framework of the question), include a comment such as "minor editorial changes required."

  – Correct all questions identified as (U) or unsatisfactory on Form 2.3-5 by rewriting or replacing the questions before the examination is administered. Questions marked as (E) for needing editorial clarifications or enhancements must be corrected before the examination is administered.

  – Review the overall written examination using Form 2.3-4. The facility reviewer blocks in Column b do not apply for NRC-developed examinations.

- Review and document any changes that need to be made and forward the written examination and completed Form 2.3-5 to the responsible NRC supervisor for review and comment in accordance with Section D before reviewing the written examination with the facility licensee.

  There are no minimum or maximum limits on the number or scope of changes the NRC regional office may direct the author or facility contact to make to the proposed

examination if the changes are necessary to make the examination conform to established acceptance criteria.

- Do the following upon NRC supervisor approval:

  – For an NRC-developed written examination, give the facility licensee enough time to review and comment on the examination. Review any facility licensee comments and make any necessary changes on a technical or psychometric basis.

    Note: Examinations that the NRC has written shall be properly formatted and ready to administer before they are reviewed with the facility licensee. The region shall not rely on the facility licensee to ensure that the quality of the examination is acceptable for administration.

  – For a facility licensee-developed written examination, provide a copy of Form 2.3-5 to the facility licensee and review comments with licensee personnel.

- After reviewing the written examination with the facility licensee, ensure that all comment and recommendation resolutions are documented and that the examination is revised as necessary. Update Form 2.3-5 to reflect how the comments/recommendations were resolved. Inform the NRC supervisor if unable to resolve written examination comments with the facility licensee.

- Sign Form 2.3-4 and forward the written examination package to the NRC supervisor for final approval after the necessary changes have been made and the examination is finalized. If the facility licensee wrote the examination, the package should include a copy of the original submittal.

4. Ensure Adequate Balance of Coverage

The NRC chief examiner should review the examination for balance of coverage at the start and then again at the end of examination development. An examination with an adequate balance of coverage contains a reasonably varied coverage of the items in the population to be sampled (i.e., 10 CFR 55.41, 10 CFR 55.43, and 10 CFR 55.45) without repeating the same concepts or overtesting similar evolutions or systems. In general, reviewing the balance of coverage of an examination involves the following steps:

a. Using the instructions in ES-4.1, Section B, step 8, check the written examinations for balance of coverage both within and across the sampling areas (i.e., tiers). Treat the SRO examination as a single 100-question examination for this check.

b. Check the operating test for balance of coverage in three ways:

   1. Review simulator scenarios for balance of coverage.

   2. Review JPMs for balance of coverage.

   3. Compare simulator scenarios and JPMs and check for overlap in their content.

c. Finally, compare the written examinations and operating test and check for overlap in their content. For example, overlap exists if the same pressurizer level controller failure (i.e., fails "high") is tested during a simulator event and in a written examination question.

D. Instructions for NRC Supervisor Review and Approval

The responsible regional supervisor will review the examination outlines and the draft examinations and evaluate any recommended changes and corrections noted during the NRC chief examiner's review. The supervisory review is not intended to be a detailed review but rather a check to ensure that all applicable administrative requirements have been implemented. If the outlines, examinations, and recommended changes are acceptable, the supervisor will authorize the NRC chief examiner to resolve any noted deficiencies with the author or facility contact.

These instructions provide additional detail for reviewing and approving examinations.

1. Deficiencies

- Ensure that any significant deficiencies in the original written examination and operating test submitted by the facility licensee are evaluated to determine an appropriate course of action. Address significant deficiencies in the examination report.

- If any of the facility-developed examination materials (written, walkthrough, or simulator) require substantive changes, then the NRC regional office will evaluate the necessary examination changes to determine whether the examination can be made to conform with the examination standards by the time the examination is scheduled to begin. If the regional office does not have the resources to ensure that an acceptable examination can be prepared by the scheduled administration date, regional management must discuss with the facility licensee the need to reschedule the examinations as necessary.

- "Substantive changes" as used in the bullet above refer to the following:

  – For the written examination, 30 percent or more of the questions are unsatisfactory, as determined by using the instructions on Form 2.3-5.

  – For JPMs, one-third or more of the JPMs are unsatisfactory, as determined by using the instructions on Form 2.3-3.

  – For the simulator scenarios, one-third or more of the total number of scenario events are unsatisfactory, as determined by using the instructions on Form 2.3-3.

2. Operating Test

- Review the operating tests before authorizing the NRC chief examiner to proceed with the facility licensee review. After reviewing the proposed comments on the operating test items, authorize the NRC chief examiner to provide the comments to the facility licensee and proceed with reviewing comments with the facility licensee.

- Following the facility licensee review, review the tests again to ensure that the concerns expressed by the facility licensee and the NRC chief examiner have been addressed appropriately. If the region and the facility licensee are unable to resolve operating test comments, then inform the NRR operator licensing program office.

3. Written Examination

- Review the entire written examination, with emphasis on all questions that are determined to have unacceptable flaws in accordance with Form 2.3-5, before any comments are provided to the facility licensee.

- When NRC supervisor review is complete, authorize the NRC chief examiner to provide comments to the facility licensee and proceed with the facility review.

- Following the facility review, review the examination to ensure that the concerns expressed by the facility licensee and the NRC have been addressed appropriately. If the region and the facility licensee are unable to resolve comments on the written examination, then consult the NRR operator licensing program office.

- Sign Form 2.3-4 when the written examination is acceptable for administration.

4. Examination Approval

- Approve the finalized examinations for administration and sign the applicable quality checklists (Forms 2.3-2 and 2.3-4).

- After approving the examination, prepare and sign the examination approval letter (Letter 2.3-1) and finalize the list of applicants (Form 2.2-1) in accordance with ES-2.2.

- Send the examination approval letter (Letter 2.3-1) to the facility licensee. Provide the list of applicants (Form 2.2-1) to the facility licensee separately.

E. Forms and Letters

Form 2.3-1	Examination Outline Quality Checklist
Form 2.3-2	Operating Test Quality Checklist
Form 2.3-3	Operating Test Review Worksheets
Form 2.3-4	Written Examination Quality Checklist
Form 2.3-5	Written Examination Review Worksheet
Letter 2.3-1	Sample Examination Approval Letter

Form 2.3-1 Examination Outline Quality Checklist

Facility: Date of Examination:

Item	Task Description	(Y)es / (N)o		
		a	b*	c#
WRITTEN	a. The outline was systematically and randomly prepared in accordance with the instructions in Section B of ES-4.1, and all knowledge and ability (K/A) categories are appropriately sampled.			
	b. The outline does not overemphasize any systems, evolutions, or generic topics.			
	c. Justifications for deselected or rejected K/A statements are acceptable.			
SIMULATOR	a. Using Form 3.4-1, Events and Evolutions Checklist, verify that the proposed scenario set contains the required number of normal evolutions, reactivity evolutions, instrument and component failures, manual control evolutions, technical specifications, and major transients.			
	b. There are enough scenarios (and spares) for the projected number and mix of applicants in accordance with the expected crew composition and rotation schedule without compromising exam integrity. Ensure that scenarios will not be repeated on subsequent days.			
	c. Ensure that all scenarios are new or significantly modified in accordance with ES-3.4 and that no scenarios are duplicated from the applicants' audit test(s).			
	d. To the extent possible, assess whether the outline(s) conforms with the qualitative and quantitative simulator set criteria specified on Form 2.3-2.			
JPMS	a. Verify that the administrative outline meets the criteria specified in the instructions on Form 3.2-1 and that no tasks are duplicated from the applicants' audit test(s).			
	b. Verify that the control room and in-plant systems outline meets the criteria specified in the instructions on Form 3.2-2 and that no tasks are duplicated from the applicants' audit test(s).			
	c. Determine whether the number of job performance measures (JPMs) and JPM types is sufficient for the projected number and mix of applicants and ensure that no items are duplicated on subsequent days.			
GENERAL	a. Assess whether the appropriate exam sections cover plant-specific priorities (including probabilistic risk assessment and individual plant examination insights).			
	b. Assess whether the 10 CFR 55.41, 10 CFR 55.43, and 10 CFR 55.45 sampling is appropriate.			
	c. Check whether K/A importance ratings (except for plant-specific priorities) are greater than or equal to 2.5.			
	d. Check for duplication and overlap across the exam and with the last two NRC exams.			
	e. Check the entire exam for balance of coverage.			
	f. Assess whether the exam fits the appropriate job level (reactor operator or senior reactor operator).			

	Printed Name/Signature	Date
a. Author		
b. Facility Reviewer (*)		
c. NRC Reviewer (#)		
NRC Chief Examiner		
NRC Supervisor		

* The facility licensee signature is not applicable for NRC-developed tests.
\# An independent NRC reviewer performs the steps in column "c." This may be the NRC Chief Examiner if he/she did not develop the outline under review.

Form 2.3-2 Operating Test Quality Checklist

Facility:	Date of Examination:	Operating Test Number:	
General Criteria	(Y)es / (N)o		
	a	b*	c#
a. The operating test meets the criteria on the associated test outline.			
b. There are enough test items so that test items will not be repeated on more than 1 day of the operating test.			
c. The operating test does not duplicate items from the applicants' audit test(s).			
d. Overlap with the written examination and between different parts of the operating test is minimized.			
e. It appears that the operating test will differentiate between competent and less-than-competent applicants at the designated license level.			
Walkthrough Criteria			
a. Each job performance measure (JPM) includes the following, as applicable: • task standard • initial conditions • initiating cues • references and tools, including associated procedures • reasonable and validated time limits (average time allowed for completion) and specific designation if the facility licensee deems it to be time critical • alternate path JPMs are labeled as "alternate path" • operationally important specific performance criteria that include the following: – detailed expected actions with exact criteria and nomenclature – system response and other examiner cues – statements describing important observations to be made by the applicant – criteria for successful completion of the JPM task standard – identification of critical steps and their associated performance standards – restrictions on the sequence of steps, if applicable			
b. Ensure that any changes from the previously approved JPM outlines (Forms 3.2-1 and 3.2-2) have not caused the test to deviate from any of the acceptance criteria (e.g., item distribution, bank use, repetition from the last two NRC examinations) specified on those forms.			
Simulator Scenario Set Criteria for Scenario Numbers: / /			
QUALITATIVE ATTRIBUTES			
1. The initial conditions are realistic in that some equipment and/or instrumentation may be out of service, but it does not cue the operators into expected events.			
2. The scenarios consist mostly of related events.			
3. Each event description consists of the following: • the point in the scenario when it is to be initiated • the malfunction(s) or conditions that are entered to initiate the event • the symptoms/cues that will be visible to the crew • the expected operator actions (by shift position) • the event termination point (if applicable)			

QUALITATIVE ATTRIBUTES (continued)	(Y)es / (N)o		
	a	b*	c#
4. The events are valid with regard to physics and thermodynamics.			
5. The sequencing and timing of events is reasonable and allows the examination team to observe and evaluate applicant performance.			
6. If time compression techniques are used, the scenario summary clearly so indicates. Operators have sufficient time to carry out expected activities without undue time constraints. Cues are given.			
7. The simulator modeling is not altered.			
8. The scenarios have been validated. Pursuant to 10 CFR 55.46(d), any open simulator performance deficiencies or deviations from the referenced plant have been evaluated to ensure that functional fidelity is maintained while running the planned scenarios.			
9. Scenarios are new or significantly modified in accordance with ES-3.4.			
10. Scenarios (as grouped) allow each applicant to be significantly involved in the minimum number of transients, events, and evolutions specified on the version of Form 3.4-1 submitted with the scenario set.			
11. Applicants are evaluated on a similar number of preidentified critical tasks across scenarios, when possible.			
12. The level of difficulty is appropriate to support licensing decisions for each crew position.			

TARGET QUANTITATIVE ATTRIBUTES per Scenario (See ES-3.4)	Actual Attributes by Scenario No. / /	(Y)es / (N)o		
		a	b*	c#
1. Malfunctions after emergency operating procedure (EOP) entry (1–2)	/ /			
2. Abnormal events (2–4)	/ /			
3. Major transients (1–2)	/ /			
4. EOPs entered/requiring substantive actions (1–2)	/ /			
5. Entry into a contingency EOP with substantive actions (≥ 1 per scenario set; set is the entire set of scenarios prepared for the scheduled exam)	/ /			
6. Preidentified critical tasks (≥ 2)	/ /			

Printed Name/Signature Date

a. Author _____

b. Facility Reviewer (*) _____

c. NRC Reviewer (#) _____

NRC Chief Examiner _____

NRC Supervisor _____

* The facility licensee signature is not applicable for NRC-developed tests.
\# An independent NRC reviewer performs the steps in column c. This may be the NRC Chief Examiner if he/she did not develop the operating test under review.

Form 2.3-3 Operating Test Review Worksheet (Job Performance Measures (JPMs))

Facility:												**Exam Date:**
1 JPM # or title	2 Type (S/P/A)	3 ALT (Y/N)	4 LOD (1–5)	5 JPM Errors							6 U/E/S	7 Explanation
				LOD	REF	IC	TSK	CUE	CS	TL		

Form 2.3-3 Instructions for Completing the JPM Table

1. Enter the JPM number and/or title.

2. Enter the type of JPM—(S)imulator, (P)lant, or (A)dministrative.

3. Enter (Y)es or (N)o for an Alternate Path JPM.

4. Rate the level of difficulty (LOD) of each JPM using a scale of 1–5 (easy–difficult). A JPM containing less than two critical steps, a JPM that tests solely for recall or memorization, or a JPM that involves directly looking up a single correct answer is likely LOD = 1 (too easy). Conversely, a JPM with over 30 steps or a JPM that takes more than 45 minutes to complete is likely LOD = 5 (too difficult).

5. Check the appropriate block for each JPM error type, using the following criteria:

   - LOD = 1 or 5 is unsatisfactory (U).
   - REF: The JPM lacks required references, tools, or procedures (U).
   - IC: The JPM initial conditions are missing or the JPM lacks an adequate initial cue (U).
   - CUE: The JPM lacks adequate evaluator cues to allow the applicant to complete the task, or the evaluator cues are subjective or leading (U).
   - TSK: The JPM lacks a task standard or lacks completion criteria for a task standard (U).
   - CS: The JPM contains errors in designating critical steps, or the JPM lacks an adequate performance standard for a critical step (U).
   - TL: The JPM validation times are unreasonable, or a time-critical JPM lacks a completion time (U).

6. Mark the JPM as unsatisfactory (U), satisfactory (S), or needs enhancements (E). A JPM is (U) if it has one or more (U) errors as determined in step 5. Examples of enhancements include formatting, spelling, or other minor changes.

7. Briefly describe any JPM determined to be unsatisfactory (U) or needing enhancement (E). Save initial review comments and detail subsequent comment resolution so that each exam-bound JPM is marked by a satisfactory (S) resolution on this form.

Form 2.3-3 Operating Test Review Worksheet (Scenarios)

Facility:	**Scenario:**	**Exam Date:**

1 Scenario Event ID/Name:	2 Scenario event errors					3 U/E/S	4 Explanation
	Realism/ Credibility	Performance Standards	Verifiable Actions	Critical Task	TS		

Form 2.3-3 Instructions for Completing the Scenario Table

1. For each scenario, enter the scenario event names and descriptions.

2. Review the individual events contained in each scenario, and identify and mark event errors:

   - The scenario guide event description is not realistic/credible—unsatisfactory (U).

   - The scenario guide event description lacks adequate crew/operator performance standards—needs enhancement (E).

   - The scenario guide event description lacks verifiable actions for a credited normal event, reactivity event instrument/component malfunction, or technical specification (TS) event (or a combination of these) (U).

   - The scenario guide event description incorrectly designates an event as a critical task (i.e., a noncritical task labeled as critical or a critical task labeled as noncritical). This includes critical tasks that do not meet the critical task criteria (i.e., the critical task does not have a measurable performance standard) (U).

   - The scenario guide event description incorrectly designates entry into TS actions when not required or does not designate entry into TS actions when required (U).

3. Based on the outcome in step 2, mark the scenario event as unsatisfactory (U), satisfactory (S), or needs enhancements (E). An event is (U) if it has one or more (U) errors as determined in step 2. Examples of enhancements include formatting, spelling, or other minor changes.

4. Briefly describe any scenario event determined to be unsatisfactory (U) or needing enhancement (E). Save initial review comments and detail subsequent comment resolution so that each exam-bound scenario event is marked by a satisfactory (S) resolution on this form.

Form 2.3-4 Written Examination Quality Checklist

Facility:	Date of Exam:	Exam Level: RO ☐ SRO ☐

Item Description				(Y)es / (N)o		
				a	b*	c#
1. Questions and answers are technically accurate and applicable to the facility. Each question includes a technical reference.						
2. a. All questions reference NRC knowledge and abilities (K/As) requirements. b. Facility learning objectives are referenced as available. c. All questions include an explanation of the correct answer explanation and a distractor analysis.						
3. Senior reactor operator (SRO) questions test at the SRO license level.						
4. The sampling process was random and systematic. (If more than four reactor operator (RO) or two SRO questions were repeated from the last two NRC licensing exams, including full (100-question) retake examinations, consult the NRC Office of Nuclear Reactor Regulation operator licensing program office.)						
5. Question duplication from the licensee screening/audit exam was controlled as indicated below (check the item that applies) and appears appropriate: __ The audit exam was systematically and randomly developed. __ The audit exam was completed before the license exam was started. __ The examinations were developed independently. __ The licensee certifies that there is no duplication. __ Other (explain):						
6. Bank use meets limits (no more than 75% from the bank, at least 10% new (at the comprehension/analysis level), and the rest new or modified); enter the actual RO/SRO-only question distribution >	Bank	Modified	New			
	/	/	/			
7. Between 38 and 45 questions of the questions on the RO exam and at least 13 of the questions on the SRO-only portion of the exam are written at the comprehension/analysis level; enter the actual RO/SRO-only question distribution >	Memory		C/A			
	/		/			
8. References/handouts provided do not give away answers or aid in the elimination of distractors.						
9. Question content conforms to specific K/A statements in the previously approved examination outline and is appropriate for the K/A statements' assigned tier; deviations are justified.						
10. Question psychometric quality and format meet the instructions and guidelines in ES-4.2.						
11. The exam contains the required number of one-point, multiple-choice items; the total is correct and agrees with the value on the cover sheet.						

	Printed Name/Signature	Date
a. Author		
b. Facility Reviewer (*)		
c. NRC Reviewer (#)		
NRC Chief Examiner		
NRC Regional Supervisor		

* The facility licensee signature is not applicable for NRC-developed tests.
\# An independent NRC reviewer performs steps in column c. This may be the NRC Chief Examiner if he/she did not develop the written examination under review.

Form 2.3-5 Written Examination Review Worksheet

Q#	1. LOK (F/H)	2. LOD (1–5)	3. Psychometric Flaws					4. Job Content Flaws				5. K/A Use Flaws		6. Source (B/M/N)	7. Status (U/E/S)	8. Explanation
			Stem Focus	Cues	T/F	Cred. Dist.	Partial	Job Link	Minutia	#/Units	Logic	Q–K/A	License Level			

Form 2.3-5 Instructions for Written Examination Review Worksheet

Refer to ES-4.2 for the definitions of terms used in this worksheet for the written examination. Review each question (Q) as submitted and as subsequently revised and document the following in the associated worksheet columns:

1. Enter the level of knowledge (LOK) as either (F)undamental or (H)igher cognitive level.
2. Enter the level of difficulty (LOD) from 1 (easy) to 5 (difficult); mark direct lookup questions (applicant can directly determine the answer from the provided reference) as LOD 1. A question is (U)nsatisfactory if it is LOD 1 or LOD 5.
3. Check the appropriate box if a psychometric flaw is identified:
   - "Stem Focus": The stem lacks enough focus to elicit the correct answer (e.g., unclear intent, more information is needed, or too much needless information). This is an (U)nsatisfactory question.
   - "Cues": The stem or one or more answer choices contains cues (e.g., clues, specific determiners, phrasing, length). This is an (U)nsatisfactory question.
   - "T/F": All of the answer choices are a collection of unrelated true/false statements. This is an (U)nsatisfactory question.
   - "Cred. Dist.": The distractors are not credible; single implausible distractors require (E)nhancement, and more than one noncredible distractor in the same question results in an (U)satisfactory question.
   - "Partial": One or more distractors are partially correct (e.g., if the applicant can make unstated assumptions that are not contradicted by the stem). This is an (U)nsatisfactory question.
4. Check the appropriate box if a job content flaw is identified:
   - "Job Link": The question is not linked to the job requirements (i.e., the question has a valid knowledge or ability (K/A) but, as written, is not operational in content). This is an (U)nsatisfactory question.
   - "Minutia": The question requires the recall of knowledge that is too specific for the closed-reference test mode (i.e., it is not required to be known from memory). This is an (U)nsatisfactory question.
   - "#/Units": The question contains data with an unrealistic level of accuracy or inconsistent units (e.g., panel meter in percent with question in gallons). This is an (U)nsatisfactory question.
   - "Logic": The question requires backward or reverse logic or application compared to the job requirements. This is an (U)nsatisfactory question.
5. Check the first box if a K/A mismatch flaw exists. Check the second box if the question is flawed because it is written at the wrong license level. Either condition results in an (U)nsatisfactory question.
6. Enter the question's source: (B)ank, (M)odified, or (N)ew. Verify that (M)odified questions meet the criteria of ES-4.2.
7. Based on the review performed in steps 2–5, mark the question as (U)nsatisfactory, in need of (E)nhancement, or (S)atisfactory.
8. Fully explain the reason for any (U) in column 7 (e.g., how the psychometric attributes are not being met).
9. Save the initial review comments and detail subsequent comment resolution so that each exam-bound question is marked by an (S) on this form.

Letter 2.3-1 Sample Examination Approval Letter

NRC Letterhead

(Date)

(Name, Title)
(Name of Facility)
(Address)
(City, State ZIP Code)

SUBJECT: OPERATOR LICENSING EXAMINATION APPROVAL

Dear (Name):

The purpose of this letter is to provide U.S. Nuclear Regulatory Commission (NRC) approval of the proposed written examination and operating test under Title 10 of the *Code of Federal Regulations* (10 CFR) 55.40(b)(4) and to confirm the final arrangements for the upcoming operator licensing examination at (facility name).

The NRC has approved the subject examinations, and you may administer the written examination on (date) in accordance with Revision 12 to NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," issued (issue date). The NRC staff will administer the operating test during the week(s) of (date). The NRC has provided the list of the applicants approved to take the examinations to (Name, Title). The examinations have undergone extensive review by my staff and representatives responsible for licensed operator training at your facility. Based on this review, I have concluded that the examinations meet the guidelines of NUREG-1021 for content, operational, and discrimination validity. By administering the written examination, you also agree that the examinations meet NUREG-1021 guidelines and are appropriate for measuring the qualifications of licensed operator applicants at your facility. If you determine that these examinations are not appropriate for licensing operators at your facility, do not administer the written examination and contact me at (telephone number).

Please contact your NRC chief examiner, (Name), at (telephone number), if you have questions or identify any errors or changes in the license level (reactor operator or senior reactor operator) or type of examination (partial or complete written examination or operating test, or both) specified for each applicant approved to take the examinations.

Sincerely,

(Name of Appropriate Regional
Representative, Title)

Docket No.: 50-(number) or
Docket No.: 52-(number)

cc: Public
NRC Document Control System
Regional Distribution

3.1 OVERVIEW OF THE OPERATING TEST FOR OPERATOR LICENSING INITIAL EXAMINATIONS

This examination standard (ES) contains an overview of the operating test, required by Title 10 of the *Code of Federal Regulations* (10 CFR) 55.45, "Operating tests," for the initial licensing of operators, including the purpose, structure, and content of the operating test. It includes general guidelines and instructions for the operating test.

A. Operating Test Structure and Content

To the extent applicable, the operating test requires the applicant to demonstrate an understanding of, and the ability to perform, the actions necessary to accomplish a representative sampling of the 13 items identified in 10 CFR 55.45(a). Each operating test need not cover all 13 items. In addition, the content of the operating test will be identified, in part, from learning objectives contained in the facility licensee's training program and information in the final safety analysis report, system description manuals and operating procedures, the facility license and amendments thereto, licensee event reports, and other materials that the U.S. Nuclear Regulatory Commission (NRC, the Commission) requests from the facility licensee.

The structure of the operating test is dictated, in part, by 10 CFR 55.45(b). Specifically, that requirement states that the test will be administered in a plant walkthrough and in either a simulation facility that the Commission has approved pursuant to 10 CFR 55.46(b), a plant-referenced simulator that conforms to 10 CFR 55.46(c), or the plant itself, if approved by the Commission under 10 CFR 55.46(b).

The operating test consists of two portions, the individual walkthrough portion, using job performance measures (JPMs), and a dynamic simulator operating test using scripted dynamic scenarios. The individual walkthrough portion, also known as the JPM portion of the operating test, consists of a set of JPMs covering administrative topics, control room systems, and in-plant systems. Each JPM focuses on specific knowledge and abilities (K/As) required for licensed operators to safely discharge their assigned duties and responsibilities. For each applicant, depending on license level, the NRC specifies the number of JPMs required and the topic areas covered during this part of the operating test in Examination Standard (ES)-3.2, "Developing Job Performance Measures," which contains specific instructions for developing JPMs for the operator licensing initial examination.

The simulator operating test, also known as the simulator test or simulator scenarios, is administered on a Commission-approved or plant-referenced simulator. A simulator test consists of a set of dynamic simulator scenarios, also referred to as the scenario set, developed for a specific examination. Depending on license level and the number of applicants taking the operating test, one or more scenarios are administered to each applicant.

Administrative Topic Job Performance Measures

This part of the walkthrough portion of the operating test covers K/As associated with administrative control of the plant. These JPMs can be administered in a classroom format, in the simulator, or in the plant. The scope and depth of coverage required in each administrative topic area are based on the applicant's license level. The applicant's competence in each topic is evaluated by administering JPMs and asking followup questions, as necessary, based on the applicant's performance.

Control Room System and In-Plant System Job Performance Measures

This part of the walkthrough portion of the operating test is used to determine whether the applicant has an adequate knowledge of plant system design and can safely operate those systems and successfully implement facility operating procedures. This involves various system types such as primary coolant, emergency coolant, decay heat removal, auxiliary, radiation monitoring, and instrumentation and control systems. The NRC examiner evaluates the applicant's system-related K/As by having the applicant perform selected tasks and, when necessary, based on the applicant's performance, probing his or her knowledge of the task and its associated system with followup questions.

This part of the walkthrough focuses primarily on those systems with which licensed operators are most involved (i.e., those having controls and indications in the main control room) and ensures that the applicant is familiar with the design and operation of systems located outside the main control room.

This part of the operating test is administered in a one-on-one walkthrough format in the control room simulator and the plant.

Simulator Operating Test

The simulator operating test is a performance-based test used to evaluate the applicant's ability to safely and competently operate the plant's systems under dynamic, integrated conditions.

Each simulator scenario is administered in a team format with up to three applicants filling the reactor operator (RO) and senior reactor operator (SRO) license positions on an operating crew. This team format enables the examiner to evaluate each applicant's ability to function within the control room team as appropriate to the assigned position in such a way that the facility licensee's procedures are adhered to and that the limitations in its license and amendments thereto are not violated.

The simulator test is designed so that each applicant can demonstrate proficiency on the competencies applicable to his or her license level. The NRC examination team administers one or more scenarios to each team or crew of applicants in order to evaluate each applicant individually on a range of competencies applicable to the applicant's license level.

B. General Instructions and Guidelines for Developing Operating Tests

The following is a list of general instructions and guidelines for use during operating test development and planning:

1. To maximize efficiency, use the same operating test material to examine multiple applicants and simulator crews, if desired. The facility licensee and the NRC chief examiner shall discuss the options and reach agreement on the strategy to maximize examination preparation efficiency while maintaining test integrity before developing the operating tests.

2. Do NOT repeat the same JPMs and simulator scenarios on subsequent days.

3. Design the operating test to examine a broad range of K/As, systems and components, and operations and events. Do not duplicate material used on the walkthrough and simulator scenario portions with material covered on the written examination. Develop

and review the operating test material as a package to preclude the same tasks and events from appearing on both parts of the operating test.

4. Do NOT duplicate test items (simulator scenarios or JPMs) from the applicant's audit test. For retake examinations, do not duplicate test items from the applicant's original test. Simulator events and JPMs that are related to those tested on the audit examination are permitted, provided that the actions required to mitigate the transient or complete the task (e.g., using an alternative path) are significantly different from those required during the audit examination. The facility licensee shall identify for the NRC chief examiner those simulator events and JPMs that are related to those tested on the audit examination.

5. For each part of the operating test, develop new material or select testing materials (i.e., JPMs and simulator scenarios) from the facility's examination banks (and modify them, if needed). Every selected test item must satisfy the applicable qualitative and quantitative standards and limitations specified in this NUREG or be modified accordingly.

6. Consider the K/As associated with normal, abnormal, and emergency tasks and evolutions as a source of topics for use in evaluating applicant competency in each part of the operating test.

    a. K/As associated with the tasks planned for the operating test should have importance ratings of at least 2.5. Tasks with importance ratings of less than 2.5 may be used if there is a substantive reason for including them (e.g., a licensee event or a significant system modification).

    b. K/As should be appropriate to the plant-specific requirements for the applicant's license level. Refer to the facility licensee's job and task analysis (if available), learning objectives, and other reference material to confirm that the operating test is correctly oriented to the facility and the applicant's license level. Failure to train the applicants on a particular K/A is ***not*** an acceptable basis for excluding a K/A.

    c. The facility licensee's site-specific task list may be used to supplement or override, on a case-by-case basis, selected individual items in the NRC's K/A catalogs. To maintain examination consistency, the site-specific task list shall not be used in place of the entire K/A catalog.

7. When selecting and developing JPMs and scenarios for the operating test, ensure that the materials contribute to the test's overall capacity to differentiate between those applicants that are competent to safely operate the plant and those that are not. Additionally, apply the three facets of test validity (i.e., content, operational, and discrimination) discussed in Appendix A, "Overview of Generic Examination Concepts." A valid test item, when missed, facilitates subsequent justification for denying the applicant's license; avoid test items that when missed cannot be used to justify a license denial.

8. The operating test for SRO applicants tests the applicant's knowledge, skills, and abilities for any on-shift position that requires an SRO license, regardless of the position he or she will be assigned when licensed.

9. The following guidelines differentiate the SRO operating test from the RO operating test:

   a. In directing licensed activities, the SRO must evaluate plant performance and make operational judgments accordingly. SRO applicants should, therefore, be more knowledgeable in areas such as operating characteristics and reactor behavior.

   b. In directing licensed activities, the SRO must have a broader and more thorough knowledge of the facility licensee's administrative controls and methods, including limitations imposed by the regulations and the facility licensee's technical specifications (TS) and their bases.

   c. The SRO may be assigned responsibilities for auxiliary systems that are outside the control room (e.g., waste disposal and fuel handling systems) and are not normally operated by licensed operators. Because the SRO may have these additional responsibilities, the SRO license applicant should demonstrate knowledge of the designs of such systems as they relate to maximum permissible concentrations, effluent release rates, and other radiological considerations.

10. Incorporate facility-specific and industry generic operating experience into the operating test whenever possible. Documents such as licensee event reports, significant event reports, and vendor-specific operating experience reports are readily available sources of operationally oriented plant anomalies.

11. Evaluate the dominant accident sequences for the facility to determine whether they are suitable for testing, on a sampling basis, during the dynamic simulator or walkthrough portions of the operating test. Dominant accident sequences are those sequences that contribute significantly to the frequency of core damage as determined by the facility licensee's probabilistic risk assessment or individual plant examination.

12. The probabilistic risk assessment/individual plant examination should also be used to identify risk-important operator actions. In determining which actions to evaluate, do not overlook actions that are relied upon for or result in specific events being driven to low-risk contribution. This will help identify those human actions that are assumed to be very reliable but might otherwise not appear in a list of risk-dominant actions.

13. Do the following for applicants applying for a multiunit license at a facility:

   a. Test the applicants' knowledge of the design, procedural, and operational differences among the units.

   b. Divide the operating test coverage among the units and do not become predictable by conducting the walkthrough tests on only one unit.

   c. For multiunit facilities that have a simulator modeled after only one of the units, test the applicants on the different systems, control board layouts, and any other differences among the units during the in-plant JPM portion of the operating test.

14. Every facet of the operating test, including the walkthrough JPMs and simulator scenarios, should be planned, researched, validated, and documented to the maximum extent possible before the test is administered.

15. If it becomes necessary to deviate from a test outline that the NRC has approved, discuss the proposed deviation with the NRC chief examiner and obtain concurrence before proceeding with the changes. Be prepared to explain why the original proposal could not be implemented and why the proposed replacement is considered an acceptable substitute.

3.2 DEVELOPING JOB PERFORMANCE MEASURES

This examination standard (ES) contains instructions for selecting and developing job performance measures (JPMs) for the walkthrough portion of the operating test for operator licensing initial examinations. The instructions in this ES can also be applied in developing JPMs that can be used for U.S. Nuclear Regulatory Commission (NRC) requalification examinations. The NRC uses JPMs to evaluate the applicant's understanding of, and ability to safely operate, the plant. Adhering to this guidance ensures that JPMs are of appropriate substance and format and helps examination authors maintain the consistency and validity of the walkthrough tests.

A. General Instructions

(1) To protect the integrity and security of the examination process, limits exist for examination material taken directly from the facility licensee's testing materials or banks without significant modification and the number of JPMs repeated from the last two NRC licensing examinations at the facility. The outline forms (Form 3.2-1, "Administrative Topics Outline," and Form 3.2-2, "Control Room/In-Plant Systems Outline") in this ES contain specific limits on JPM bank use and repetition from the previous two NRC examinations.

(2) For JPMs, a "significant modification" means that at least one condition has been substantively changed in a manner that alters the course of action of the original JPM.

(3) If JPMs are repeated from the past two NRC examinations, they must be randomly selected from all the JPMs used on the past two examinations.

(4) The examination author should ensure that the JPMs, both individually and as a group, have meaningful performance criteria that will provide a legitimate basis for evaluating the applicant's understanding of the plant and ability to safely operate it. The test should not include simple, one-step JPMs or JPMs that involve only direct lookup of the correct answer. JPMs that incorporate the testing of immediate action steps from memory are acceptable if they include testing additional steps or items that are not from memory. Examination authors should avoid creating a walkthrough test that is heavily weighted with tasks of low difficulty; this type of test does not provide the NRC with an adequate basis to make a licensing decision.

B. Instructions for Selecting Administrative Topic Job Performance Measures

The following are instructions for how to select topics for administrative topic JPMs.

1. Determine the Number of Administrative Topic JPMs to Develop

Obtain the required number of administrative topic JPMs to be evaluated based on the license level of the applicants using the criteria on Form 3.2-1. Refer to the outline form for bank limits and other criteria.

2. Select a Knowledge and Ability Item for Each Administrative Topic JPM

Select a knowledge and ability (K/A) associated with each administrative topic from Section 2.0, "Generic Knowledge and Abilities," of the applicable K/A catalog:

(a) For the senior reactor operator (SRO) applicants, all administrative topic JPMs must be at the SRO level. Select K/A statements for the SRO administrative topic JPMs that allow for the evaluation of SRO applicants in a manner that is representative of the greater depth and scope of an SRO's administrative responsibilities and of their ability to perform administrative tasks that are the responsibility of the facility's senior licensed positions.

(b) For the "Emergency Plan" topic, select K/As related to the emergency plan and implementing procedures and do not use K/As associated with the emergency operating procedures.

(c) Select K/As with importance ratings of at least 2.5 (SRO column) for the SRO administrative topic JPMs, and select K/As with importance ratings of at least 2.5 (reactor operator (RO) column) for the RO administrative topic JPMs. Tasks with importance ratings of less than 2.5 may be used if there is a substantive reason for including them (e.g., a recent licensee event or a significant system modification).

3. Select an Activity for Each Administrative Job Performance Measure Topic

Select a performance-based administrative activity for the JPM that meets the K/A. Administrative topic JPMs are not used to evaluate the applicant's ability to perform system or component manipulations. Administrative topic JPMs that take place in the simulator/plant can involve system or component manipulations that do not change the configuration of the plant (e.g., pulling up data on the plant computer, swapping the digital display to take different instrument readings). Administrative topic JPMs may require the applicant to identify and respond to one or more postulated administrative errors.

This section provides some example activities by topic area for administrative topic JPMs.

a. Conduct of Operations Topics

This topic area evaluates the applicant's knowledge of the daily operation of the facility. The following subjects are examples of the types of administrative tasks that could be evaluated under this topic:

- shift turnover
- shift staffing requirements
- operator responsibilities and procedure usage
- purpose, function, and administrative controls for plant systems
- administrative aspects of fuel handling and refueling

The subject of fuel handling can be covered in the control room or in the fuel handling areas of the plant. The RO applicant should be aware of his or her duties in the control room during fuel handling. These duties include monitoring instrumentation and responding to alarms from the fuel handling area (with actions that do not require direct manipulation of system controls) and communicating with fuel handling personnel in support of refueling operations. The SRO applicant should be evaluated on topics such as requirements for core alterations, requirements for new and spent fuel storage and movement, the design of the fuel handling area, precautions and requirements for the use of the fuel handling tools, and administrative aspects of fuel handling casualties such as when to stop fuel movement or evacuate containment.

b. Equipment Control Topics

This topic area addresses the administrative requirements associated with managing and controlling plant systems and equipment. The following subjects are examples of the types of administrative tasks that could be evaluated under this topic:

- surveillance testing (for example, recording and evaluating plant data)
- prestartup activities (for example, calculations for criticality)
- maintenance (for example, postmaintenance test requirements)
- tagging and clearances
- temporary modification of systems
- changes to procedures and plant design
- technical specifications, including plant mode
- processes for controlling equipment configuration/status
- familiarity with, and use of, piping and instrument drawings

These subjects can be evaluated within the framework of a normal maintenance evolution. For example, the examiner can ask the applicant to perform a clearance to take a failed system or component out of service, initiate maintenance on the system, and test the system before placing it back in service. A test that requires integrated system operation (e.g., a pump operability test) would not be considered administrative in nature. However, stroke timing a valve in a shutdown system would be an administrative task.

c. Radiation Control Topics

This topic area evaluates the applicant's knowledge and abilities with respect to radiation hazards and protection (of plant personnel and the public). The following subjects are examples of the types of administrative tasks that could be evaluated under this topic:

- use and function of portable radiation and contamination survey instruments and personnel monitoring equipment
- knowledge of significant radiation hazards
- radiological safety principles and procedures
- radiation exposure limits under normal or emergency conditions
- control of radiation releases

This topic may be covered in conjunction with the JPMs prepared for the in-plant systems walkthrough. One possibility is to evaluate these subjects during the required entry into the radiologically controlled area.

The levels of knowledge expected of RO and SRO applicants in some radiation control subjects differ significantly. The RO's duties generally require knowledge of radiation worker responsibilities and operation of plant systems associated with liquid and gaseous waste releases. Therefore, the depth to which RO applicants are evaluated should be limited to their responsibilities and the monitoring requirements before, during, and after the release. The SRO, however, may be involved in reviewing and approving release permits and should be

cognizant of the requirements associated with those releases, as well as their potential effect on public health and safety.

d. Emergency Plan Topics

This topic area evaluates the applicant's knowledge of the facility's emergency plan, including, as appropriate, the responsibility of the RO or SRO to decide whether the plan should be executed, and activities/duties assigned under the plan. The following subjects are examples of the types of administrative tasks that could be evaluated under this topic:

- lines of authority during an emergency
- operator responsibilities during an emergency
- emergency plan procedures
- emergency action levels and classifications
- emergency facilities
- emergency communications
- emergency protective action recommendations
- security event procedures (nonsafeguards information)

The knowledge required of RO and SRO applicants in this area differs significantly. RO applicants should be familiar with the emergency plan and with their plant-specific responsibilities under the emergency plan implementing procedures (EPIPs). By contrast, SRO applicants must demonstrate additional knowledge based on their responsibility to direct and manage the implementation of the EPIPs during the initial phases of an emergency. As a result, SRO applicants should have a more detailed understanding of the EPIPs, in general, and should be familiar with event classification procedures, protective action recommendations, and communication requirements and methods. To minimize predictability, the use of JPMs that include variations of the same activity (e.g., always testing this topic with an emergency classification) should be avoided. Instead, the test items for this topic should vary from examination to examination to include items from the bulleted list above.

This topic may be evaluated by linking a JPM to a simulator transient that requires implementation of the emergency plan. Such a JPM can be conducted immediately following a simulator scenario or during control room or in-plant systems JPMs.

4. Time Allowances for Administrative Job Performance Measures

Administrative topic JPMs range, on average, from 15 minutes to 45 minutes in duration (per JPM). For time-critical administrative topic JPMs, the JPM task standard specifies a time limit.

5. Fill Out Form 3.2-1 ("Administrative Topics Outline")

Form 3.2-1 includes instructions on how to complete the administrative topics outline. When complete, the outline is reviewed and approved in accordance with ES-2.3, "Reviewing and Approving Operator Licensing Initial Examinations."

6. Develop Job Performance Measures in Accordance with ES-3.2, Sections D and E

Upon NRC approval of Form 3.2-1, the examination author develops the administrative topic JPMs in accordance with ES-3.2, Sections D and E.

C. Instructions for Selecting Control Room System and In-Plant System Job Performance Measures

Prepare Form 3.2-2 as follows:

(1) Determine the required number of JPMs for the control room system and in-plant systems to develop based on the applicant's license level using the criteria on Form 3.2-2. Refer to the outline form for bank limits and other criteria.

(2) Using the instructions on Form 3.2-2, identify the safety function; associated system; and task, location, and type code for each required JPM.

(3) When Form 3.2-2 is complete, ensure that the form is reviewed and approved in accordance with ES-2.3.

Upon NRC approval of Form 3.2-2, the examination author develops the control room system and in-plant system JPMs in accordance with ES-3.2, Sections D and E.

D. Instructions for Developing Job Performance Measures

This section contains instructions for developing JPMs for both operator licensing initial and requalification examinations (except as noted). The steps do not have to be performed in this exact order.

Although written from the perspective of developing new JPMs, these instructions also apply when modifying existing JPMs for reuse and when reviewing proposed JPMs for NRC approval (in accordance with ES-2.3).

If a JPM already exists for the selected task, review it using the criteria in this section to ensure that it is acceptable for use.

Document JPMs using Form 3.2-3, "Job Performance Measure Template," or an equivalent. Form 3.2-4, "Job Performance Measure Development Job Aid," may be used to verify that the relevant criteria are satisfied.

1. Develop Performance Criteria

Develop meaningful performance criteria that provide examiners with a basis for evaluating the applicant's K/A. Artificially subdividing existing tasks to generate new ones may dilute the value of the JPM to a point where it becomes meaningless. The JPMs cannot test solely for simple recall or memorization. Steps *a–d* below explain how to develop performance criteria.

a. Define the Task Standard

For the task associated with the JPM, define the task standard. The task standard is the predetermined qualitative or quantitative outcome (or both) against which task performance will be measured. The task standard clearly describes the expected outcome (i.e., end state) for successful completion of the JPM. For alternate path JPMs, the task standard includes the end state reached by way of alternate path actions. When applicable, the task standard includes a tolerance range for acceptable performance (e.g., 4,950–5,050 gallons per minute flow).

A properly defined and detailed task standard enables consistency in determining the JPM's critical steps and subsequently evaluating applicant performance.

The following are examples of task standards.

Administrative Topic JPM:

(Example from a print-reading task): The task is satisfactorily met when the applicant has determined that, with both limit switches 2E51-N060 and 2E51-N061 closed, relay 2E51-K52A will energize, causing the following functions:

- valve 2E51-F029 closes
- valve 2E51-F031 closes
- "Condensate Storage Tank Low Level" annunciator alarms

Control Room System JPM:

The task is satisfactorily met when the applicant has reset and opened all main steam isolation valves at $\leq$200 pounds per square inch differential and then has isolated a subsequent steamline break by closing valves MS-V123 and MS-V456 before reaching maximum safe temperatures in two areas (approximately 8 minutes after receiving Group 1 System A and B alarms).

In-Plant System JPM:

The task is satisfactorily met when the diesel generator is started, synchronized to the grid, and loaded at x $\pm$ y kilowatts.

b. Develop Performance Standards for Each Step of the Task

For each step of the task, identify a performance standard for successful completion of the step:

- Provide details that explain what is necessary to successfully complete the given step and that allow the examiner to evaluate progress toward completing the task in accordance with the procedural references.

- When possible, also provide details for the expected state of controls and indications (e.g., switch positions and meter readings), even if the procedural step does not specify these criteria.

- Note any important observations that the applicant should make while performing the step.

- Note any specific procedural restrictions on the sequence in which the steps are performed in the JPM.

Facility procedures may be adapted for use as JPMs by identifying performance standards for each step.

c. Identify the Critical Steps and Use Verifiable Actions

The critical steps are the task steps that the applicant must perform correctly (i.e., accurately, in the proper sequence, and at the proper time) to accomplish the task standard. Ensure that

each critical step has a performance standard as described in 1.b, above. Clearly designate the critical steps on the JPM worksheet for the NRC examiner. For tasks that involve a procedure step with multiple parts or elements, clearly identify which parts or elements of the procedure step are critical.

Although critical steps consist of verifiable actions most of the time, sometimes a critical step does not involve a verifiable action. These critical steps must still be designated as critical. Each JPM must contain at least two critical steps. Additionally, a control room system or in-plant system JPM cannot consist solely of critical steps that are not verifiable actions.

- Example: During a control room system JPM in which a system is being aligned, if a manual valve in the plant must be opened for the task to be complete, the phone call to direct a field operator to open the valve would be designated a critical step, even though a phone call is not a verifiable action.

- Example: During an in-plant system JPM that involves aligning a system, if the applicant is required to call the control room to start a pump or open a valve and the actions taken in the control room are necessary to accomplish the task standard, any phone call to direct those actions would also be designated a critical step, even though phone calls are not verifiable actions. Here, the applicant directs the control room operator to perform what would be considered a verifiable action.

When verifiable actions are part of in-plant system JPMs, write the performance standard to include what the applicant must describe to show how he or she would perform the action, such as closing a valve or repositioning a switch. For example, the applicant describes how to perform the verifiable actions, such as, “I am turning the hand-wheel in the clockwise direction and observing the stem move inward until I feel resistance.”

d. Specify the Job Performance Measure Termination Criteria

Include a statement that describes the conditions to be met for the NRC examiner to terminate the JPM, such as applicant success or failure to meet the task standard.

2. Specify Initial Conditions and Write the Initiating Cue

Determine system and plant conditions that permit realistic operator performance of the task.

Provide the applicant sufficient information about the status of the plant and system to facilitate task performance, without coaching the applicant. If the task is intended to be performed on the simulator, it is worthwhile to differentiate those specific initial conditions (ICs) and system realignments that are necessary for the task to be performed as planned from other general conditions that add realism and set the stage for performing the task but have no real bearing on its successful execution. Breaking down the ICs in such a manner will simplify the simultaneous administration of different tasks by two or more applicants.

Any required operator actions preceding the starting point of the JPM should already be complete unless a given action is purposely omitted as part of an alternate path JPM.

Include an initiating cue that provides the stimulus for the applicant to begin performing the task. When appropriate, the cue should clearly specify the desired endpoint for the task. For example, if the applicant should start and load the emergency diesel generator, the cue should state the load at which the task will be considered complete.

Note: Alternate path tasks, described in Section E, may have an actual endpoint different from that stated in the initiating cue.

Duplicate the ICs and initiating cue on a separate sheet of paper so that they can be handed to the applicant. This is particularly helpful for tasks with detailed ICs or those that will be performed in high-noise areas. Ensure that the ICs and initiating cue do not reveal the nature of any alternate path JPMs that are planned.

3. Identify References and Tools

Identify the plant procedures necessary for performing the JPM, as well as the procedures that provide guidance, directions, or standards for performing the task. When reviewing JPMs selected from the facility licensee's bank, it is important to ensure that the procedures identified in the JPM are still current.

Identify any special tools or equipment (e.g., a stopwatch, wrench, fuse puller, or spool piece) that the applicant will need to perform the task. It is helpful to the NRC examiner if the JPM states the location(s) where these items may be found. Any required tools should be readily available to the plant operators; they should not be staged specifically for the examination.

4. Develop Examiner Cues

Identify appropriate system response cues so that the examiner can give the applicant specific feedback on the component and system reactions to the applicant's manipulations, especially those procedural steps identified as critical to task completion. The response cues are particularly important in the following situations:

- in-plant tasks that will be simulated because the applicant will not have available the normal indications (e.g., alarms, flow rates, temperatures, and pressures) that would be observed during actual task performance

- alternate path JPMs that require the applicant to perform auxiliary procedures when equipment or instrumentation fails during use

System response cues may not be necessary for tasks that are performed on the simulator.

If it is possible to anticipate incorrect actions that the applicants might take, it is beneficial to note the expected system response cues in the JPM as an aid to the NRC examiner.

Identify any additional cues or instructions that the examiner might need to provide to the applicant in response to procedural steps for which the applicant will not be held accountable (i.e., those steps that have either already been performed or will be performed by other personnel in remote locations).

5. Develop a Time Standard

Determine an average time for completing the task; this is referred to as the validation time, and it starts when the initiating cue is read to the applicant at the plant location where an operator would normally be when directed to perform the JPM task.

JPMs that have a task standard that must be completed within a time specified in a regulation, licensing-basis document, or commitment to the NRC are called "time-critical" JPMs. Identify

any time-critical JPMs, and ensure that the timeline can be met during JPM validation. For time-critical JPMs, specify the time limit in the JPM task standard.

The validation time and completion time for a time-critical JPM may differ, especially if the applicant needs to complete additional steps following the time-critical element of the assigned task.

6. Review and Approve Job Performance Measures Using the Instructions in ES-2.3

Facility licensees have the option to submit up to two JPMs to the NRC chief examiner for preliminary review and comment as part of the presubmittal sample.

7. Validate Job Performance Measures

Validate each JPM before examination administration; changes, other than editorial ones, should not be made to the JPM after validation activities are complete. Each JPM should be validated as early as possible before the examination is to be administered to allow time for changes to be made. The JPM should not be a surprise to the examiners or simulator operators during examination administration.

E. Additional Instructions for Developing Alternate Path Job Performance Measures

JPMs are intended to be tasks that an operator must be able to perform that relate to the operator's job task analysis. Operators are frequently challenged to perform auxiliary procedures when equipment or instrumentation fails during use. Therefore, the NRC expects applicants to be able to use alternative methods to perform tasks.

An alternate path JPM allows the NRC to evaluate whether the applicant has the skills and knowledge needed to safely operate the system and the ability to recognize and diagnose an unexpected system response and then execute one or more alternative paths within the wide spectrum of procedures under the applicant's cognizance.

Develop alternate path JPMs using the instructions in Section D and the additional instructions below for alternate path JPMs.

1. Success Path

The JPM must have a valid success path endorsed by the facility licensee. The success path must differ from the normal success path in order to test the applicant's ability to use an alternate operation of the system or procedure. This may require analyzing ICs to determine an alternative method for completing the task, mitigating a system-related problem that occurs during the task, or realigning the system.

2. Procedurally Driven

The JPM must be based on a procedure that addresses required actions (i.e., if the JPM requires an alternative method to complete the task, the procedure would have an exit step that directs the use of that alternative method). The applicant may be required to use some common practices endorsed by the facility licensee that are addressed through generic administrative procedures or policies (e.g., shifting controls to manual).

3. Logical Sequence

The sequence of procedurally driven actions must be logical. For example, an applicant performing a normal evolution when a malfunction occurs would not be expected to enter emergency operating procedures. More realistically, the applicant would attempt to correct the problem by referring to an annunciator response procedure or abnormal operating procedure. However, an applicant performing a normal evolution may encounter a situation requiring a reactor trip. A JPM should not involve a cascading sequence of malfunctions, for which several procedures must be used simultaneously, that occur while performing a task. This type of activity is better tested in the simulator operating test portion of the examination.

4. Independent of Crew Dynamics

The JPM should be designed so that the applicant can complete the task or mitigate a problem that occurs during a task without having to rely on the actions of other control room operators. This provision does not prohibit simulator operators from acknowledging irrelevant alarms or unexpected reactions of other systems that are not associated with the task. The JPM may still require the applicant to use the simulator operator to perform needed manipulations in the plant.

F. Forms

Form 3.2-1 Administrative Topics Outline
Form 3.2-2 Control Room/In-Plant Systems Outline
Form 3.2-3 Job Performance Measure Template
Form 3.2-4 Job Performance Measure Development Job Aid

Form 3.2-1 Administrative Topics Outline

Facility: _____		Date of Examination: _____
Examination Level: RO ☐	SRO ☐	Operating Test Number: _____
Administrative Topic (Step 1)	Activity and Associated K/A (Step 2)	Type Code (Step 3)
Conduct of Operations		
Conduct of Operations		
Equipment Control		
Radiation Control		
Emergency Plan		

Instructions for completing Form 3.2-1, “Administrative Topics Outline”

1. For each license level, determine the number of administrative job performance measures (JPMs) and topic areas as follows:

Topic	Number of JPMs	
	RO*	**SRO and RO Retakes**
Conduct of Operations	1 (or 2)	2
Equipment Control	1 (or 0)	1
Radiation Control	1 (or 0)	1
Emergency Plan	1 (or 0)	1
Total	**4**	**5**

* Reactor operator (RO) applicants do not need to be evaluated on every topic (i.e., “Equipment Control,” “Radiation Control,” or “Emergency Plan” can be omitted by doubling up on “Conduct of Operations”), unless the applicant is taking only the administrative topics portion of the operating test (with a waiver or excusal of the other portions).

2. Enter the associated knowledge and abilities (K/A) statement and summarize the administrative activities for each JPM.

3. For each JPM, specify the type codes for location and source as follows:

Location:

(C)ontrol room, (S)imulator, or Class(R)oom

Source and Source Criteria:

(P)revious two NRC exams (no more than one JPM that is **randomly selected** from last two NRC exams)
(D)irect from bank (no more than three for ROs, no more than four for SROs and RO retakes)
(N)ew or Significantly (M)odified from bank (no fewer than one)

Form 3.2-2 Control Room/In-Plant Systems Outline

Facility: _____ Date of Examination: _____

Operating Test Number: _____

Exam Level: ☐ RO ☐ SRO-I ☐ SRO-U

System/JPM Title	Type Code	Safety Function
Control Room Systems		
a.		
b.		
c.		
d.		
e.		
f.		
g.		
h.		
In-Plant Systems		
i.		
j.		
k.		

1. Determine the number of control room system and in-plant system job performance measures (JPMs) to develop using the following table:

License Level	Control Room	In-Plant	Total
Reactor Operator (RO)	8	3	11
Senior Reactor Operator-Instant (SRO-I)	7	3	10
Senior Reactor Operator-Upgrade (SRO-U)	2 or 3	3 or 2	5

2. Select safety functions and systems for each JPM as follows:

   Refer to Section 1.9 of the applicable knowledge and abilities (K/A) catalog for the plant systems organized by safety function. For pressurized-water reactor operating tests, the primary and secondary systems listed under Safety Function 4, "Heat Removal from Reactor Core," in Section 1.9 of the applicable K/A catalog, may be treated as separate safety functions (i.e., two systems, one primary and one secondary, may be selected from Safety Function 4). From the safety function groupings identified in the K/A catalog, select the appropriate number of plant systems by safety functions to be evaluated based on the applicant's license level (see the table in step 1).

   For RO/SRO-I applicants: Each of the control room system JPMs and, separately, each of the in-plant system JPMs must evaluate a different safety function, and the same system or evolution cannot be used to evaluate more than one safety function in each location. One of the control room system JPMs must be an engineered safety feature.

   For SRO-U applicants: Evaluate SRO-U applicants on five different safety functions. One of the control room system JPMs must be an engineered safety feature, and the same system or evolution cannot be used to evaluate more than one safety function.

3. Select a task for each JPM that supports, either directly or indirectly and in a meaningful way, the successful fulfillment of the associated safety function. Select the task from the applicable K/A catalog (K/As for plant systems or emergency and abnormal plant evolutions) or the facility licensee's site-specific task list. If this task has an associated K/A, the K/A should have an importance rating of at least 2.5 in the RO column. K/As that have importance ratings of less than 2.5 may be used if justified based on plant priorities; inform the NRC chief examiner if selecting K/As with an importance rating less than 2.5. The selected tasks must be different from the events and evolutions conducted during the simulator operating test and tasks tested on the written examination. A task that is similar to a simulator scenario event may be acceptable if the actions required to complete the task are significantly different from those required in response to the scenario event.

   Apply the following specific task selection criteria:

- At least one of the tasks shall be related to a shutdown or low-power condition.
- Four to six of the tasks for RO and SRO-I applicants shall require execution of alternative paths within the facility licensee's operating procedures. Two to three of the tasks for SRO-U applicants shall require execution of alternative paths within the facility licensee's operating procedures.
- At least one alternate path JPM must be new or modified from the bank.
- At least one of the tasks conducted in the plant shall evaluate the applicant's ability to implement actions required during an emergency or abnormal condition.
- At least one of the tasks conducted in the plant shall require the applicant to enter the radiologically controlled area. This provides an excellent opportunity for the applicant to discuss or demonstrate radiation control administrative subjects.

If it is not possible to develop or locate a suitable task for a selected system, return to step 2 and select a different system.

4. For each JPM, specify the codes for type, source, and location:

Code	License Level Criteria		
	RO	SRO-I	SRO-U
(A)lternate path	4–6	4–6	2–3
(C)ontrol room			
(D)irect from bank	≤ 9	≤ 8	≤ 4
(E)mergency or abnormal in-plant	≥ 1	≥ 1	≥ 1
(EN)gineered safety feature (for control room system)	≥ 1	≥ 1	≥ 1
(L)ow power/shutdown	≥ 1	≥ 1	≥ 1
(N)ew or (M)odified from bank (must apply to at least one alternate path JPM)	≥ 2	≥ 2	≥ 1
(P)revious two exams (randomly selected)	≤ 3	≤ 3	≤ 2
(R)adiologically controlled area	≥ 1	≥ 1	≥ 1
(S)imulator			

Form 3.2-3 Job Performance Measure Template

Facility: Job Performance Measure No.:

Task Title: Task No.:

System: Knowledge/Ability Reference and Rating:

Time-Critical Task: (Yes/No) Alternate Path: (Yes/No)

Validated Time:

Method of Testing: Simulated Performance _____ Actual Performance ____

Location: Classroom __ Simulator ___ Plant ___

Task Standard:

Required Materials (procedures, equipment):

General References:

Notes to Examiner:

Simulator Requirements:

Initial Conditions:

Initiating Cues:

Form 3.2-3 Job Performance Measure Template (page 2)

Steps and Performance Standards

Note: Critical steps are denoted with a checkmark ✓ [or other symbol inserted here]

Start Time: _____ End Time: _____

STEP	PERFORMANCE	STANDARD	CRITICAL	GRADE (S/U)
1.				
Cue:				
Comments:				
2.				
Cue:				
Comments:				
3.				
Cue:				
Comments:				
4.				
Cue:				
Comments:				

Termination Criteria:

Form 3.2-4 Job Performance Measure Development Job Aid

This form can be used to verify that the relevant criteria are satisfied.

Every job performance measure (JPM) should have the following characteristics:

1. ___ Be supported by the facility licensee's job task analysis.

2. ___ Be operationally important (meet the applicable knowledge and abilities catalog threshold criterion (2.5 for initial examinations and 3.0 for requalification examinations) or as determined by the facility licensee and agreed to by the U.S. Nuclear Regulatory Commission). JPMs shall not test only for simple recall or memorization.

3. ___ Be designed as either senior reactor operator (SRO)-only, reactor operator (RO)/SRO, or auxiliary operator/RO/SRO.

4. Include the following, as applicable:

   a. ___ task standard

   b. ___ initial conditions

   c. ___ initiating cues

   d. ___ references and tools, including associated procedures

   e. ___ validated time limits (average time allowed for completion) and specific designation of those JPMs that are deemed to be time critical by the facility licensee operations department

   f. ___ operationally important specific performance criteria that include:

      (1) ___ expected actions with exact control and indication nomenclature and criteria (e.g., switch position and meter reading), even if the procedural step does not specify these criteria

      (2) ___ system response and other cues that are complete and correct so that the examiner can properly cue the applicant, if asked

      (3) ___ statements describing important observations that the applicant should make

      (4) ___ identification of critical steps

      (5) ___ restrictions on the sequence of steps

   g. ___ termination criteria

3.3 GENERAL TESTING GUIDELINES FOR DYNAMIC SIMULATOR SCENARIOS

This examination standard (ES) provides a framework for preparing and evaluating dynamic scenarios (referred to as "simulator scenarios" or "scenarios" throughout this ES). The standard ensures that the scenarios are of appropriate scope, depth, and complexity for the U.S. Nuclear Regulatory Commission's (NRC's) simulator operating test portion of the operator licensing initial examination and NRC-conducted requalification examinations.

Specifically, this ES includes details on the following:

- a basic procedure for developing new simulator scenarios, including the associated qualitative and quantitative scenario attributes
- the critical task (CT) methodology

Adhering to the concepts and guidelines discussed here, in association with the specific criteria cited in ES-3.4, "Developing Scenarios," or ES-6.4, "Requalification Dynamic Simulator Examinations," as applicable, will enhance the consistency and validity of the dynamic simulator operating tests.

A. Integrated Scenario Development

This section summarizes the major activities that contribute to the development of a dynamic simulator scenario. The instructions apply to both operator licensing initial and requalification examination programs, except as noted. Although they are written from the perspective of new scenario development, the instructions also apply when modifying an existing scenario for reuse and when assessing the quality of proposed scenarios. Examples of simulator scenarios used on initial examinations can be found in the NRC's Agencywide Documents Access and Management System 2 years after the administration of the examination.

1. Identify Scenario Objectives

The basic objective of an operating test simulator scenario is to evaluate the operator's ability to respond to events that are most appropriately tested in a dynamic simulator environment. Specifically, such events include those that require the operators to demonstrate their knowledge of integrated plant operations, as well as their ability to diagnose abnormal plant conditions and work together to mitigate plant transients that exercise their knowledge and use of abnormal operating procedures and emergency operating procedures (EOPs). Additionally, the scenario must require the operators (usually senior reactor operators (SROs)) to use technical specifications (TS) and, for requalification examinations, to implement the emergency plan.

Requalification scenarios must have specific objectives derived, in part, from the facility licensee's requalification training program objectives. A requalification examination should not be limited to topics covered in the requalification cycle.

2. Select Initial Conditions

The initial conditions (ICs) established for a scenario must allow the scenario to commence realistically. In other words, the ICs should be representative of a typical plant status, which

may include various components, instruments, and annunciators out of service. It is also realistic to have maintenance or surveillance activities in progress. All, some, or even none of these ICs may have a bearing on subsequent scenario events. ICs should also be changed frequently to prevent future events from becoming predictable. In addition, ICs (including power levels) should vary among the scenarios and periodically include startup and low-power situations.

The ICs, including any items that would normally be addressed during the shift turnover, should be described briefly in the space provided at the top of Form 3.3-1, "Scenario Outline."

3. Select Events

After establishing the ICs, a sequence of events designed to achieve the scenario objectives should be selected. Section B discusses the qualitative and quantitative attributes to consider when selecting events. For operator licensing initial examinations, ES-3.4 enumerates specific requirements for each quantitative criterion. ES-6.4 discusses NRC-conducted requalification examinations.

Each event has or contributes to an objective, whether it is to evaluate the operator's knowledge of a recent system modification, ability to respond to a safety-significant event, or use of the TS for a particular safety-related component. Uncomplicated events that require no operator action beyond the acknowledgment of alarms and verification of automatic actions provide little basis for evaluating the operator's competence. As such, the operating test should *not* include such events unless they are necessary to set the stage for subsequent events or to test the SRO applicant's knowledge of TS actions.

Scenarios should be developed so that each type of event (i.e., normal evolutions, instrument failures, component failures, and major plant transients) affects various systems. Having one equipment failure cause or exacerbate another can also be useful in evaluating the operators' understanding of system and component interactions. Balancing the severity of events and the demands they place on each operating position (e.g., reactor operator (RO) and balance of plant (BOP)) will allow each operator to demonstrate his or her competence across a range of conditions.

All events do not have to be linked; one event need not occur for the next event to logically follow (although in many instances, such a relationship adds to the credibility of the scenario). However, the scenario should not consist of a series of totally unrelated events. A well-crafted scenario flows from event to event, giving the operators enough time in each event to analyze what has happened, evaluate the consequences of their action (or inaction), assign a priority to the event given the existing plant conditions, and determine a course of action. Care should be taken so that one event does not fully mask the symptoms of another, because the operators could overlook the malfunction and cause the event or competency coverage for the scenario set to be deficient.

4. Document Events

Each planned operation, malfunction, and transient should be recorded on Form 3.3-1 and numbered sequentially. Each event should be cross-referenced to a simulator malfunction number (or numbers), if applicable, or the simulator instructions that must be entered should be described briefly.

For each event listed on Form 3.3-1, prepare Form 3.3-2, “Required Operator Actions” (or equivalent), as follows:

- Enter the scenario, event, and page numbers and a brief description of the event at the top of the form.

- Include information about when the event is to be initiated (e.g., by signal of the lead examiner/evaluator, timeline, or plant parameter).

- Identify the symptoms or cues that the operators will be provided, the expected actions to be taken, communications to be made, the references to be used by each operating position (e.g., the SRO, RO, and BOP operators) on the crew, and the event terminus (i.e., the anticipated point at which the examiners or evaluators will have enough information on operator performance to move to the next event).

- Include *every* required operator action; this is particularly important for the CTs (refer to Section C) and other verifiable actions and behaviors that will provide a useful basis for evaluating the operators’ competence. If referencing procedure steps, include the verifiable actions that the applicants are expected to take within that procedure. For example, instead of stating only “The BOP starts emergency diesel generator A in accordance with Procedure XYZ, Steps 1.10–1.25,” reference the procedure steps and include the verifiable actions for that set of procedure steps.

- List expected actions in chronological order. Certain actions may be required throughout the event (e.g., if a safety or relief valve fails open, the operators should continually monitor pressure and water level). Flag these actions to show that they are continuous.

- Space the expected actions on Form 3.3-2 to allow room for the examiner to document the operator’s performance during the simulator test. Leave the far-left column of the form blank so that the examiners can record the time that key actions occurred during the test.

- Flag all CTs in a manner that makes them apparent to the individuals who will administer the operating test (e.g., by using underlines, asterisks, or bold type). Identify the measurable performance standard for each CT (refer to Section C).

- Identify and document events that occur before major transients that impact TS functions (such as inoperable instruments).

- When possible, include setpoints and other parameters to provide an objective method for evaluating the operator’s performance. Statements such as “performs actions in accordance with Procedure XXXXX” generally do *not* provide sufficient guidance and are inadequate. However, the statement “performs actions of steps XXX of Procedure XXX (attached)” is acceptable.

5. Determine the Scenario Endpoint

The endpoint of the scenario should be specified on the last operator action sheet (Form 3.3-2) by identifying a particular plant condition, procedural step, or other point that is clearly

recognizable. For requalification examinations, the scenario should *not* be terminated until the stated objectives have been achieved.

6. Validate the Scenario

Every scenario should be validated to ensure that it will run as intended.

B. Scenario Attributes

All valid scenarios contain common attributes that make them useful as evaluation tools. A properly constructed scenario provides for an accurate test of each individual applicant's or operator's skills and abilities, as well as an opportunity to evaluate the crew members' team-dependent skills and abilities. Each scenario must be of sufficient scope and complexity to demonstrate the difference between competent applicants/operators and crews and those who are not performing at an acceptable level. Scenarios also must require the crew to demonstrate its ability as a team to adequately protect public health and safety in emergency conditions, using the facility licensee's EOPs.

A scenario consists of both qualitative and quantitative attributes. No single qualitative or quantitative attribute or group of attributes can be used to determine the acceptability of a scenario. However, a trained examiner should be able to assess the adequacy of a scenario or develop a new scenario, using both sets of attributes. This assessment, combined with validation of the scenario on a real-time basis, should be enough to determine whether a scenario is an acceptable tool for use in measuring the competency of a crew or its individual members.

1. Qualitative Attributes

a. Realism/Credibility

Introducing unrealistic or incredible events into a scenario can affect the validity of the scenario. Piping, component, and instrument failures often occur in such a way that deterioration can be tracked over a discrete time period (e.g., a small leak that propagates over time or a pump failure preceded by a high-vibration condition). Including such precursors in scenarios is important, where appropriate. A great deal of evaluative feedback can be obtained by observing how an operator or crew responds to a gradually worsening condition. One technique is to insert an event precursor (e.g., a small steam generator tube leak) and maintain the plant at a slightly degraded condition to observe how the crew incorporates that condition into its conduct of subsequent plant operations.

Although scenarios may include faults that occur with little or no warning (e.g., valve operators fail, fires occur in breakers or transformers, undetected pipe erosion results in piping failures), such faults often provide minimal evaluative benefits because they happen so suddenly that operators have little to do but watch the event unfold. These events are most useful when trying to establish a plant condition for subsequent evaluation goals or to assess the ability of an operator or crew to use procedures in a symptom-based, rather than an event-based, mode.

Mechanistic component failures are well-documented events that occur each year and sometimes in multiple numbers. However, nonmechanistic failures (e.g., pipe breaks) generally occur singularly; therefore, unless there is a connective precursor, such as a seismic event, it would not be realistic or credible to have several piping systems fail during any one scenario.

Simulated events that appear to violate the laws of physics and thermodynamics contribute to negative training and are unacceptable. Time-compression techniques, discussed further below, may also contribute to negative training. However, if a scenario is intended to evaluate a crew's ability to execute procedural steps that may take a long time to reach during an event (e.g., hydrogen generation during a core uncovering event), such a technique may be useful. In such instances, the scenario must contain a cue such that, when the crew detects the indications of such events, it is informed that the parameters are not responding as expected for the actual plant and that time is being compressed. This cue should be presented at the first opportunity that does not distract the crew from responding to available indications and before the crew challenges the validity of those indications.

Time compression can also include a "jump" forward in time to test important tasks that occur after a prolonged period of time. An example of such time compression is a jump more than 21 hours forward in time following a loss of all alternating-current power for an AP1000 plant so that actions to be taken before a loss of direct-current power can be evaluated. If this "jump" is used, the crew must receive a turnover or cue addressing any relevant plant conditions that changed because of the time compression. The crew should also be allowed an opportunity to conduct a crew brief before resuming the scenario.

b. Event Sequencing

The sequence of events has a major effect on establishing the complexity of a simulator scenario. The pace at which malfunctions are entered can also adversely affect the way an operator or a crew responds.

Malfunctions may be entered simultaneously at separate control panel locations provided that an individual applicant can handle each event without requiring extensive assistance. Too short a time between malfunctions may mask the effects of a particular malfunction and divert the operators' attention. This limits the observers' ability to evaluate the operators' response to the earlier malfunction and may be prejudicial to a fair evaluation. Conversely, extending the time between malfunctions so that no operator activity is in progress may cause undue stress. During an examination, the operators expect something to occur; too much time between events should be avoided.

Therefore, the insertion of malfunctions in the scenario should be carefully timed. Rigorously following a planned time sequence of events is often less valid than initiating malfunctions on the basis of plant parameters or operator actions. The appropriate sequencing of events relates directly to the objectives of the scenario.

Event sequencing may involve time compression to speed up the response of key parameters so that the scenario can proceed to the next event within a reasonable time. Time compression may be accomplished by adjusting parameter indications or accelerating plant behavior characteristics so that plant indications trigger an event more quickly than would typically occur in reality (e.g., opening a drain path from a steam generator that is not noticeable to the operator so that the simulation reaches the entry conditions for a loss of heat sink). This method is acceptable as long as the time compression gives the operators time to perform tasks that they would typically perform during the period in which time is compressed. To avoid wasting the operators' time determining the validity of the plant indications, the examiner should inform the crew before the scenario begins that time compression may be used during an event and should debrief the crew after the scenario to minimize the potential for negative training.

Important evaluative benefit is gained in terms of safety significance by having key components or instruments fail after entering the EOPs. This process compels the operators to respond immediately to a safety-related situation by taking alternative actions to mitigate the event. This process also allows for a better evaluation of the operators' overall knowledge of plant procedures and systems because the event must be incorporated into the mitigation strategy for the remainder of the scenario. Examination authors should be careful when selecting failures because some instrument and component failures that are initiated after the major transient require little action and may provide little insight into the operator's competence.

c. Simulator Modeling

The scenario shall not exceed the limits of the facility licensee's configuration management system by altering a simulator model to obtain a desired effect. For example, it is not appropriate to increase the posttrip decay heat input in order to maximize internal core temperatures during a loss-of-cooling event; the simulator model must be allowed to perform as designed. The scenario may simulate events for which a simulator malfunction does not exist by using overrides or remote functions for local operator actions. An example would be failing indicators to simulate an inoperable component.

d. Evaluating Competencies

ES-3.6, "Grading and Documenting Operating Tests," describes the individual competencies that apply to the RO and SRO license levels during initial licensing examinations. ES-6.4 describes competencies that apply to individuals and crews during NRC-conducted requalification examinations.

The scenario set needs to allow for the evaluation of each applicant on all the rating factors within each competency. Scenarios that require little analysis or problem solving and few verifiable actions may not provide an adequate basis to evaluate the required rating factors.

NRC examiners depend on verifiable actions to evaluate competencies and make conclusions about an applicant's ability to operate the plant.

e. Level of Difficulty

The simulator operating test must differentiate between those examinees who have adequately obtained the minimum level of knowledge, skills, and abilities required to be licensed operators and those who have not. Simulator scenarios that are either too easy or too difficult are not effective differentiators.

In general, the level of difficulty of a scenario will increase with an increase in the scenario's quantitative attributes, such as the number of malfunctions or CTs. However, the number of quantitative attributes does not always indicate the scenario's level of difficulty (two scenarios having the same quantitative attributes can vary significantly in the level of difficulty). Unfortunately, there are no definitive minimum or maximum attribute values that can be used to identify inappropriate scenarios that will not differentiate because they are too easy or too difficult.

The two most important determinants of the level of difficulty of a simulator scenario are the amount of analysis and problem solving and the number of operator actions required to mitigate

the events in the scenario. Malfunctions that require analysis or problem solving increase the level of difficulty because they require the examinees to integrate a number of system conditions, evaluate their interrelationships, and take actions that demonstrate an understanding of the underlying concepts. Scenarios that consist of a number of unrelated malfunctions that require little or no operator analysis or response are generally less challenging.

2. Quantitative Attributes

Those attributes discussed in the previous section provide for a qualitative assessment of the complexity of a simulator scenario. However, some characteristics of a scenario can be quantified and generally have a bearing on the complexity and level of difficulty of the scenario.

These characteristics are described below, and ES-3.4 and ES-6.4 enumerate a target range for each attribute that is applicable to the operator licensing initial and requalification examination, respectively. The ranges are not absolute limits; some scenarios may provide an excellent evaluation tool but may not fit within the ranges. A scenario that does not fit into these ranges should be evaluated to ensure that it is appropriate.

a. Normal Evolutions

Normal evolutions include activities such as a feed pump startup, turbine loading, generator synchronization, and reactivity manipulations, that involve evolutions such as a reactor startup or a change in power with boron concentration, control rods, or core flow.

Normal evolutions can be used as a backdrop on which to stage the abnormal or emergency situations. For example, a main feedwater control valve may fail passively (i.e., as is) before the operators conduct a normal power change.

Time-consuming normal evolutions (such as a power escalation from low power) can provide an opportunity to evaluate the SRO's supervisory or resource management skills. Events such as component or instrument failures may be added to challenge the operators while continuing the power escalation.

Short surveillances (e.g., exercising safety rods or paralleling the emergency diesel generator with the grid) may be used to examine the operator's dexterity on the control panels or to involve operators who are not engaged in other activities.

b. Reactivity Manipulations

Reactivity manipulations include activities that produce a clearly observable plant response, such as bringing the reactor critical from a substantially subcritical state, raising power to the point at which reactivity feedback from nuclear heat addition is noticeable and a heatup rate is established, changing reactor power manually with control rods or recirculation flow, or borating or diluting the reactor coolant.

c. Total Events

Total events are the number of instrument (e.g., nuclear, control, or process) and component (e.g., pump, motor, valve, or pipe) failures that constitute a scenario, including those initiated after EOP entry. To count as a separate event, they must involve a significant system response and require operator action to correct. For example, an anticipated transient without scram

(ATWS) is a single event, regardless of how many instructions a facility licensee simulator operator must program to produce it.

Components that are placed out of service at the beginning of a scenario as part of the shift turnover conditions, and of which the crew is made aware, are not considered events nor counted for TS evaluations.

Component or instrument failures that require no verifiable actions do not count toward the recommended total number of events.

d. Events after Emergency Operating Procedure Entry

A scenario must include at least one event that involves failure of instruments or components after the EOPs have been entered. The malfunction(s) for this event should influence the operators' choice of mitigation strategy. For example, failing a high-pressure safety injection pump to start on a large-break loss-of-coolant accident (LOCA) does not affect the mitigation strategy; however, this would have an effect if it were the only available high-pressure safety injection pump on a small-break LOCA. These malfunctions may have been initiated at the beginning of the scenario or before EOP entry.

An instrument or component failure that occurs before the major event/EOP entry can be counted again, as a separate event, after the major event/EOP entry only if the operator actions differ distinctly from the actions before the major event/EOP entry for the same failure, as in the following example:

- Event 1 of a scenario has the "B" train auxiliary feedwater (AFW) pump operating for a surveillance test (counted as a normal evolution). During surveillance testing, the "B" train AFW pump trips on overspeed. The crew secures the AFW system and backs out of the surveillance. The crew is told that the "B" train AFW pump is still available in an emergency but is considered inoperable.

- Later in the scenario, during the major event, steam generator levels are lowering to the point that requires the AFW system. Event 5 of the scenario is an overspeed trip of the "A" train AFW pump, and the "B" train AFW pump that was used earlier during Event 1 is required to be used. Here, the same failure, AFW pump overspeed trip, can be counted again because the crew takes different actions. For Event 1, the crew secures the pump/system and backs out of the surveillance, and the unit supervisor makes a TS entry. For Event 5, the crew manually resets the overspeed mechanism and restores flow to the steam generators from the "B" train AFW pump because the "A" train AFW pump is unavailable.

On the contrary, an instrument or component failure cannot be counted again as a separate event after the major event/EOP entry if the operator actions are similar, as in the following example:

- Event 4 of a scenario had a loss of an electrical bus with a failure of the bus auto transfer, resulting in a loss of normal letdown. As a result, the operators had to place excess letdown in service.

- Event 5 of the same scenario was the major event, with a steam generator tube rupture (SGTR) occurring on the reactor trip. Because of the reactor trip and the previous bus

loss, normal letdown cannot be established, and the operator at the controls (ATC) has to establish excess letdown again. The actions of the ATC operator do not differ from the ATC actions taken before the major event and thus cannot be counted as a separate event for this applicant position.

e. Abnormal Events

Each scenario shall evaluate the operator's ability to implement abnormal operating procedures. This attribute also includes alarm response procedures that involve significant and verifiable actions. An abnormal event may or may not be a precursor to the major transient, although it can add to the credibility of a scenario, such as preceding a total loss of feedwater with a single feed pump trip. However, certain events may cue the operators about subsequent events. Therefore, for a scenario derived from the facility licensee's bank, the examination author should vary or modify the precursor events that lead to the major transient. The scenario should include abnormal events that do not always predict the same major transient (e.g., a steam generator tube leak does not always lead to a subsequent tube rupture).

Some abnormal events for each scenario should require the operators to recognize and apply TS.

Component or instrument failures that occur following EOP entry do not count toward the recommended total number of abnormal events, but they do count as post-EOP entry events.

f. Major Transient

A major transient is one that has a significant effect on plant safety and leads to an automatic (or manual, if initiated by an operator) protective system actuation, such as a reactor trip or an engineered safety system actuation. A single major transient that actuates more than one automatic protective system will count as a single major transient. Examples include a loss of offsite power, LOCA, steamline or feedline break, SGTR, and loss of feedwater. A major transient should normally involve activation of the facility licensee's emergency plan.

g. Emergency Operating Procedures Used

Operators use EOPs to respond to events that challenge plant safety functions. Scenarios should require significant operator action to maintain plant safety and, where a success path exists, prevent further degradation of plant safety.

A scenario that requires the operators to refer to many different EOPs may not be as complex as a scenario that involves only one EOP but requires the use of alternative decision paths and prioritization of actions within the EOP to deal with the situation. Therefore, this attribute reflects the EOPs that have measurable actions that the crew must take. Moreover, the primary scram response procedure that serves as the entry point for the EOPs is not counted. For AP1000 plants, for which the EOP entry procedure is prolonged, the primary reactor trip procedure can be counted if there are significant operator actions and the NRC approves doing so as part of the examination approval process.

For boiling-water reactors (BWRs), the number of EOPs used shall be counted consistent with the four top-level guidelines for emergency procedures:

(1) reactor pressure vessel (RPV) control
(2) primary containment control
(3) secondary containment control
(4) radioactivity release control

The use of multiple control sections of these guidelines does not count separately as EOPs used. For example, use of RPV level control and RPV pressure control should be counted as one EOP used (RPV control).

h. Emergency Operating Procedure Contingency Procedures Used

Contingency procedures are used when there is a significant challenge to a critical safety function or if plant conditions have become severely degraded. Therefore, using them in a scenario provides an opportunity to observe the operators' attempt to execute a mitigation strategy that clearly has substantial safety significance to the plant and public health and safety. For initial licensing examinations, the scenario set must include at least one event that requires the applicants to enter and perform safety-related tasks within an EOP contingency procedure.

Examination authors and reviewers should consider the following list of contingency procedures, which is not all inclusive, as a set of general guidelines that may not fully apply to all scenarios sets:

(1) Westinghouse pressurized-water reactor (PWR)

Emergency contingency action procedures include the following:

- loss of all alternating-current power with or without safety injection required
- loss of emergency coolant recirculation
- LOCA outside containment
- uncontrolled depressurization of all steam generators
- SGTR with loss of reactor coolant—subcooled recovery
- SGTR with loss of reactor coolant—saturated recovery
- SGTR without pressurizer pressure control

Functional recovery procedures entered as a result of red or orange conditions on the critical safety function status trees include the following:

- response to nuclear power generation/ATWS
- response to inadequate core cooling
- response to degraded core cooling
- response to loss of secondary heat sink
- response to imminent pressurized thermal shock conditions
- response to high containment pressure
- response to containment flooding

(2) Westinghouse AP1000

Emergency contingency action procedures include the following:

- LOCA outside of containment

Functional recovery procedures entered as a result of red or orange conditions on the critical safety function status trees include the following:

- response to nuclear power generation/ATWS
- response to inadequate core cooling
- response to degraded core cooling
- response to loss of heat sink
- response to imminent pressurized thermal shock conditions
- response to high containment pressure
- response to containment flooding
- response to high pressurizer level

(3) Combustion Engineering PWR

EOP contingency procedures include the following:

- entry into functional recovery procedures
- transition among functional recovery safety function success paths
- transition from one safety function to another within the functional recovery procedures

(4) Babcock and Wilcox PWR

The Babcock and Wilcox EOP structure does not identify procedures that can be easily recognized as contingency procedures. However, the descriptions above for the Westinghouse contingency procedures provide guidance on the types of events to consider.

(5) General Electric BWR

EOP contingency procedures include strategies for the following:

- alternative level control
- emergency RPV depressurization
- level/power control (ATWS)
- RPV flooding

Note: Because of the structure of the General Electric BWR EOPs, these may not be stand-alone procedures.

i. Simulator Run Time

A scenario should be designed to run approximately 60 to 90 minutes. However, this does not preclude scenarios taking more or less time. The nominal run time of 60 minutes may not provide sufficient time to conduct a scenario that progresses through several EOPs or requires the performance of fairly involved procedural steps. Very meaningful and involved scenarios can be conducted in less time, but care should be taken not to place an undue burden on the operators by initiating malfunctions at too rapid a pace. This parameter is one of many that

should be considered in assessing the overall quality of a scenario. As long as the scenario meets the other criteria stated here, the scenario run time is a secondary concern.

j. Emergency Operating Procedure Run Time

The time during which the operators are involved in EOPs has a strong relationship to the complexity of the scenario because most CTs occur in the EOPs and the actions that the operators take have the most potential to affect public health and safety. Therefore, a significant percentage of the time a scenario is progressing should be spent in the EOPs. Usually, more time is required when contingency procedures are in effect because it generally takes some time for the plant to degrade such that critical safety functions are jeopardized. However, operators should be evaluated in EOP activities beyond the point at which an event is diagnosed and initial mitigation actions are taken. Many of the actions taken to stabilize the plant and recover from a transient are safety significant. Therefore, scenarios should be allowed to progress so that these operations can be observed.

However, scenarios should not be solely EOP oriented. Valuable assessments can be made within abnormal operating procedures with the plant at power because of the level of safety significance associated with transients in these conditions.

k. Critical Tasks

As defined in ES-8, "Glossary," a "critical task" is one used by the NRC during simulator scenarios to evaluate whether an individual or crew can complete actions that are significant to the safety of the plant and the public. CTs must be performed correctly, either by operators individually or together with other crew members, to ensure the safety of the plant and the public.

CTs range from simple safety-significant tasks (e.g., starting the standby liquid control system during an ATWS condition or tripping a reactor coolant pump during a small-break LOCA) to tasks that require a higher level of skill and involve several crew members (e.g., executing a rapid cooldown within predefined limits using steam generator power-operated relief valves or using low-pressure injection systems to maintain the vessel level while cooling the suppression pool).

CTs are used during operator licensing initial and requalification examination scenarios in the following manner:

- Initial licensing examination scenarios use CTs for the individual operator competency evaluations because they help the examiner focus on tasks that significantly impact the safety of the plant or the public.

- Requalification examination scenarios use CTs to evaluate crew performance on tasks that are significant to the safety of the plant or the public. CTs are objective measures for determining whether the performance of an individual or crew is satisfactory or unsatisfactory. ES-6.4 includes specific instructions for CTs in NRC-developed requalification examinations.

When determining the number of CTs designed into a scenario and reviewing the number of CTs for a scenario set, examination authors and reviewers should consider the difficulty level and need for an equitable administration of the operating test.

Preidentified CTs are part of scenario design and are included on the scenario outline forms (Form 3.3-1). Because not all operator actions can be predicted, either an individual or the crew may "create" a new CT. Additional events may be determined to be CTs after the scenario is administered. These are considered "postscenario CTs" and are identified by the NRC examination team after scenario administration. Both preidentified *and* postscenario CTs are identified and designated using the same criteria, which Section C explains in detail.

C. Critical Task Methodology

The following steps explain how to select or develop CTs for dynamic simulator scenarios:

1. How To Identify Scenario-Specific Critical Tasks

CTs must meet one or more of the following criteria:

- They *directly lead* to the restoration of one or more safety functions
- They are EOP-directed actions that are *essential* to an event's overall mitigative strategy
- They are tasks with one or more actions that would prevent a challenge to plant safety such as preventing the following (examples are not all-inclusive):
  - conditions that warrant the initiation of emergency depressurization (BWR)
  - conditions that result in orange or red path critical safety functions (Westinghouse and AP1000)
  - conditions that warrant transitioning to functional recovery guidelines (Combustion Engineering)
  - conditions that adversely impact the implementation of those EOP actions essential to the mitigative strategy for the event (Babcock and Wilcox)
- Applicant/operator or crew actions or inactions that create a challenge to plant safety are considered postscenario CTs irrespective of subsequent mitigative actions. For example, a postscenario CT exists when an applicant *unnecessarily* creates a situation that would result in emergency action level entry or escalation on the loss or potential loss of *more than one fission product barrier* in accordance with the facility's emergency action levels.

Taking manual control of an automatic safety system qualifies as a CT only if the automatic initiation feature failed to work. It is then safety significant for the crew to take manual actions, as plant conditions clearly indicate that an automatic action should have occurred and did not. Moreover, during scenario development and validation, CTs can be identified based on those actions that, if performed incorrectly or omitted, degrade the mitigation strategy needed in the scenario. If the manual system has also failed and no action will be effective, this should not be identified as a CT. However, if an applicant/operator or the crew significantly deviates from, or fails to follow, procedures that affect the maintenance of basic safety functions, those actions may form the basis of a CT identified in the postscenario review.

If a facility maintains a CT list derived from guidance provided by its vendor owner's group, the examination author should reference this list as an aid when designating scenario CTs. However, the NRC has not reviewed these CT lists, so they may contain tasks that do not meet the CT criteria for the purpose of the NRC operating test. Furthermore, scenario CTs depend on both specific equipment configurations and malfunctions, while owner's group CTs are based on specific accident sequences that may not match those of a given scenario.

2. Elements of a Critical Task

A CT must possess each of the following elements:

- Initiating Cue: An expected signal or notice (i.e., indication, alarm, communication, or procedure step) designates when a CT should be performed. The cue need not indicate that the action is a CT.

- Performance Feedback: During the time span of a CT, performance feedback must be available to at least one member of the crew. This feedback provides the crew members with information about the effect of the crew's actions or inaction related to or because of the CT. The crew must be able to determine that its action had an impact or that its inaction is causing plant conditions to degrade.

- Success Path: It must be possible to accomplish the CT during the scenario. Carefully consider the specific equipment configurations, malfunctions, and accident sequences in the associated scenario when designating CTs.

- Measurable Performance Standard: The measurable performance standard for a CT includes the expected actions and boundary conditions that clearly identify at what point a CT must be accomplished; such conditions must be objective. The expected actions must be observable and taken by at least one member of the crew. Document the expected actions on the operator action form (Form 3.3-2). Document the boundary conditions for each CT on the scenario outline form (Form 3.3-1) and operator action form.

  Use objective performance standards that include clear boundary conditions for when a CT must be accomplished. Boundary conditions ensure that examiners have agreed on limits for what is acceptable for task completion and what constitutes task failure. When bounding CTs, in addition to asking what constitutes how the task is met, it can be helpful to ask how an applicant or operator could fail the task. Use objective performance standards that include clear boundary conditions for when a CT must be accomplisheFor example, "if pressure falls below 1,400 pounds per square inch (psi), start pump XYZ," is not objective because there is not a lower bound for system pressure after which the operator performance would be considered deficient. The operator performing this task could start the pump when pressure reaches 0 psi and still not violate the performance standard, even though the operator is expected to start the pump sooner.

  The following guidance applies to the establishment of objective boundary conditions for performance standards:

  - preferred boundary conditions:

- thresholds at which safety functions are severely challenged or lost
- thresholds that result in changes to the mitigative strategy for an event, such as transitions to contingency procedures or functional recovery procedures
- time-critical operator actions that are applicable to the facility and necessary to mitigate the event (ensuring that the time-critical operator action assumptions and consequences still apply in the specific scenario)
- TS safety limits

– alternative boundary conditions:

- exiting or transitioning from the procedure that first directs CT accomplishment
- exceeding a parameter value (e.g., limits from the facility's final safety analysis report or design documentation), as agreed upon by the NRC chief examiner and the facility licensee
- the expiration of a reasonable amount of time, as agreed upon by the NRC chief examiner and the facility licensee
- for emergent CTs (i.e., postscenario CTs), the lead examiner present during the scenario determines the scenario endpoint

3. What to Avoid When Designating Critical Tasks

Emergency event classification during a simulator scenario does not meet all elements of the CT methodology. Emergency event classifications have a an initiating cue, a success path and a measurable performance standard, but they do not provide the applicant with performance feedback for the correct or incorrect classification.

The following are examples of performance standards that cannot be measured objectively during a simulator scenario and, therefore, are not suitable for use as CT measurable performance standards:

- understanding (such as an applicant must understand the significance of a certain plant response)
- observing that an expected response has occurred
- observing the performance of a system

D. Forms

Form 3.3-1 Scenario Outline
Form 3.3-2 Required Operator Actions

Form 3.3-1 Scenario Outline

Facility:	_____	Scenario #:	_____
Scenario Source:	_____	Op. Test #:	_____
Examiners:	_____	Applicants/	_____
	_____	Operators:	_____
	_____		_____

Initial Conditions:

Turnover:

Critical Tasks:

Event No.	Malf. No.	Event Type*	Event Description

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor, (TS)Tech Spec, (MC)Manual Control

Form 3.3-2 Required Operator Actions

Op. Test No.: _____ Scenario No.: _____ Event No.: _____ Page ___ of ___

Event Description:

Symptoms/Cues:
_____

Time	Position	Applicant's Actions or Behavior

3.4 DEVELOPING SCENARIOS

This examination standard (ES) contains specific criteria and instructions for selecting and developing simulator scenarios for the simulator operating test portion of the operator licensing initial examination. This section is designed to be used in conjunction with ES-3.3, "General Testing Guidelines for Dynamic Simulator Scenarios." Adherence to the concepts and instructions in these two sections ensures that simulator scenarios are of appropriate scope, depth, and complexity and maintains the consistency and validity of this portion of the operating test.

Examination authors should develop new scenarios in accordance with these instructions and modify existing scenarios to conform to these instructions. If a facility licensee encounters difficulty meeting a requirement in these instructions (e.g., because of large class sizes requiring the generation of more scenarios than normal), it should coordinate with the U.S. Nuclear Regulatory Commission (NRC) chief examiner to meet the intent of these instructions to the extent possible.

A. General Instructions

The following are general instructions for developing simulator scenarios for operator licensing initial examinations.

- The scenario set consists of new scenarios and scenarios from existing facility licensee or NRC scenario banks that are then modified.

- To maintain test integrity, every scenario shall be new or significantly modified to ensure that the applicant has not had the opportunity to rehearse or practice the scenario and to ensure that the applicant does not recognize the scenario based on the initial conditions (ICs), the sequence and repetition of events, or other cues. A scenario is significantly modified if it meets all of the following criteria:

  – At least two events have not been used on the previous two operator licensing initial examinations at that facility. However, if the associated operator actions in response to an event are different, this event is not considered to be the same event. Events found in spare scenarios will count as previously used events if they were made publicly available in the NRC's Agencywide Documents Access and Management System.

  – Events that appear in simulator scenarios on the applicant audit examination can be repeated only if the operator actions in response to the event are significantly different from those required during the audit examination.

  – Because there are a limited number of methods for adding reactivity, reactivity manipulation events can be repeated from past examinations.

  – If the scenario is extracted from the facility licensee's bank, it must be altered to the degree necessary to prevent the applicants from immediately recognizing the scenarios based on the ICs, the sequence and repetition of events used, or other cues.

- The examination author should vary the ICs (including power levels), normal operations, malfunctions, and major transients among the scenario set and periodically include startup and low-power situations.

- If any major event is repeated from either of the previous two NRC operator licensing initial examination operating tests, the examination author should change the major event, the ICs, or subsequent malfunctions (or a combination thereof) to alter the course of action (within the emergency procedures) for the given scenario(s).

  – The NRC expects that all major events would be broadly sampled over the course of several operating tests and that no major event will be omitted routinely without justification.

- It may be possible to significantly reduce the number of simulator scenarios required to examine a large group of applicants by administering the same scenario on the same day to multiple applicant crews. Provisions must be made to sequester the crews and to prevent them from discussing the simulator scenario until all crews have completed that scenario.

- SRO-upgrade (SRO-U) applicants are evaluated on manipulating the controls only if they are put in the at the controls (ATC) or balance of plant (BOP) position to prevent the need for a surrogate to complete the crew.

- Ensure that the operator actions for the scenario events/evolutions differ from operator tasks that appear on the job performance measure portion of the operating test or on the written examination.

- The examination author should refer to Form 3.6-5, "Reactor Operator Competency Grading Worksheet for the Simulator Operating Test," and Form 3.6-6, "Senior Reactor Operator Competency Grading Worksheet for the Simulator Operating Test," in ES-3.6, "Grading and Documenting Operating Tests," to ensure that each scenario allows the examiner to evaluate the applicant's performance on each competency and rating factor. The scenario could give each applicant multiple opportunities to demonstrate competence in each rating factor.

B. <u>Determining the Number of Scenarios and the Use of Surrogate Operators</u>

Based on the anticipated crew compositions, plan the crews and determine the number of scenarios to satisfy the following:

- Each senior reactor operator (SRO) applicant (upgrade and instant) has at least one scenario in the unit supervisory position (i.e., the shift supervisor, control room supervisor, or unit supervisor position).

- Each reactor operator (RO) applicant has at least one scenario in the BOP position and one scenario in the lead reactor operator position (i.e., the ATC position).

- Each SRO-instant (SRO-I) applicant has at least one scenario in either the BOP or the ATC position.

- Include one “spare” or additional scenario for use in case one of the planned scenarios does not work as intended.

For example, a crew consisting of two ROs and one SRO-I will normally require three scenarios to evaluate each applicant’s performance in the required positions listed above; a surrogate SRO may have to fill the supervisory role while the SRO-I applicant is in the BOP or ATC position.

For example, a crew consisting of two SRO-Is and one RO will normally require two scenarios to evaluate each applicant’s performance in the required positions listed above.

Use the following instructions when planning the use of surrogate operators:

- Use a surrogate operator only when necessary to complete an applicant crew for the simulator test.

- Do not replace applicants with surrogates solely because the applicants have performed the minimum number of events or scenarios. If an applicant would be exposed to only *one* additional scenario above the minimum required, do not use a surrogate operator in place of an applicant.

- Do not require or permit an applicant to participate in *more* than one scenario above the minimum required. In such a case, use a surrogate operator.

- If the facility licensee normally operates with, and is required by its technical specifications (TS) to have, more than two ROs in the control room, the NRC chief examiner can allow the use of additional surrogates to fill out the crews. In such cases, NRC examiners must ensure that the presence of additional operators does not limit the examiners’ ability to evaluate each applicant on the required number of events.

The NRC chief examiner must consult the NRC Office of Nuclear Reactor Regulation operator licensing program office before examination administration if he or she desires to use surrogate operators contrary to the instructions above.

C. Specific Instructions for Developing Scenario Outlines

Form 3.3-1, “Scenario Outline,” is an example of the information to include on the outline for each scenario. For the scenario source, indicate whether the scenario is new or significantly modified. For modified scenarios, provide information about the original scenario (e.g., the NRC examination year and name of the facility). To minimize the amount of rework that might be required as a result of changes in the planned scenario events, complete Form 3.3-2, “Required Operator Actions,” after the NRC chief examiner has reviewed and commented on the proposed simulator operating test outlines.

The following are specific instructions for developing simulator scenario outlines for operator licensing initial examinations. Use these steps in conjunction with Steps 1–5 of ES-3.3, Section A, “Integrated Scenario Development.”

1. Criteria for Specific Events and Evolutions for Operator Licensing Initial Examination Scenarios and Scenario Sets

Select and sequence events and evolutions for each scenario using the testing guidelines in ES-3.3, along with the targets in Table 3.4-1, for quantitative attributes per scenario and the required number of events and evolutions for each applicant.

Table 3.4-1 Target Quantitative Attributes per Scenario/Scenario Set

Quantitative Attribute	Target per Scenario
Events after EOP entry	1–2
Abnormal events	2–4
Major transients	1–2
EOPs entered/requiring substantive actions	1–2
Entry into a contingency EOP with substantive actions	1 per **scenario set**
Preidentified CTs	2 or more

The quantitative attribute target ranges specified in Table 3.4-1 are not absolute limitations; some scenarios may be excellent evaluation tools but may not fit within the ranges. The NRC chief examiner can evaluate a scenario that does not fit into these ranges to ensure that the level of difficulty is appropriate. If this allowance is used, the NRC chief examiner must document his or her qualitative evaluation on Form 2.3-3, "Operating Test Review Worksheets."

The only exception to the above allowance is that each scenario must have at least two preidentified critical tasks (CTs). To assist in promoting examination consistency among applicants, NRC chief examiners and examination authors should carefully assign scenarios to applicant teams so that, whenever possible, the applicants are evaluated on a similar number of preidentified CTs.

2. License Level Criteria

Additionally, each applicant is required to respond to a specified minimum number, based on applicant license level, of the types of evolutions, failures, TS evaluations, and transients in accordance with Table 3.4-2 below and the instructions for its use . This table provides the minimum number of events/evolutions by applicant, based on the license level for an applicant's entire scenario portion of the operating test; it is not the number required per scenario.

Use Form 3.4-1, "Events and Evolutions Checklist," to track how each applicant will be tested on the minimum number of planned events and evolutions.

Table 3.4-2 Events and Evolutions for License Level

Event/Evolution Type	Applicant License Level		
	RO	SRO-I	SRO-U
Reactivity Manipulation	1	1	0
Normal Evolution	1	1	1
Instrument/Component (I/C) Failure	4	4	2
Major Transient	2	2	1
Manual Control of Automatic Function	1	1	0
TS Evaluation	0	2	2

Use the following instructions for meeting the required number of events and evolutions in Table 3.4-2:

(1) For SRO-U applicants, the requirement for a minimum number of events involving manual control of an automatic function does not apply because SRO-U applicants do not need to be evaluated in the ATC/BOP position.

(2) For SRO-I applicants, at least two of the four I/C failure events and one of the two major transient events must occur while the applicants are in the ATC/BOP position. One reactivity manipulation event and one manual control of an automatic function event must occur while the SRO-I is in the ATC/BOP position.

(3) For the minimum required number of reactivity manipulation, normal evolution, manual control of automatic function, and I/C failure events, only count events/evolutions that require the applicant to perform verifiable actions that provide insight into the applicant's competence. This means that the applicant must *perform* some action, not just make a telephone call to an operator to take some action in the field. An applicant on the telephone directing an operator to take some action in the field while the applicant is observing control room indications is *not* performing a verifiable action; instead, the applicant is directing. Although such an action may provide insight as to whether the applicant understands the system, it does not give insight useful to the examiner in determining whether the applicant can operate the equipment controls and control the system response.

To count the performance of a calculation as a verifiable action, the performance should relate directly to the competency being examined; the activity should not be credited just because a calculation was performed. In these cases, it is acceptable only to give credit for performing a verifiable action if the applicant diagnoses a malfunction or event and then performs a calculation (i.e., shutdown-margin or leak-rate calculation) that can be graded by the examiner against acceptable grading criteria. Additionally, an applicant may calculate the leak rate for the primary coolant system to determine entry into TS or to determine a possible location for the leak (primary or secondary), in which case credit could be given. However, the applicant should receive credit only for performing the calculation if that calculation is used for some amount of diagnosis of the event by the applicant or for decisionmaking. Therefore, unless the applicant manipulates some piece of equipment or equipment controls or performs a calculation that includes

diagnosis of the event/malfunction (including entry into TS), the applicant should *not* receive credit for the event/malfunction.

(4) Manual control of an automatic function can be for either a safety or a nonsafety-related system or component that has both an automatic and a manual control feature; the control feature is not limited to controllers. For example, if the event involves the failure of the automatic-start feature of a pump, the applicant has to manually start that pump. The event must involve verifiable actions by the applicant. An applicant checking that that a digital-controller has auctioneered out a bad input is not considered a verifiable action.

(5) Each TS evaluation must be tied to a separate event, and each TS evaluation must involve entry into TS action statements. The offsite dose calculation manual cannot be used to meet the minimum TS evaluation requirement.

(6) TS events can be stand-alone events for the SRO applicant and are not required to also count as an I/C failure event requiring verifiable action by the control board operators.

(7) With the exception of manual control of automatic function events and the SRO TS evaluations, count each evolution, failure, or transient only once per applicant. For example, a power change can be counted as a normal evolution or as a reactivity manipulation, and similarly, a component failure that immediately results in a major transient event counts as one or the other, but not both.

(8) Any normal evolution, component failure, or abnormal event (other than a reactor trip or other automatic power reduction) that requires the applicant to perform a controlled power or reactivity change will qualify as a reactivity manipulation event. This includes events such as an emergency boration, a dropped rod recovery, a significant rod bank realignment, or a manual reactor power reduction in response to a secondary system upset. Such events may produce a timelier operator and plant response than a normal power change.

Note: Count an event as either an I/C failure or a reactivity manipulation event for a single applicant position (such as the ATC) but not both. Applicants must perform verifiable actions to receive credit for the I/C failure event. For example, if a component fails and a power reduction is the only verifiable action, count this as either an I/C failure or as a reactivity manipulation event. If both the ATC and the BOP perform the power reduction, the event may be counted as an I/C failure or reactivity manipulation event for either position (i.e., the ATC gets the reactivity manipulation and the BOP gets the I/C failure—the ATC may NOT receive credit for both a reactivity manipulation and an I/C failure).

(9) Replace reactivity manipulation and normal evolution events with an additional I/C failure event on a one-for-one basis, if desired.

(10) Develop scenarios so that the required TS evaluation and I/C failure events are completed in events that occur before the major transient. Take care when using TS evaluation and I/C failure events after the major transient, since they may require little applicant action and therefore provide little insight into applicant performance. For some plant types, it may be necessary to have I/C failure events, used to meet the minimum

number of I/C failures, after the major transient. This is acceptable if the applicants can be evaluated properly.

(11) Use Form 3.4-1 to record the planned events and evolutions, giving the event number (i.e., a "2" for Event "2") for each applicant.

3. Review Scenario Outlines

If the facility licensee prepared the scenario outlines, a facility supervisor or manager must review the proposed outlines in accordance with ES-2.3, "Reviewing and Approving Operator Licensing Initial Examinations," before submitting the outlines to the NRC for approval.

4. Forward Outlines to the NRC Chief Examiner for Approval

When the proposed simulator operating test outlines (Form 3.3-1) are complete, forward them, along with Form 3.4-1, to the NRC chief examiner so that they are received by the date agreed upon with the NRC regional office at the time the examination arrangements were confirmed; outlines are normally due approximately 150 days before the scheduled examination date. Refer to ES-2.1, "Preparing for Operator Licensing Initial Examinations," for additional instructions on the review and submittal of the examination outlines.

5. Option for Presubmittal Sample to the NRC Chief Examiner

Facility licensees have the option to submit one simulator scenario to the NRC chief examiner for preliminary review and comment.

D. Specific Instructions for Developing Scenario Guides and Finalizing Scenarios

After the NRC approves the operating test outlines (ES-2.3), use the following instructions to prepare the final simulator test materials.

1. Revise Form 3.3-1 as Requested by the NRC Chief Examiner

2. Complete a Detailed Operator Action Form (Form 3.3-2 or Equivalent) for Each Event in Each Scenario

Document all required operator actions (e.g., opening, closing, and throttling valves; starting and stopping equipment; raising and lowering level, flow, and pressure; making decisions and giving directions; acknowledging or verifying key alarms and automatic actions), and identify CTs.

3. Update Form 3.4-1 as Necessary

4. Review Scenarios

Using the instructions in ES-2.3, review each scenario and the complete simulator operating test. Perform this review in conjunction with evaluating the associated job performance measures to minimize duplication.

5. Validate Scenarios

Before administering the simulator operating test, validate each scenario on the simulator to ensure that it will run as intended. Typically, the facility licensee performs this validation during examination development, and the examination team validates it again during the preparatory site visit.

In some cases, such as for retake examinations and other exigent circumstances (i.e., examination security issue), the scenarios can be validated while the applicants are taking another portion of the examination (i.e., the written examination).

After validation, ensure that any necessary revisions are made to the scenario outline form (Form 3.3-1) and operator actions form (Form 3.3-2).

6. Finalize Scenarios

After incorporating the necessary revisions, review and approve the simulator operating test using the instructions in ES-2.3.

E. Forms

Form 3.4-1 Events and Evolutions Checklist

Form 3.4-1 Events and Evolutions Checklist

Facility: Date of Exam: Operating Test No.:

APPLICANT	EVENT TYPE	Scenarios 1 POSITION SRO	1 ATC	1 BOP	2 POSITION SRO	2 ATC	2 BOP	3 POSITION SRO	3 ATC	3 BOP	4 POSITION SRO	4 ATC	4 BOP	TOTAL	MINIMUM* RO	I	U
RO ☐	RX														1	1	0
SRO-I	NOR														1	1	1
☐	I/C														4	4	2
SRO-U	MAJ														2	2	1
☐	Man. Ctrl														1	1	0
	TS														0	2	2
RO ☐	RX														1	1	0
SRO-I	NOR														1	1	1
☐	I/C														4	4	2
SRO-U	MAJ														2	2	1
☐	Man. Ctrl														1	1	0
	TS														0	2	2
RO ☐	RX														1	1	0
SRO-I	NOR														1	1	1
☐	I/C														4	4	2
SRO-U	MAJ														2	2	1
☐	Man. Ctrl														1	1	0
	TS														0	2	2
RO ☐	RX														1	1	0
SRO-I	NOR														1	1	1
☐	I/C														4	4	2
SRO-U	MAJ														2	2	1
☐	Man. Ctrl														1	1	0
	TS														0	2	2
RO ☐	RX														1	1	0
SRO-I	NOR														1	1	1
☐	I/C														4	4	2
SRO-U	MAJ														2	2	1
☐	Man. Ctrl														1	1	0
	TS														0	2	2

Form 3.4-1 Instructions for the Events and Evolutions Checklist

1. Mark the applicant license level for each simulator operating test number.

2. For the set of scenario columns, fill in the associated event number from Form 3.3-1, "Scenario Outline," to show the specific event types being used for the applicant while in the assigned crew position for that scenario.

* Minimums are subject to the instructions in Section C.2, "License Level Criteria."

KEY: RX = Reactivity Manipulation; NOR = Normal Evolution; I/C = Instrument/Component Failure; MAJ = Major Transient; Man. Ctrl = Manual Control of Automatic Function; TS = Technical Specification Evaluation; RO = Reactor Operator; SRO-I or I = Instant Senior Reactor Operator; SRO-U or U = Upgrade Senior Reactor Operator; SRO = Senior Reactor Operator; ATC = At the Controls; and BOP = Balance of Plan

3.5 ADMINISTERING OPERATING TESTS

This examination standard (ES) contains instructions for U.S. Nuclear Regulatory Commission (NRC) examiners on how to administer operating tests to initial license applicants at power reactor facilities. It includes instructions and guidelines for administering both the walkthrough and simulator portions of the operating test.

Regardless of whether the facility licensee or the NRC prepared the operating test, the NRC administers every operating test for initial licensing in accordance with the instructions in this section.

The NRC regional office and the facility licensee coordinate the schedule for administering the operating test, with a goal of maximizing efficiency while maintaining examination security. The facility licensee provides administrative and logistics support (e.g., personnel to operate the simulation facility, surrogate operators, monitors, copies of the approved operating test materials as arranged with the NRC chief examiner) to facilitate the administration of the operating tests.

All participants in the testing process must also be mindful of their responsibilities for examination security and integrity pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 55.49, "Integrity of examinations and tests."

A. General Instructions for the NRC Chief Examiner

(1) Operating tests will normally be administered on regular workdays. If weekend, holiday, or shift work is necessary to administer the operating tests, coordinate arrangements with the assigned examiners and the facility licensee and obtain permission from the NRC regional Branch Chief.

(2) To maintain uniform conditions for licensing applicants as operators, administer the operating test and written examination within 30 days of each other. This may not be possible under certain circumstances, such as a weather or health emergency. Obtain concurrence from the Office of Nuclear Reactor Regulation (NRR) operator licensing program office if more than 30 days will elapse between the completion of one and the start of the other.

(3) Assign a single NRC examiner (the examiner of record) to individually evaluate an applicant during the scenario(s) that is part of the applicant's operating test. The following exceptions to this assignment are permitted:

(a) For a three-person crew consisting only of senior reactor operator—upgrade (SRO-U) applicants (who do not need to be evaluated on the control boards), the region may assign two examiners to evaluate the crew. Note: SRO-U applicants will still be held accountable for any performance deficiencies, and they will be graded on their ability to "operate the controls."

(b) For the purpose of examination efficiency or minimizing surrogate use, an examiner other than the examiner of record can administer a scenario to an applicant, provided that the examiner of record is present during the scenario (e.g., examining one of the other applicants) and the scenario is in addition to the

minimum required for that applicant. This exception requires approval from the NRR operator licensing program office.

(4) Arrange for any NRC examiners who are not familiar with the facility to tour the facility before they administer any operating tests. Such tours shall not be conducted or observed by any of the applicants. In addition, the tours should, at a minimum, cover areas of the plant that will be used during the examination process, such as the control room, the simulation facility, and planned walkthrough locations.

(5) Ensure that any job performance measures (JPMs) that the facility licensee or the NRC did not previously validate during the preparatory site visit are validated before administering them.

(6) Confirm with the facility licensee that the simulator instructor's station, programmers' tools, and external interconnections do not compromise operating test security while conducting examinations. The primary objective is to ensure that the examination material cannot be read or recorded at other unsecured consoles and is either physically secured or electronically protected when not in use by individuals listed on the security agreement. Refer to ES-1.3, "Examination Security," for simulator security considerations.

(7) In the interest of examination security, limiting the number of observers, and maintaining uniform conditions for licensing applicants as operators, do not permit the facility licensee to use video and audio recording during the administration of the operating test.

(8) Before beginning the operating test, brief the applicant(s) using Parts A, C, D, and E of ES-1.2, "Guidelines for Taking NRC Examinations." To save time, an examiner may brief the applicants as a group. This briefing may be conducted during the NRC preparatory site visit.

(9) Do not repeat the same simulator scenarios and JPMs on subsequent days. One approach for efficiency is to divide the operating test into segments and administer the same operating test segment to all relevant applicants on the same day. Ensure that examination security is maintained.

(10) Verify that each applicant, as listed on Form 2.2-1, "List of Applicants," performed the required number of JPMs and simulator scenario events (and types of events) before leaving the facility licensee site. Use the spare scenario when necessary to ensure that each applicant performs the required simulator scenario events and evolutions. It is acceptable to run an abbreviated version of the spare scenario if necessary to ensure that all applicants are evaluated on the required number of events. For example, run the spare scenario up to the major event to ensure that applicants are evaluated on the minimum number of required instrument and component failure or technical specification (TS) evaluation events.

(11) The NRC chief examiner will discuss with the facility licensee how long it plans to retain the operating test materials to support the NRC licensing action on all the applications and adjudicatory actions on any hearing demands.

(12) Conduct an exit briefing with the facility licensee after the operating tests are complete. Address any generic weaknesses noted during the operating tests, as well as any other

significant issues (e.g., problems with the reference materials, the simulation facility, or the plant) that the examination report might address. The individual operating test results are predecisional until approved by NRC management in accordance with ES-5.1, "Issuing Operator Licenses and Postexamination Activities." Do not share results with the facility licensee during the exit briefing.

B. General Instructions for the NRC Examination Team

(1) Meet as a group with the NRC chief examiner to review the examination materials after the responsible supervisor has approved them for administration. The meeting should focus on those test items that might require extensive cuing by the examiner and those that are unique to the facility and require a response different than what the examiner might expect based on experience.

(2) Administer the operating test in accordance with the planned and approved outlines and simulator scenario guides (operator actions). Substitute or replace planned material only if an item is determined to be invalid or impossible to perform or simulate because of unanticipated access restrictions, equipment failures, or examination security concerns. Operating test changes require NRC chief examiner and regional Branch Chief approval. If the regional Branch Chief is not available, the NRC chief examiner can authorize a change and later inform the regional Branch Chief that a change occurred.

(3) During administration, take detailed notes to facilitate a thorough documentation of an applicant's performance deficiencies. The examiner must be able to cross-reference each comment and performance deficiency to a specific JPM, simulator event, or followup question.

(4) Take reasonable measures to ensure that any notes documenting the applicant's performance on the operating test are not accessible to the facility licensee staff. These notes are predecisional; do not leave examination notes unattended or unsecured in the simulator or examination room to which the facility licensee staff has access.

(5) Retain the examination material generated during administration of the operating test to support the NRC licensing action on all the applications and adjudicatory actions on any hearing demands. When those actions are complete, consult Management Directive 3.53, "NRC Records and Document Management Program," to determine the record status and disposition the operating test examination material accordingly.

C. Limits on Operating Test Observers

Limit the number of people present during an operating test to maintain the integrity of the test and to minimize distractions:

(1) Except for the simulation facility operators, no other member of the facility licensee's staff is allowed to observe an operating test without the NRC chief examiner's permission. Facility management and other personnel deemed necessary by the facility licensee will generally be allowed access to the examination (under security agreements, as appropriate), provided that the simulation facility can accommodate them and there is no impact on the applicants.

(2) Under no circumstances will another applicant be allowed to observe an operating test. Operating tests are not to be used as training for future applicants.

(3) Other examiners may observe an operating test as part of their training or to audit the performance of the examiner(s) administering the operating test.

(4) The NRC chief examiner may permit other NRC employees, such as resident inspectors, regional personnel, researchers, or NRC supervisors, to observe an operating test.

(5) Non-NRC employees (e.g., representatives from the Institute of Nuclear Power Operations) may observe an operating test with prior approval from the NRR operator licensing program office. The NRC chief examiner will control the observer's activities in accordance with guidance provided by NRR.

(6) When possible, observers should monitor the examination from the simulator control booth or a separate room using a secured video feed (while maintaining examination security).

(7) An applicant may request administration of his or her operating test without extraneous observers.

D. Instructions for the Use of Surrogate Operators during Administration

Surrogate operators are used when necessary to complete an applicant crew for the simulator test in accordance with the instructions in Section B of ES-3.4, "Developing Scenarios."

Before administering a scenario with a surrogate operator, the NRC chief examiner ensures that the surrogate operator(s) is briefed on the content of the scenario(s) and his or her expected actions in response to every event. The surrogate operator's activities should not be restricted to such an extent that the applicants being evaluated are required to assume responsibilities beyond the scope of their respective positions.

Surrogate operators should be licensed operators or facility licensee staff who are certified to have the knowledge and abilities required to assume the full responsibilities of the roles that they take in the operating test. Examiners are not assigned to evaluate surrogate operators.

Surrogate operators *shall not* take a proactive role in assisting or coaching the applicants, because such interventions would hinder the examiners' ability to evaluate the applicants' competence. The NRC will run additional scenarios, if necessary, to ensure that every applicant can demonstrate his or her competence so that the NRC can make a licensing decision.

E. Instructions for the Use of Followup Questions

Examiners use followup questions during operating test administration to assist in their assessment of the applicant's knowledge, skills, and abilities and to clarify their observations. Followup questions must be performance based, meaning that they must be related to observed performance during the operating test.

Examiners should use followup questions to do the following:

(1) Clarify or confirm an applicant's understanding of the administrative topic or system as it relates to a JPM task when the applicant fails to accomplish the task standard for the JPM or demonstrates a lack of understanding about the administrative topic or system, equipment, and procedures, such as having difficulty locating information, control board indications, or controls.

(2) Clarify actions taken or not taken during simulator scenarios.

(3) Clarify statements (written or verbal) made by an applicant during simulator scenarios and JPMs.

(4) Determine whether a performance deficiency exists when an applicant takes an unexpected action, does not take an expected action, or says something during the simulator scenario that reveals a potential lack of understanding.

(5) Determine the appropriate competency or the primary cause of a performance deficiency in support of rating factor selection.

(6) Evaluate the senior reactor operator (SRO) applicant (while in the SRO position) on applicable TS actions in accordance with the simulator scenario guide. Do this by first asking the applicant to explain the TS implications for each event of the scenario without providing any cues as to which events should be considered. Then, if a performance deficiency is identified, use more detailed questions to determine which rating factor to cite during grading activities.

Examiners administer followup questions during a brief question-and-answer period after the completion of each simulator scenario or JPM and before starting the next JPM, or the applicant is released to a facility licensee staff member for sequestration. Followup questions can be asked, with examiner discretion, during a JPM.

Examiners must document the question asked and the applicant's response in their examiner notes for each followup question for use during grading activities.

Performance-based followup questions during any part of the operating test may include a combination of open- and closed-reference items. Open-reference items require applicants to apply their knowledge of the plant to postulated normal, abnormal, and emergency situations. Closed-reference items may be used to evaluate the immediate actions of emergency and other procedures, certain automatic actions, operating characteristics, interlocks, setpoints, and routine administrative activities, as appropriate to the facility.

Applicants may use reference information such as diagrams and procedures for answering open-reference followup questions.

The examiner may encourage the applicants to sketch diagrams, flowpaths, or other illustrations to aid in answering any followup questions that might be necessary. The examiner retains this examination material because it provides additional documentation to support a pass or fail decision. After completion of the licensing action and adjudicatory actions on any hearing demands, the examiner should consult Management Directive 3.53 to determine the record status and disposition the examination material accordingly.

F. Performance of the Simulation Facility during the Operating Test

If the simulation facility becomes inoperative or presents hardware, software, or modeling issues that cannot be resolved promptly, the NRC chief examiner should discuss the situation with the facility licensee and the responsible regional supervisor so that management can decide whether to conduct the operating test. The simulator examinations may need to be rescheduled for a later date.

The simulator should be considered inoperative under any of the following conditions:

- The simulator exhibits a mass/energy imbalance, erratic logic, or inexplicable panel indications during evolution execution.
- The simulator exhibits unplanned and unexplained events or malfunctions that cause the applicants to divert from the expected responses and success path of the planned scenario.
- The simulator automatically goes to the "freeze" state during a scenario, or the instructor's station receives a "beyond simulated limits" alarm.
- The simulator operator informs the NRC examination team that a software module has halted or "kicked out."

The occurrence of any of these abnormal simulator operating conditions during an examination is a reason to stop the scenario. Additionally, the NRC chief examiner must determine whether the simulator condition impacted applicant performance or an examiner's ability to assess applicant performance.

When the simulator has been restored to full operation, the NRC chief examiner will determine whether to replace the scenario, run the scenario from a specific event, or restart the scenario from the beginning.

When resuming or restarting the scenario, the "backtrack" function should not be used; "backtracking" may introduce new computer coding errors and affect data recording displays. Additionally, the simulator must be in a relatively stable plant condition, at a definitive procedural step, before it is turned over to the applicants. The applicants should have a reasonable amount of time to refamiliarize themselves with plant status.

Any events or malfunctions that did not function as expected or were not useful in evaluating the applicants (e.g., a surveillance test that required a long time to perform) should be noted on the master copy of the scenarios to aid in future scenario preparation.

G. Specific Instructions for Administering Simulator Scenarios

Simulator scenarios should be administered according to the following instructions:

(1) The only senior operator position that can be filled by an SRO applicant during the simulator operating test is that of the senior licensed operator immediately responsible for control of the unit. This position is typically referred to as the shift supervisor, control room supervisor, or unit supervisor.

(2) One or more facility licensee staff members normally assume the role of plant personnel that the applicants direct or notify about plant operations (e.g., shift technical advisor (STA), shift manager, work control supervisor, assist/third control room operator). In rare circumstances, and with NRC chief examiner approval, a surrogate crew member may fill such a position (only if the facility's license requires that position). These role players do not need to have a license. SRO applicants still need to be able to perform the tasks normally carried out by these role players, but they are not required to demonstrate those duties as part of the simulator scenario portion of the operating test. SRO applicants are tested and evaluated on these types of SRO-level tasks during the administrative topics part of the walkthrough portion of the operating test. This includes the principal duties of the shift manager position (i.e., assuming the role of the emergency director, performing emergency classifications, and making protective action recommendations). (Reference: SECY-98-266, "Final Rule—Requirements for Initial Operator Licensing Examinations," dated November 13, 1998, Attachment 1, Section II, Agencywide Documents and Management System (ADAMS) Accession No. ML20206T689.)

(3) Before the operating test begins, the NRC chief examiner will brief or participate in the briefing of all nonapplicant operating test participants on their responsibilities, reporting requirements, duties, and level of participation. If the STA position is implemented during a simulator scenario, the briefing must include the STA's expected actions in response to every event.

(4) Applicant crew interactions with the STA must be conducted in accordance with the facility licensee's normal control room practice (e.g., an STA shall not be stationed in the simulator if he or she is on call at the site). The STA cannot proactively assist or coach the applicants; this behavior hinders the NRC examination team's ability to evaluate the applicants' competence.

(5) The NRC expects applicants to perform "peer checks" in accordance with the facility licensee's operations and training procedures and practices; however, additional personnel may not be stationed or called on for this purpose. If an applicant begins to show a performance deficiency that is corrected by a peer checker, the applicant will still be assessed a performance deficiency as if he or she had taken the action without correction.

(6) Just before beginning the simulator scenarios, the examiners review the scenario events with the facility licensee simulator operator and ensure that he or she has the most current version of the scenario guide and is familiar with the sequence of events. The purpose of this review is to refamiliarize the NRC examination team with the sequence of events and ensure that the scenario will proceed as planned. Examiners should also discuss the required procedures, TS, and special circumstances related to the scenarios. The NRC chief examiner will ensure that the facility licensee simulator operator playing the role of other plant personnel is aware of the timescale for responding to the applicants' requests for information. For example, the NRC chief examiner may specify the use of time compression for field operations such as valve lineups to prevent long delays in simulated operations, and the use of real-time delays for giving applicants simulated reports from maintenance or chemistry personnel, to present applicants with the same analysis problems that they will face as operators.

(7) The facility licensee simulator operator can provide only the information that the applicants specifically request and that does not compromise the integrity of the examination. When the simulator operator is briefing the applicants or communicating with them on the telephone, the examiners should monitor the conversations to ensure that the information provided is appropriate and does not cue the applicants.

(8) The NRC chief examiner ensures that the facility licensee simulator operator is ready to record the plant parameters at specified intervals as identified by the NRC examination team during the examination preparation week. Parameter readings should be collected at meaningful intervals, depending on the parameter, the nature of the event, and the capability of the simulation facility. If necessary, based on applicant performance, the NRC chief examiner will retain the recordings as backup documentation to augment the notes taken by the examiners during the simulator test until the NRC takes its licensing action on all the applications and adjudicatory actions on any hearing demands are complete. Then, the NRC chief examiner should consult Management Directive 3.53 to determine the record status and disposition the simulator recordings accordingly.

(9) The examiner in charge of the scenario should have a suitable communication system with the facility licensee simulator operator so that the examiner can prompt him or her to insert the malfunctions without cuing the applicants. Malfunctions may be planned for a predetermined time or power level so that the examiners and the facility licensee simulator operator are aware of the event that is occurring or pending.

(10) If necessary, the examiners may use time compression to speed up the response of key parameters so that the scenario can proceed to the next event within a reasonable time. Time compression is acceptable if used judiciously, and the operators receive enough time to perform the tasks that they would typically perform in real time. The examiners should inform the applicants during the scenario if time compression is used.

(11) Before beginning each scenario, the facility licensee simulator operator will advance any control room strip chart recorders that may prove useful in recreating the sequence of events. Additionally, the simulator operator will ensure that digital recorders are appropriately reset so that the applicants cannot observe the history from previous simulator runs.

(12) Before the simulator test begins, the facility licensee staff or NRC examiner will provide a shift turnover briefing. The briefing will cover present plant conditions, power history, equipment out of service, abnormal conditions, surveillances due, and instructions for the shift, and the applicants will have time to familiarize themselves with the plant status.

(13) After the shift turnover briefing and before beginning the scenario, the facility licensee staff or NRC examiner will advise the applicants to conduct any standard shift briefings (e.g., reactivity management) and any necessary normal evolution briefings before the scenario commences.

(14) Examiners should use the expected actions and behaviors listed on Form 3.3-2, “Required Operator Actions,” as a guide while administering the simulator tests. If an applicant performs as expected, the examiner may simply note on the form the time when the expected actions occurred. However, if an applicant does not perform as expected, the examiner should note the applicant’s actions (or lack thereof) next to or

below the expected action and follow up with appropriate questions after the simulator scenario is completed.

Note: Each examiner must determine the best way to document the applicant's actions and develop a documentation technique that facilitates an assessment of the applicant's competencies and substantiates a subsequent licensing decision. Some examiners record a minute-by-minute account of all key plant events and the applicant's actions as they occur; other examiners record only the applicant's significant actions. Precise examiner notes are an essential aspect of examination administration because these notes provide an account of observed performance deficiencies.

(15) Examiners should limit discussions with the applicants during the scenarios both to maintain realism and to avoid distracting the applicants from operating the plant. Questions during the scenarios should be limited to those necessary to assess the applicants' understanding of plant conditions and the required operator actions. Whenever possible, defer questioning the applicant until a time when the applicant is not operating or closely monitoring the plant (preferably after the simulator has been placed in "freeze").

(16) Immediately after completing the scenario, the examiners assemble to do the following:

(a) Verify that each examiner observed the applicant perform the required number of transients and events to allow adequate evaluation of all required competencies.

(b) Determine the status of the critical tasks (CTs) during the scenario and identify any critical performance deficiencies, including whether an applicant's action(s) or inaction(s) created a challenge to plant safety and thus resulted in a postscenario CT (refer to the CT methodology in Section C of ES-3.3, "General Testing Guidelines for Dynamic Simulator Scenarios").

(c) Identify any significant performance deficiencies occurring during the scenario. Significant performance deficiencies include any of the following:

- performance deficiencies that either cause an automatic reactor protection system (RPS)/engineered safety feature (ESF) actuation or that warrant or involve a manual RPS/ESF actuation that should have otherwise been avoidable had the applicant responded to the event as expected

  Note: Subsequent RPS/ESF actuations that do not alter equipment alignments are not treated as additional significant performance deficiencies.

  Note: Single RPS/ESF channel actuations are not treated as significant performance deficiencies.

- performance deficiencies that would result in an unplanned emergency action level entry at the Alert or Site Area Emergency level OR an avoidable escalation to the Alert or Site Area Emergency level, in accordance with the facility's emergency plan emergency action level

matrix, and do not meet the criteria for a postscenario CT (refer to the CT methodology in Section C of ES-3.3)

- performance deficiencies that result in an unplanned power change of more than 10-percent rated thermal power

  Note: Placing the unit at a lower reactor power level, in a controlled manner, as the result of a conservative decision in response to an event is not treated as a significant performance deficiency.

(d) An applicant who is corrected by another crew member will still be held accountable for what would have transpired if he or she had taken the action without correction. Analyze those corrected actions to determine whether they would have resulted in an event that reaches the threshold for classification as a significant performance deficiency or postscenario CT.

(e) Determine if the as-run scenario invalidated any preidentified CTs. If necessary, run an additional scenario to ensure that all required events and evolutions are completed.

(f) Cross-check examiner notes and observations for performance deficiencies "shared" by more than one applicant. Both evaluating examiners must note the deficiency and formally document it during grading.

(g) Determine what followup questions need to be asked.

(17) Because the simulator operating tests for the initial licensing examination are conducted with only one applicant in the SRO position, the NRC does *not* require the SRO applicant to complete an emergency classification within the normal event classification period of time. The scenario does not need to include event classification.

(18) If an applicant demonstrated potential performance deficiencies during the simulator scenario, before permitting cleanup and reset of the simulator, the examiners should ask the facility licensee simulator operator to provide copies of the logs, charts, data, or other materials that may be required to evaluate and document the applicant's performance.

H. Specific Instructions for Administering Job Performance Measures

JPMs should be administered according to the following instructions:

(1) JPMs that are conducted in the control room cannot interfere with normal shift operations. The NRC chief examiner should ask the facility licensee training manager to notify the shift supervisor when the NRC will conduct examination activities in the control room. If the number of persons or the noise level in the control room is excessive, the examiner should, if possible, move to a quieter location, modify the sequence of the JPMs, and return when the level of activity in the control room has abated, or ask the facility licensee training manager to address the issue.

(2) To optimize the use of the simulator, JPM administration should be coordinated with the facility licensee. The NRC chief examiner may allow simultaneous administration of different JPMs (in a staggered or parallel fashion) to multiple applicants in the simulator;

the NRC examiners must ensure that applicant interference is minimized and that test integrity is not compromised. This can be done successfully through various techniques. A simulator control room of average size can often support two JPMs conducted in parallel. If one JPM contains significant annunciator response or an alternate path, simultaneous administration may occur by staggering the start of the second JPM to ensure that every applicant who is taking the second JPM has already taken the JPM with an alternate path or significant annunciators. A back panel JPM and a main board JPM are compatible for parallel administration. If available, equipment such as room dividers is useful to separate the JPMs.

(3) JPMs may be administered in "station keeping" mode, in which the examiners remain in position at designated operating stations and the applicants, under escort, rotate through the various stations. Such arrangements would have to be agreed to by, and coordinated with, the facility licensee; moreover, examination security must be maintained.

(4) If a discrepancy exists between the simulator setup and the conditions specified in a JPM, the examiner should stop the JPM and correct the situation, as necessary. If the task can be completed with different values (e.g., wind direction when determining a protective action recommendation during an emergency), the examiner should document the differences in the associated as-administered JPM and coordinate with the facility licensee contact and the NRC chief examiner to validate the applicant's response under the actual conditions.

(5) The applicant can use materials such as facility licensee forms, schedules, and procedures if they are relevant to the tasks to be performed.

(6) If the applicant requests a "peer check," the examiner can acknowledge the applicant's request and proposed actions regardless of their accuracy or correctness or inform the applicant that a peer checker is not available; NRC examiners do not provide peer checks during JPMs. The applicant will be held accountable for performance deficiencies during the JPMs. Similarly, the examiner will not permit an applicant to obtain assistance from a "procedure reader" when performing JPMs.

(7) For in-plant system JPMs, the examiner should not credit the applicant's pointing to a valve or switch and stating that "the valve is closed" or "the breaker is closed" as completing the step successfully. The applicant must describe how he or she would perform a verifiable action, such as "I am turning the hand-wheel in the clockwise direction and observing the stem move inward until I feel resistance."

(8) If the applicant exceeds twice the validated time estimate for a JPM because he or she has selected an incorrect procedure or operated the wrong equipment (despite being presented with sufficient plant feedback to correct the performance deficiency), the examiner should stop the JPM, document the circumstances, and proceed with the next JPM. However, if the applicant is on the correct path but has simply stopped making progress toward completing a JPM that is not time critical, the examiner should ask the applicant to describe the work to be done and how long it should take to complete the JPM. If the applicant does not then make timely progress toward completing the described actions, the examiner should inform the applicant that the allowed time for the JPM has elapsed and the applicant will be evaluated on the work completed. The examiner should then proceed with the next JPM.

(9) If the applicant volunteers additional or corrected information after completing a task but before starting the next JPM or release to a facility licensee staff member for sequestration, the examiner should offer the applicant the opportunity to take whatever actions would be required in a similar situation in the plant. The examiner should record any revisions to previously performed tasks or answers for consideration when grading the operating test.

(10) If an applicant demonstrated potential performance deficiencies during a control room system JPM, the examiner should ask the facility licensee simulator operator to provide copies of the logs, charts, data, or other materials that may be required after leaving the facility to evaluate and document the applicant's performance.

I. Walkthrough Evaluation Techniques

NRC examiners should be familiar with and practice the walkthrough evaluation techniques described in this section. This guidance is intended to assist NRC examiners in administering JPMs by illustrating good and bad examples of walkthrough examination techniques.

1. Providing Cues

"Cuing" refers to the information that an examiner provides to an applicant when conducting a JPM. When conducting JPMs on the simulator, the simulator provides most of the required cues. However, when conducting JPMs outside of the simulator, the examiner must provide realistic and timely information to the applicant.

a. Verbal and Visual Cues

Verbal cues are often required to provide relevant system information, such as valve position, meter deflection, or indicating light status. Visual cues can also be used, such as employing a pointing device to indicate a gauge value. The examiner should take care to provide the applicant with the indications that should be readily observed (e.g., "the red light just illuminated," "the valve position indicator does not move"). An examiner can give too much information or inappropriate information (e.g., providing indications that are not visible or audible to the applicant) that could invalidate the JPM. The examiner should keep in mind what the applicant would see and hear while performing the JPM and provide consistent cues.

b. Nonverbal Cues

Examiners should take care to avoid body language that would suggest to an applicant that he or she provided an incorrect response or performed the wrong procedural step. Voice inflections indicating something has been performed incorrectly or a change in how cues are given (e.g., talking more methodically or rapidly) are examples of nonverbal communication that should be avoided.

Thorough preparation and familiarity with the JPM are vital to providing proper cuing. Knowledge of the indications that will be available and how they will respond to the applicant's actions allow an examiner to give accurate and timely cues when an applicant is incorrectly performing the task.

2. Evaluation Skills

When evaluating an applicant, an examiner must have the ability to differentiate between what he or she knows or believes to be true about an applicant's ability and how the applicant performs on the JPM. As previously discussed, an examiner must be familiar with the JPM to be able to accurately evaluate performance. If unprepared for the examination, the examiner may not see performance deficiencies as the applicant performs the JPM or may not ask pertinent questions. An examiner must remain attentive to the applicant's actions at all times. This will ensure that the examiner provides timely cues and detects performance deficiencies.

3. Examination Administration

When conducting JPMs in the simulator, the examiner should *not* manipulate any controls or silence or acknowledge any alarms. The examiner must take a "hands-off" approach to maintain the proper testing environment. The examiner should take care to shield any notes or grading from the applicant to prevent giving an indication of performance, which may either provide a false sense of security or increase stress levels. If an applicant's actions are not clear, the examiner should be prepared to ask appropriate followup or clarifying questions. Documenting these questions and the subsequent answers is important as they may have a bearing on an applicant's overall grade.

3.6 GRADING AND DOCUMENTING OPERATING TESTS

This examination standard (ES) applies to the operating test for initial licensing examinations and contains instructions for grading and documenting all parts of the operating test, collating the data to arrive at a pass or fail recommendation, and reviewing the documentation to ensure completeness.

The instructions in this ES require the U.S. Nuclear Regulatory Commission (NRC) examiners to evaluate each applicant's performance on the operating test, document performance deficiencies (PDs), and determine whether the applicant's level of knowledge and understanding meets the minimum requirements to safely operate the facility for which the license is sought.

A. Responsibilities

1. Facility Licensee

The facility licensee's responsibilities include providing the NRC examiners with additional reference materials and information needed to evaluate an applicant's performance on the operating tests. Such materials might include simulator strip chart recordings, captured data that document plant status during the simulator scenarios, and procedures that document the expected operator actions.

Facility licensees must submit any formal applicant or facility comments (or both) about the operating test to the NRC chief examiner as part of the postexamination package (see ES-4.4, "Grading and Documenting Written Examinations") for consideration during grading activities.

2. NRC Examiner of Record

The NRC examiner of record has the following responsibilities for the operating tests for operator licensing initial examinations:

- After administering the operating test, review and evaluate each applicant's performance and finalize the operating test documentation in accordance with the instructions in Sections B and C of this ES.

- Thoroughly explain and document the basis for any operating test failure.

3. NRC Chief Examiner

The NRC chief examiner assigned to the initial licensing examination, or a management-assigned designee, has the following responsibilities:

- Review any operating test comments received as part of the postexamination package and determine whether they need to be incorporated in the grading of the operating test.

- Work with the other examiners on the team to resolve any technical questions that might arise during the grading process.

- Communicate the need for any additional reference material to the facility licensee contact.

- Review, in detail, each examiner's operating test documentation to ensure that the test (as given) and its grading meet the requirements in ES-3.4, "Developing Scenarios," and this ES.

- Review, in detail, the grading of each applicant's operating test to verify that the examiner's comments appropriately support his or her recommendation.

- Ensure that PDs are graded and documented consistently for each applicant who took the simulator operating test.

- Ensure that grading is accurate for PDs that involve more than one applicant in the same operating crew.

- Review the examiner of record's recommendation for the operating test in the examiner recommendations section of each applicant's Form 5.1-2, "Individual Examination Report," and document a final recommendation by signing and dating next to the examiner signature. Confer with the examiner before opposing the examiner's pass/fail recommendation. Such disagreements are not common and usually happen when the justification for an unsatisfactory grade is not adequately documented. Provide specific reasons for opposing the examiner of record's recommendation on the applicant's Form 5.1-2.

  Note: If the NRC chief examiner is the examiner of record for an applicant, a management-assigned designee must perform this step for that applicant in lieu of the NRC chief examiner. The same person cannot sign both blocks (recommendation and final recommendation) on an applicant's Form 5.1-2.

B. Grading and Documenting Instructions

Follow these instructions to grade and document operating test performance for each applicant.

1. Identify Performance Deficiencies

For each applicant, review the job performance measures (JPMs) and simulator scenarios that were administered and the responses to any followup questions that were asked. Evaluate all notes and documentation generated during operating test administration to determine the areas in which the applicant had PDs.

Material (such as figures, drawings, flowcharts, or forms) that the applicant generated or used during the operating test can be used as an aid to document the applicant's performance. Mark and reference any material used to support the documentation of a PD, and attach it to the applicant's examination results package.

Evaluate the validity and technical accuracy of any followup questions asked during the operating test, as well as any unexpected events or actions that occurred during the simulator operating test. If necessary, work through the NRC chief examiner to obtain any additional reference material that might be required to resolve any technical questions.

Evaluate every item that may constitute a PD and determine whether it meets the following definition of a performance deficiency in ES-8, "Glossary":

An observed action or inaction (including operational tasks, procedure/process implementation, communications, and administrative functions), or a statement of understanding or intent, that demonstrates a lack of ability or understanding as outlined by an established standard for operator performance (e.g., facility procedure, policy, learning objective, regulatory requirement).

For simulator scenarios, hold applicants accountable for PDs corrected by other members of the control room team.

2. Evaluate the Applicant's Performance on Job Performance Measures

The following is a list of steps showing how to evaluate the applicant's performance on JPMs:

(a) On the applicant's Form 3.6-1, "Job Performance Measure Grade Report," enter the titles of the administrative topic JPMs and control room/in-plant systems JPMs administered to the applicant in the walkthrough portion of the operating test.

(b) Evaluate each PD highlighted in the examiner notes. Grade each JPM listed on the form as satisfactory (S) or unsatisfactory (U) using the following criteria:

- If the applicant did not complete a time-critical JPM in the allotted time, grade the JPM as unsatisfactory.
- If the applicant did not complete the task standard, grade the JPM as unsatisfactory.
- The applicant must accomplish the JPM task standard by correctly completing all the critical steps. If the applicant initially missed a critical step but later performed it correctly and accomplished the task standard without degrading the condition of the system or the plant, grade the applicant's performance on that JPM as satisfactory.
- The responses to any performance-based followup questions asked during operating test administration must confirm that the applicant's understanding of the administrative topic or plant system is satisfactory. If the responses to any of the followup questions reveal that the applicant's understanding of the administrative topic or plant system is severely deficient, the applicant may receive an unsatisfactory grade for the JPM even though the applicant successfully completed the task standard for the JPM. Thoroughly document the reasons for this type of unsatisfactory grade.

(c) Document the grade for each JPM by placing an S or U in the "Evaluation" column for that JPM on Form 3.6-1.

(d) Using the instructions in Section C of this ES, document all PDs for each JPM, regardless of the applicant's grade, on Form 3.6-4, "Operating Test Comments." If applicable, also document the reason for terminating any JPMs before the applicant could complete the task standard. Reference the comment page number on Form 3.6-1.

3. Document the Applicant's Score on Job Performance Measures

Document the applicant's results for both the overall walkthrough and administrative topic JPMs by placing an S or a U in the appropriate blocks in the operating test summary section on Form 5.1-2. Enter W or E if any part of the walkthrough was waived or excused, respectively.

a. Overall Score for Walkthrough

Determine the score for the overall walkthrough by calculating the percentage of satisfactory grades for the administrative topic and systems JPMs. If the applicant has an S on fewer than 80 percent of the administrative topics and systems combined (i.e., 12/15 for reactor operator (RO) and senior reactor operator—instant (SRO-I) applicants and 8/10 for SRO-U applicants), the applicant fails the walkthrough portion of the operating test and receives a U overall.

b. Score for Administrative Topic Job Performance Measures

To determine if the applicant demonstrated minimal competence on the administrative topics, a separate score is calculated for the applicant's administrative topic JPMs. Calculate the percentage of satisfactory grades for the administrative topic JPMs. If a senior reactor operator (SRO) applicant has an S on fewer than 60 percent (i.e., 3/5) or an RO applicant has an S on fewer than 50 percent (i.e., 2/4) of the administrative topic JPMs, the applicant fails this part of the walkthrough.

Retake applicants who were previously granted an excusal from the systems walkthrough must achieve a satisfactory grade on at least 80 percent of the administrative topic JPMs (i.e., 4/5 for RO and SRO applicants) to pass.

4. Evaluate the Applicant's Performance on Simulator Scenarios

The following (4.*a*–4.*d*) shows the steps in evaluating the applicant's performance on simulator scenarios:

a. Types of Performance Deficiencies for Simulator Scenarios

For the simulator scenarios, two subcategories of PDs allow for more stringent grading than would otherwise be applied to a PD:

i. A significant performance deficiency (SPD) results in a larger rating factor (RF) point deduction than a regular PD. The examination team identifies SPDs after administering each simulator scenario. SPDs include any of the following:

– PDs that either cause an automatic reactor protection system (RPS)/engineered safety feature (ESF) actuation or that warrant a manual RPS/ESF actuation that should have been avoidable had the applicant responded to the event as expected

Note: Subsequent RPS/ESF actuations that do not alter equipment alignments are not treated as additional SPDs.

Note: Single RPS/ESF channel actuations are not treated as SPDs.

– PDs that would result in an unplanned emergency action level entry at the Alert or Site Area Emergency level OR an avoidable escalation to the Alert or Site Area Emergency level, in accordance with the facility's emergency plan emergency action level matrix, and do not meet the criteria for a postscenario critical task (CT) (refer to the CT methodology in Section C of ES-3.3, "General Testing Guidelines for Dynamic Simulator Scenarios")

– PDs that result in an unplanned power change of more than 10-percent rated thermal power

Note: Placing the unit at a lower reactor power level, in a controlled manner, as the result of a conservative decision, in response to an event, is not treated as an SPD.

Applicants will be held accountable for SPDs corrected by other members of the control room team.

ii. A critical performance deficiency (CPD) is a PD associated with the failure to complete a CT. The associated CT may be a preidentified or a postscenario CT, and it must meet the elements of a CT in ES-3.3. If an applicant has more than one CPD, the applicant's performance is considered unsatisfactory for the simulator portion of the operating test.

Applicants will be held accountable for CPDs corrected by other members of the control room team. If an applicant neglects to take an action or takes an incorrect action and is subsequently corrected by a team member, the examination team will determine the impact of that lack of action or incorrect action on the scenario as it relates to a CT. The measurable performance standard for this type of CT depends on the consequence of the applicant's lack of action or incorrect action if the crew had not corrected it.

The following table summarizes how to grade performance deficiencies that result in meeting criteria for emergency action levels that were not scripted in the scenario guide.

Table 3.6-1 Unscripted Emergency Action Levels and Associated PD Type

Applicant's Simulator Scenario Performance Result:	PD Type:
Criteria met for a General Emergency	CPD (postscenario CT)
Criteria met for a Site Area Emergency based on more than one fission product barrier	CPD (postscenario CT)
Criteria met for an Alert or a nonfission product barrier Site Area Emergency	SPD
Criteria met for an Unusual Event	PD

b. Code and Grade Performance Deficiencies for Simulator Scenarios

Review each PD for the simulator operating test. Using the applicable competency and RF worksheet (Form 3.6-5, "Reactor Operator Competency Grading Worksheet for the Simulator Operating Test," for RO applicants and Form 3.6-6, "Senior Reactor Operator Competency Grading Worksheet for the Simulator Operating Test," for SRO applicants) and the instructions and guidance in this step, code each PD with an RF (number and letter) from the competency area that most accurately reflects the deficiency. No more than two RFs can be assigned to

each PD. If a second RF is assigned, it must be in a different competency area. Competency 3, "Operate Plant Component Controls," may be "not observed" for SRO-U applicants. However, if the SRO-U applicant was observed in this area, then grade this competency and factor it into the applicant's overall grade.

Assess all PDs using the competency RF descriptions listed in Forms 3.6-5 and 3.6-6. If the examiner concludes that a "No" response exists after comparing the PD against the RF questions on Forms 3.6-5 and 3.6-6 and further assessing the performance using the criteria below, the examiner must lower the applicant's score in the corresponding RF(s) by the appropriate number of points. Table 3.6-2 summarizes how to reduce RF scores.

Table 3.6-2 Summary of RF Scores by PD Type

	PD Type		
	CPD	**SPD**	**All Other PDs**
Competency/RF			
RFs *other* than those in the communications competency	3 point deduction per RF	2 point deduction per RF	1 point deduction per RF
Communications competency RFs	No point deduction for the first PD in each RF. For the 2nd and 3rd PDs in an RF, deduct 1 point from the associated RF. For the 4th and subsequent PDs in an RF, deduct 2 points. The minimum score for any RF is a "1."		

c. Performance Deficiency Guidance for RFs

Use the following criteria in conjunction with Table 3.6-2 to determine whether the PD affects the applicant's simulator operating test score:

- For a PD related to the applicant's *ability* to operate (including operating controls, directing operations, and implementing procedures), reduce the score in the applicable RF(s) if either of the following is observed:
  - The applicant's action or inaction fails to meet an expectation established by a standard for operator performance.
  - The applicant's inaction or intent to perform an action would have failed to meet an expectation established by a standard for operator performance, but another crew member corrected for the PD.
- For a PD related to the applicant's *understanding* (including diagnosing plant conditions and understanding system operation), reduce the score in the applicable RF(s) if any of the following are observed:
  - The applicant exhibits a lack of understanding by providing an *erroneous response to a followup question* related to an observed potential PD during the scenario.

- The *applicant's statement* (verbal or written) reveals a lack of understanding (related to required operator knowledge) that the applicant does not correct, using his or her own knowledge, before taking improper action based on the misunderstanding or before the initiation of the next scenario event. The applicant may use a reference to correct himself or herself.

- The *applicant's delay* in taking a required action reveals a lack of understanding that the applicant does not correct, using his or her own knowledge, and the resulting inaction complicates the crew's response to the event.

  Note: Typically, an unsatisfactory delay in taking a required action should be assessed in RF 3.a as *lack of ability* to manipulate controls in a timely and accurate manner. However, if misunderstanding is the primary cause of the applicant's delay, then RF 3.b can be considered. The NRC does not expect the applicant to exhibit an immediate and unwavering understanding of plant conditions at all times. The applicant will need a period of time to evaluate plant conditions and come to a state of understanding. The applicant may pause while operating the plant to establish, improve, or confirm this understanding. This behavior is consistent with industry expectations and standards for operator human performance techniques (e.g., stop-think-act-review or STAR). The examiner must provide evidence of the applicant's *lack of understanding* while operating plant controls in order to cite RF 3.b and reduce the RF 3.b score. The following are examples of a lack of understanding:

  - The applicant relies on another crew member's knowledge to effectively assess and operate the plant.

  - The applicant does not successfully exhibit the understanding required to take prompt and prudent action to avoid more complicated plant conditions.

  - The applicant provides an erroneous response to followup questions.

- For a PD related to the applicant's *ability* to communicate, reduce the score in the associated RF if *both* of the following are observed:

  - Communication made by the applicant is inaccurate, incomplete, or not in accordance with the licensee's established means for ensuring precise communications.

  - The communication is not self-corrected, and the communication is needed to support effective plant operation.

    Note: Temporary miscommunication that stems simply from one applicant mishearing another, if it is corrected by the licensee's established means for ensuring precise communications, does not result in a point deduction.

If the examiner concludes a "Yes" response exists after comparing the PD against the RF questions in Forms 3.6-5 and 3.6-6 or if the criteria in steps 4.a, 4.b, 4.c, and 4.d do not apply to

the PD, then the PD does not impact any RF score. Document the PD in the comments section for the applicable grade report.

d. Specific Instructions for Performance Deficiencies Involving Technical Specifications

Use the following instructions when evaluating SRO applicant performance against the RF areas in the technical specifications (TS) competency. Treat each TS event separately. A TS event can be either a predetermined TS-related event as designated in the scenario Forms 3.3-1 or 3.3-2 or a TS-related condition that occurs as a result of the flow of the scenario or actions of the applicants. Additionally, if, during followup questioning, the applicant corrects a TS determination that was made incorrectly during the scenario (provided that time limits associated with any required actions had not yet expired by the end of the scenario), then do not penalize the applicant for the original PD in the TS competency.

Every missed TS entry represents a PD, except for missed TS entries that fall under RF 6.a, which are limited to one PD per TS event. For example, if a single event during a scenario has three associated TS entries, each missed TS from that single event constitutes a separate PD. Similarly, if an applicant incorrectly determines that an inoperability exists for an operable component or identifies and enters a TS that does not apply, these represent PDs that must be graded accordingly. However, PDs related to recognition (RF 6.a) should not be "carried forward" as PDs under location (RF 6.b) or TS compliance (RF 6.c). Similarly, an applicant who recognizes that an inoperability exists but who does not locate the correct TS (RF 6.b) cannot have that PD "carried forward" as a PD under TS compliance (RF 6.c) unless the applicant's deficient knowledge about TS compliance is substantiated by followup questioning.

Rating Factor 6.a

Did the applicant RECOGNIZE when instruments/components were inoperable and when conditions were covered by the TS?

Evaluate RF 6.a at the event level; evaluate TS-related conditions that result from the flow of the scenario or unexpected operator action as separate TS events. For example, during a pressurized-water reactor scenario, reactor coolant system pressure goes below the departure from nucleate boiling limit; a TS entry is required because the limit for departure from nucleate boiling was exceeded. This condition represents a separate TS event. In another example, during a boiling-water reactor scenario, a recirculation loop flow mismatch exceeds a TS limit; a TS entry is required for the recirculation flow mismatch. This condition represents a separate TS event. Similarly, if a crew takes an unexpected action that causes TS-related equipment to be considered inoperable, then that condition would also represent a separate TS event.

For a given TS event, determine whether the applicant recognized that TS entry is required. The applicant demonstrates competence by identifying that the event has TS implications and making a TS determination. An applicant's TS determination may include announcing entry into one or more limiting conditions for operation (LCOs), logging the LCO entry in the crew's log, discussing the LCO entry during followup questioning, or a combination of these. It is insufficient for an applicant to state that he or she is "evaluating TS." The applicant must make a clear and definitive TS determination. Additionally, an applicant demonstrates competence for an event that has no TS implications by not making a TS determination. Once the applicant has made

a TS determination associated with the event, then refer to the descriptions in RF 6.b and RF 6.c to assess the accuracy of the applicant's TS determination.

PDs in RF 6.a. are limited to one PD per TS event whether the applicant failed to make a TS determination when required or made a TS determination when TS entry was not required.

Rating Factor 6.b

Did the applicant demonstrate an ability to LOCATE the appropriate TS for the equipment he or she determined was inoperable, covered by TS, or both?

Evaluate RF 6.b at the LCO level. An applicant demonstrates competence in RF 6.b by entering the required LCOs, and *only* the required LCOs, for a given event. For each LCO, the entry must be considered correct in terms of any functional units that are applicable for the inoperable component. Functional units are not to be evaluated independently for separate PDs; either the LCO entry is entirely correct or it is not.

Deduct 1 point in this RF for each required LCO that is not entered correctly. If an applicant enters an LCO that is not required, this error represents a separate PD only if it can be determined through followup questioning that the LCO entry was not made in lieu of a correct LCO entry. If it is determined that an applicant had the choice between multiple LCOs and simply selected the wrong one, then this error is considered a single PD. Each required LCO entry represents a separate opportunity for a PD in RF 6.b. The number of 1-point deductions for failure to enter a required LCO is limited to the number of LCOs that are required to be entered for a given event. Limit additional 1-point reductions for entry into LCOs that are not required to only those incorrect LCO entries that were made due to separate and independent misconceptions that did not contribute to an applicant's failure to enter a correct LCO.

Rating Factor 6.c

Did the applicant correctly INTERPRET and ensure COMPLIANCE with TS and LCO action statements?

Evaluate RF 6.c at the LCO level. For each required LCO entry, the applicant demonstrates competence in RF 6.c by identifying and complying with the correct conditions and action statements, and only the correct conditions and action statements. For any action statement with a time requirement that fits within the scenario runtime, an applicant further demonstrates compliance by ensuring that the necessary action is taken within the required timeframe. If the applicant does not identify the correct conditions and action statements, and only the correct conditions and action statements, for a given LCO, then deduct 1 point in RF 6.c for the specific LCO. For example, if the correct TS determination is LCO 3.1.1, Conditions A, B, and C, and instead the applicant enters LCO 3.1.1, Conditions D, E, and F, then this would constitute a 1-point deduction in RF 6.c. The PD is that the applicant failed to identify the correct conditions/action statements for the LCO that was entered. Evaluate each required LCO that is entered in this manner.

Therefore, for each TS event, limit the number of PDs in RF 6.c to the number of LCOs required to be entered.

5. Document the Applicant's Rating Factor Scores for Simulator Scenarios

Document the grade for each RF on the applicant's Form 3.6-2, "Reactor Operator Simulator Scenario Grade Report," or Form 3.6-3, "Senior Reactor Operator Simulator Scenario Grade Report," as follows:

- If there is no basis on which to grade an RF (i.e., it is "not observed" (N/O)), enter "0" under "Weighting Factors," and enter "N/O" under "RF Grades." Depending on which RF is "N/O," circle the appropriate weighting factors for each remaining RF applicable to that competency; the weighting factors for each competency must always add up to 1. If more than one RF per competency or more than two RFs overall are not observed, inform the NRC regional office management and consult with the Office of Nuclear Reactor Regulation (NRR) operator licensing program office to determine whether the test supports a licensing decision.

  – On Form 3.6-4, document the reason for grading an RF as "N/O" (e.g., the simulator malfunctioned, an event did not take place as planned, another applicant interceded).

- If an applicant performed an activity related to an RF and had no PDs, enter an RF score of "3" for that RF.

- For PDs *not* categorized as critical or significant and *not* related to RFs under the communications and crew interactions (communications) competency—

  – If an applicant has a single PD related to an RF, enter an RF score of "2" for that RF.

  – If an applicant has two PDs related to an RF, enter an RF score of "1" for that RF.

  – If an applicant has three or more PDs related to an RF, circle an RF score of "0."

- For all PDs related to RFs under the communications and crew interactions (communications) competency—

  – Do not deduct points for the first PD in any RF under the communications competency. If an applicant has a second or a third PD in an RF under the communications competency, deduct 1 point, resulting in an RF score of "2."

  – If an applicant has four or more PDs in the same RF under the communications competency, deduct 2 points, resulting in an RF score of "1." Note: The minimum score for RFs under the communications competency is "1."

- An SPD results in a 2-point deduction for the associated RF(s) unless it is in the communications competency.

- A CPD results in a 3-point deduction for the associated RF(s) unless it is in the communications competency.

Using the instructions in Section C of this ES, document all PDs on Form 3.6-4. Include reasons for coding each PD with the specific RF(s). For each comment, reference the comment page number on Form 3.6-2 or Form 3.6-3.

6. Determine and Document RF Grades, Competency Grades, and Overall Simulator Test Scores for Simulator Scenarios

For each RF on Forms 3.6-2 and 3.6-3, multiply the RF score by its associated weighting factor to obtain a numerical measure (the RF grade).

For each competency on Forms 3.6-2 and 3.6-3, sum the RF grades to obtain a competency grade and enter the resulting competency grade in the designated column. (The grades should range between 0 and 3.)

Using the following evaluation criteria, determine whether the applicant's overall performance on the simulator test is satisfactory (S) or unsatisfactory (U), and document the grade by placing an S or a U in the "Simulator Operating Test" block of the "Operating Test Summary" on Form 5.1-2. Enter W or E if this part of the operating test was waived or excused, respectively.

- The applicant's performance is unsatisfactory if the applicant has more than one CPD. Note: The examiner is still required to document all RF scores, RF grades, and competency grades, following the instructions above.

- The applicant's performance is satisfactory if the grade for all competencies is greater than 1.8 and the applicant has no more than one CPD.

- The applicant's performance is satisfactory if the grade for Competency 4, "Communications and Crew Interactions," is less than or equal to 1.8 but greater than 1.0 and the individual grades for all other competencies are 2.0 or greater and the applicant has no more than one CPD.

- If neither of the satisfactory conditions above is met, then the applicant's performance is unsatisfactory.

7. Finalize the Documentation

Review and finalize the simulator scenarios that were run during the operating test.

Complete Form 3.3-1, "Scenario Outline," by entering the applicants' names, the positions they occupied during the scenario, and the facility's name on the top of the form. Enter on Form 3.3-1 any scenario revisions that were made during the test, so that each form accurately shows all the events that actually occurred during each scenario. Change the event numbers, malfunction numbers, malfunction types, and descriptions, as necessary, to reflect the "as-run" conditions. These changes may be made either by using pen and ink or by retyping the scenario as long as the final form is clear and legible.

Update each Form 3.3-2, "Required Operator Actions," to reflect the "as-run" conditions. Discard or mark as "not used" any events that were not run and fill out new forms for any events that were run but not originally planned. Neatly enter notes, comments, and additional actions in the spaces between the expected operator actions.

The final Forms 3.3-1 and 3.3-2 must be a clear, legible, and sequential record of the actual events and actions that occurred during the simulator operating test. The forms sent to the applicant shall not contain any rough notes or irrelevant comments.

Explain deviations from the nominal grading criteria in detail. For example, an examiner may conclude that an applicant's performance is acceptable despite exhibiting deficiencies that would normally result in an unsatisfactory grade. Conversely, an examiner may conclude that an applicant's performance is unacceptable even though the documented deficiencies would normally result in a passing grade. In either case, the examiner shall document the basis for concluding that the applicant is, in fact, (un)acceptably proficient in that area, why the nominal grading criteria might be too (lenient) severe, or how a flaw in the test item might have contributed to the applicant's deficient performance (or a combination of these). The NRC regional office shall obtain written concurrence from the NRR operator licensing program office before completing the licensing action.

Retain notes and documentation until the NRC takes its licensing action on all the applications and adjudicatory actions on any hearing demands are complete. When those actions are complete, consult Management Directive 3.53, "NRC Records and Document Management Program," to determine the record status, and disposition the notes and documents accordingly. Such notes may be subject to disclosure if requested under the Freedom of Information Act.

8. Make a Final Recommendation

After grading and documenting the operating test, in the "Examiner Recommendation" area of the applicant's Form 5.1-2, make an overall recommendation for the operating test by checking the "Pass" or "Fail" (or "Excuse/Waive" if the entire operating test was excused or waived in accordance with ES-2.2, "Applications, Medical Requirements, and Waiver and Excusal of Examination and Test Requirements") block and signing and dating in the row for the operating test recommendation. Make a "Pass" recommendation only if *all* "Operating Test Summary" blocks of Form 5.1-2 contain satisfactory (S) grades or the letters W or E, indicating that the applicant did not have to be examined in that area.

If an applicant demonstrated a PD with serious safety consequences, the examiner may recommend an overall failure of the operating test even when the grading instructions in this ES would normally result in a passing grade.

Conversely, if, on any part of the operating test, an applicant demonstrated several PDs with minimal or no safety consequences, the examiner may recommend a "Pass" when the grading instructions would normally result in a failing grade. In either case, the examiner shall thoroughly justify and document the basis for the recommendation on Form 3.6-4. The NRC regional office must get written concurrence from the NRR operator licensing program office before completing the licensing action.

Assemble the operating test results package (including Forms 5.1-2, 3.6-1, 3.6-2 or 3.6-3, 3.6-4, 3.3-1, and 3.3-2 and all supporting documentation, such as strip chart recordings and applicant notes and drawings) for each applicant and forward the package to the NRC chief examiner to review.

C. Specific Instructions for Documenting Performance Deficiencies

For each applicant, document every PD. The level of detail required for documenting a PD depends on whether the PD contributed to the applicant's failure of that part of the operating test.

1. For Performance Deficiencies that Contribute to a Failure

To document a PD that contributes to a failure of that part of the operating test (overall walkthrough, administrative topics, simulator operating test), include the following details (as applicable):

(a) the task administered (i.e., describe the JPM or simulator scenario and event, as well as the applicant's position on the operating crew)

(b) the applicant's incorrect action and an indication of whether the action was a JPM critical step or a simulator scenario CPD or SPD

(c) for a CPD or SPD on the simulator operating test, an explanation of how the associated criteria are met

(d) the lack of knowledge or ability that the applicant demonstrated

(e) the potential or actual consequences of the applicant's incorrect action

(f) the associated followup questions asked and the applicant's responses

(g) the correct answer or action, with an appropriate facility licensee reference (e.g., lesson plan, system description, procedure name and number)

(h) the knowledge and ability number and its importance rating from the applicable knowledge and ability catalog, the facility licensee's learning objectives, or both

(i) the item from Title 10 of the *Code of Federal Regulations* (10 CFR) 55.45(a) that the applicant did not understand or was unable to perform

Whenever possible, substantiate comments with printouts, strip chart recordings, or other collected parameter data generated during the simulator operating test, as well as with figures, drawings, flowcharts, or forms generated or used by the applicant. For a PD related to a followup question, document the followup question and the applicant's response.

Provide specific supporting details (and avoid generalizing the PD) so that the licensing official can make a logical decision about the examiner's recommendation (ES-5.1, "Issuing Operator Licenses and Postexamination Activities").

2. Performance Deficiencies that Do Not Contribute to a Failure

To document a PD that does not contribute to an operating test failure, include a brief statement describing the PD and the expected action. For a PD related to a followup question, document the followup question and the applicant's response.

Provide enough detail (and avoid generalizing the PD) so that the independent reviewer, responsible supervisor, and licensing official can make a logical decision in support of the examiner's recommendation with regard to issuing the operator license.

D. Forms

Form 3.6-1	Job Performance Measure Grade Report
Form 3.6-2	Reactor Operator Simulator Scenario Grade Report
Form 3.6-3	Senior Reactor Operator Simulator Scenario Grade Report
Form 3.6-4	Operating Test Comments
Form 3.6-5	Reactor Operator Competency Grading Worksheet for the Simulator Operating Test
Form 3.6-6	Senior Reactor Operator Competency Grading Worksheet for the Simulator Operating Test

Form 3.6-1 Job Performance Measure Grade Report

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Applicant Docket Number: 55-		Page of
Walkthrough Grading Details	**Evaluation (S or U)**	**Comment Page Number**
Administrative Topics		
a.		
b.		
c.		
d.		
e.		
Systems—Control Room		
a.		
b.		
c.		
d.		
e.		
f.		
g.		
h.		
Systems—In Plant		
i.		
j.		
k.		

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Form 3.6-2 Reactor Operator Simulator Scenario Grade Report

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Applicant Docket Number: 55-					Page of
Reactor Operator Simulator Operating Test Grading Details					
Competencies/ Rating Factors (RFs)	RF Weights	RF Scores	RF Grades	Comp. Grades	Comment Page No.
1. Interpretation/Diagnosis a. Recognize and Verify Status b. Interpret and Diagnose Conditions c. Prioritize Response	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____	_____ _____ _____
2. Procedures/Technical Specifications a. Reference b. Procedure Compliance c. Technical Specification Entry	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____	_____ _____ _____
3. Operate Plant Component Controls a. Locate and Manipulate b. Understanding c. Manual Control	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____	_____ _____ _____
4. Communications a. Provide Information b. Receive Information c. Carry Out Instructions	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____	_____ _____ _____

Note: Enter RF weights (nominal, adjusted, or “0” if not observed (N/O)); RF scores (0, 1, 2, 3, or N/O); and RF grades from Form 3.6-5, “Reactor Operator Competency Grading Worksheet for the Simulator Operating Test,” and sum to obtain competency grades.

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Form 3.6-3 Senior Reactor Operator Simulator Scenario Grade Report

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Applicant Docket Number: 55-					Page of
Senior Reactor Operator Simulator Operating Test Grading Details					
Competencies/ Rating Factors (RFs)	RF Weights	RF Scores	RF Grades	Comp. Grades	Comment Page No.
1. Interpretation/Diagnosis a. Recognize and Attend b. Ensure Accuracy c. Understanding d. Diagnose	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	_____	_____ _____ _____ _____
2. Procedures a. Reference b. Emergency Operating Procedure Entry c. Correct Use	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____	_____ _____ _____
3. Operate Plant Component Controls a. Locate and Manipulate b. Understanding c. Manual Control	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____	_____ _____ _____
4. Communications a. Clarity b. Crew and Others Informed c. Receive Information	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____	_____ _____ _____
5. Directing Operations a. Timely and Decisive Action b. Oversight c. Solicit Crew Feedback d. Monitor Crew Activities	_____ _____ _____ _____	_____ _____ _____ _____	_____ _____ _____ _____	_____	_____ _____ _____ _____
6. Technical Specifications a. Recognize b. Locate c. Compliance	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____	_____ _____ _____

Note: Enter RF weights (nominal, adjusted, or “0” if not observed (N/O)); RF scores (0, 1, 2, 3, or N/O); and RF grades from Form 3.6-6, “Senior Reactor Operator Competency Grading Worksheet for the Simulator Operating Test,” and sum to obtain competency grades.

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Form 3.6-4 Operating Test Comments

Use this form or an equivalent and the instructions in Section C of ES-3.6, "Grading and Documenting Operating Tests," to document the applicant's PDs. Items marked with a * do not apply if the applicant has a passing score for the associated part of the operating test (overall walkthrough, administrative topics, simulator operating test).

Reference: [page, JPM No.]
JPM: [topic or name]

Simulator Scenario [No. or name], Event [No. or name]
Assigned Competency Area(s) and Rating Factor(s)

Expected Action/Response and Associated References:

Applicant Action/Response:

*Lack of Knowledge/Ability:

*Potential/Actual Consequences:

Followup Questions and Response:

*Knowledge/Ability and Importance Rating and/or Learning Objective:

*Reference to 10 CFR 55.45(a):

Form 3.6-5 Reactor Operator Competency Grading Worksheet for the Simulator Operating Test

Reactor Operator (RO) Competency 1:

Interpret/Diagnose Events and Conditions Based on Alarms, Signals, and Readings

This competency does *not* include knowledge of system operation such as setpoints, interlocks, or automatic actions nor the understanding of how one's actions affect the plant and system conditions—this is evaluated in Competency 3.

Rating Factors (RFs)	Weighting Factors	RF Scores	RF Grades	Comp. Grade
(a) Did the applicant RECOGNIZE and VERIFY off-normal trends and status accurately and promptly in order to identify conditions that are out of specification?	Not observed (N/O) = 0	3		_____
	Nominal = 0.33	2		
	(b) N/O = 0.50	1		
	(c) N/O = 0.50	0		
(b) Did the applicant correctly INTERPRET/DIAGNOSE plant conditions based on control room indications to guard against and mitigate conditions that are out of specification and to verify that signals are consistent with plant and system conditions?	N/O = 0	3		
	Nominal = 0.34	2		
	(a) N/O = 0.50	1		
	(c) N/O = 0.50	0		
(c) Did the applicant prioritize and ATTEND TO annunciators, alarm signals, and instrument readings in order of importance and severity?	N/O = 0	3		
	Nominal = 0.33	2		
	(a) N/O = 0.50	1		
	(b) N/O = 0.50	0		

RO Competency 2: Comply with and Use Procedures, References, and Technical Specifications					
Rating Factors (RFs)	Weighting Factors		RF Scores	RF Grades	Comp. Grade
(a) Did the applicant REFER TO and/or VERIFY the appropriate normal, alarm/annunciator, abnormal, emergency, and administrative procedure or reference in sufficient time to avoid adverse impacts on plant status?	N/O	= 0	3		_____
	Nominal	**= 0.33**	2		
	(b) N/O	= 0.50	1		
	(c) N/O	= 0.50	0		
(b) Did the applicant COMPLY WITH procedures (including precautions and limitations) and references in an accurate manner and in sufficient time to avoid adverse impacts on plant status? This includes recognizing emergency operating procedure entry conditions, carrying out immediate actions without assistance, and using control room reference materials, such as prints, books, and charts to aid in the response to events and plant conditions.	N/O	= 0	3		
	Nominal	**= 0.34**	2		
	(a) N/O	= 0.50	1		
	(c) N/O	= 0.50	0		
(c) Did the applicant RECOGNIZE plant conditions that are addressed in technical specifications and COMPLY WITH required limiting conditions for operation and action statements? This includes the use of control room reference materials, such as prints, books, and charts, to aid in the diagnosis and classification of events and conditions.	N/O	= 0	3		
	Nominal	**= 0.33**	2		
	(a) N/O	= 0.50	1		
	(b) N/O	= 0.50	0		

RO Competency 3: Operate Plant Component Controls					
Rating Factors (RFs)	Weighting Factors		RF Scores	RF Grades	Comp. Grade
(a) Did the applicant LOCATE AND MANIPULATE controls in an accurate manner to attain a desired plant and system response in sufficient time to avoid adverse impacts on plant conditions? This includes the ability to locate plant and system instruments and indications.	N/O	= 0	3		_____
	Nominal	**= 0.34**	2		
	(b) N/O	= 0.50	1		
	(c) N/O	= 0.50	0		
(b) Did the applicant's actions demonstrate UNDERSTANDING OF SYSTEM OPERATION, including set points, interlocks, and automatic actions? This includes knowledge of system operation AND the understanding of how one's actions affect plant and system conditions.	N/O	= 0	3		
	Nominal	**= 0.33**	2		
	(a) N/O	= 0.50	1		
	(c) N/O	= 0.50	0		
(c) Did the applicant demonstrate the ability to take MANUAL CONTROL of automatic functions when appropriate based on plant conditions?	N/O	= 0	3		
	Nominal	**= 0.33**	2		
	(a) N/O	= 0.50	1		
	(b) N/O	= 0.50	0		

RO Competency 4: Communicate and Interact with Other Crew Members					
Rating Factors (RFs)	Weighting Factors		RF Scores	RF Grades	Comp. Grade
(a) Did the applicant PROVIDE clear, pertinent, and accurate INFORMATION, oral and written, on system status to others for the performance of their jobs? This includes providing information to other crew members about conditions affecting safe plant operation, regardless of which applicant's control board is directly affected.	N/O	= 0	3		_____
	Nominal	**= 0.34**	2		
	(b) or (c) N/O	= 0.50	1		
(b) Did the applicant effectively RECEIVE INFORMATION from others? This includes requesting, acknowledging, and attending to information from other crew members about conditions affecting safe plant operation, regardless of which applicant's control board is directly affected.	N/O	= 0	3		
	Nominal	**= 0.33**	2		
	(a) or (c) N/O	= 0.50	1		
(c) Did the applicant successfully CARRY OUT THE INSTRUCTIONS of the supervisor?	N/O	= 0	3		
	Nominal	**= 0.33**	2		
	(a) or (b) N/O	= 0.50	1		

Form 3.6-6 Senior Reactor Operator Competency Grading Worksheet for the Simulator Operating Test

Senior Reactor Operator (SRO) Competency 1: Interpret/Diagnose Events and Conditions Based on Alarms, Signals, and Readings				
Rating Factors (RFs)	Weighting Factors	RF Scores	RF Grades	Comp. Grade
(a) Did the applicant RECOGNIZE AND ATTEND TO off-normal trends and status, annunciators, and alarms in order of their importance and severity and in sufficient time to avoid adverse impacts on plant status? This includes correctly interpreting the significance of each alarm and verifying that it is consistent with plant and system conditions.	N/O = 0	3		_____
	Nominal = 0.20	2		
	(b) N/O = 0.25	1		
	(c) or (d) N/O = 0.29	0		
(b) Did the applicant ensure the collection of CORRECT, ACCURATE, and COMPLETE information and reference material on which to base diagnoses?	N/O = 0	3		
	Nominal = 0.20	2		
	(a) N/O = 0.25	1		
	(c) or (d) N/O = 0.28	0		
(c) Did the applicant's directives and actions demonstrate an UNDERSTANDING of how the PLANT, SYSTEMS, and COMPONENTS OPERATE AND INTERACT (including set points, interlocks, and automatic actions)? This does NOT include knowledge of system operation that is evaluated under SRO Competency 3.	N/O = 0	3		
	Nominal = 0.30	2		
	(a) or (b) N/O = 0.38	1		
	(d) N/O = 0.43	0		
(d) Did the applicant correctly INTERPRET/DIAGNOSE plant conditions based on control room indications to guard against and mitigate conditions that do not meet specifications?	N/O = 0	3		
	Nominal = 0.30	2		
	(a) or (b) N/O = 0.37	1		
	(c) N/O = 0.43	0		

SRO Competency 2: Comply with and Use Procedures and References				
Rating Factors (RFs)	Weighting Factors	RF Scores	RF Grades	Comp. Grade
(a) Did the applicant REFER TO and/or VERIFY correct alarm/annunciator, abnormal, emergency, and administrative procedures, procedural steps, and references when appropriate in sufficient time to avoid adverse impacts on plant status? This includes the use of control room reference materials, such as prints, books, and charts, to aid in the diagnosis and classification of events and conditions.	N/O = 0	3		_____
	Nominal = 0.33	2		
	(b) N/O = 0.50	1		
	(c) N/O = 0.50	0		
(b) Did the applicant RECOGNIZE ABNORMAL OPERATING PROCEDURE/ EMERGENCY OPERATING PROCEDURE ENTRY CONDITIONS in sufficient time to avoid adverse impacts on plant status?	N/O = 0	3		
	Nominal = 0.33	2		
	(a) N/O = 0.50	1		
	(c) N/O = 0.50	0		
(c) Did the applicant USE PROCEDURES CORRECTLY and ensure correct implementation by the crew in sufficient time to avoid adverse impacts on plant status? This includes following procedural steps in the correct sequence, abiding by procedural cautions and limitations, selecting correct paths on decision blocks, and correctly transitioning between procedures.	N/O = 0	3		
	Nominal = 0.34	2		
	(a) N/O = 0.50	1		
	(b) N/O = 0.50	0		

SRO Competency 3:
Operate Plant Component Controls

Note: For SRO-upgrade (SRO-U) applicants, include grading in this competency if the applicant performed a scenario in a position that operated plant controls. If the SRO-U applicant was tested only in the SRO position, mark this competency as "N/O" (not observed).

Rating Factors (RFs)	Weighting Factors	RF Scores	RF Grades	Comp. Grade
(a) Did the applicant LOCATE AND MANIPULATE CONTROLS to attain a desired plant and system response or condition in sufficient time to avoid adverse impacts on plant status?	N/O = 0	3		_____
	Nominal = 0.34	2		
	(b) N/O = 0.50	1		
	(c) N/O = 0.50	0		
(b) Did the applicant's control manipulations demonstrate an UNDERSTANDING OF SYSTEM OPERATION, including set points, interlocks, and automatic actions? This includes the ability to locate plant and system instruments and indications and to understand how one's actions affect plant and system conditions.	N/O = 0	3		
	Nominal = 0.33	2		
	(a) N/O = 0.50	1		
	(c) N/O = 0.50	0		
(c) Did the applicant demonstrate the ability to take MANUAL CONTROL of automatic functions when appropriate based on plant conditions?	N/O = 0	3		
	Nominal = 0.33	2		
	(a) N/O = 0.50	1		
	(b) N/O = 0.50	0		

SRO Competency 4: Communicate and Interact with the Crew and Other Personnel					
Rating Factors (RFs)	Weighting Factors		RF Scores	RF Grades	Comp. Grade
(a) Did the applicant PROVIDE communications in a clear, easily understood manner?	N/O	= 0	3		_____
	Nominal	**= 0.40**	2		
	(c) N/O	= 0.50	1		
	(b) N/O	= 0.67			
(b) Did the applicant KEEP crew members and those outside the control room INFORMED of plant status?	N/O	= 0	3		
	Nominal	**= 0.40**	2		
	(c) N/O	= 0.50	1		
	(a) N/O	= 0.67			
(c) Did the applicant ENSURE RECEIPT of clear, easily understood communications from the crew and others?	N/O	= 0	3		
	Nominal	**= 0.20**	2		
	(a) or (b) N/O	= 0.33	1		

SRO Competency 5: Direct Shift Operations					
Rating Factors (RFs)	Weighting Factors		RF Scores	RF Grades	Comp. Grade
(a) Did the applicant take TIMELY AND DECISIVE ACTION in response to problems during both normal and off-normal situations? This includes well-thought-out directions that demonstrated appropriate CONCERN for the SAFETY of the plant, staff, and public. Timely actions are those actions that are performed in sufficient time to avoid adverse impacts on plant status.	N/O	= 0	3		
	Nominal	**= 0.30**	2		
	(c) or (d) N/O	= 0.38	1		
	(b) N/O	= 0.43	0		
(b) Did the applicant remain ATTENTIVE to control room indications, stay in a position of OVERSIGHT, and provide an APPROPRIATE AMOUNT of DIRECTION and GUIDANCE that facilitated CREW PERFORMANCE? This includes maintaining focus on the "big picture."	N/O	= 0	3		_____
	Nominal	**= 0.30**	2		
	(c) or (d) N/O	= 0.37	1		
	(a) N/O	= 0.43	0		
(c) Did the applicant SOLICIT and INCORPORATE FEEDBACK from the crew to foster an effective, team-oriented approach to problem solving and decisionmaking?	N/O	= 0	3		
	Nominal	**= 0.20**	2		
	(d) N/O	= 0.25	1		
	(a) or (b) N/O	= 0.29	0		
(d) Did the applicant ensure that THE CREW carried out CORRECT AND TIMELY ACTIVITIES (including diagnosis, procedural implementation, and operation of the control boards)? Timely actions are those that are performed in sufficient time to avoid adverse impacts on plant status.	N/O	= 0	3		
	Nominal	**= 0.20**	2		
	(c) N/O	= 0.25	1		
	(a) or (b) N/O	= 0.28	0		

SRO Competency 6:
Comply with and Use Technical Specifications

Use this worksheet in conjunction with the specific instructions for grading performance deficiencies involving technical specifications (TS) in Examination Standard 3.6, Section B.4.c.

Rating Factors (RFs)	Weighting Factors		RF Scores	RF Grades	Comp. Grade
(a)* Did the applicant RECOGNIZE when instruments/components were inoperable and when conditions were covered by the TS? *If the applicant does not address TS at all, this weighting factor becomes 1.0.	N/O	= 0	3		
	Nominal	**= 0.33**	2		
	(b) N/O	= 0.50	1		
	(c) N/O	= 0.50	0		
(b) Did the applicant demonstrate an ability to LOCATE the appropriate TS for the equipment he or she determined was inoperable and/or covered by TS? This includes the functional units for instrument TS.	N/O	= 0	3		_____
	Nominal	**= 0.33**	2		
	(a) N/O	= 0.50	1		
	(c) N/O	= 0.50	0		
(c) Did the applicant correctly INTERPRET and ensure COMPLIANCE with TS and limiting condition for operation action statements?	N/O	= 0	3		
	Nominal	**= 0.34**	2		
	(a) N/O	= 0.50	1		
	(b) N/O	= 0.50	0		

3.7 ALTERNATIVES FOR IN-PLANT JOB PERFORMANCE MEASURES AT PLANTS UNDER CONSTRUCTION

A substantial number of the plant systems must be constructed before performing a plant walkthrough during the NRC initial licensing examination so that the plant walkthrough portion of the operating test is not predictable. Predictable examinations may prevent the examiner from distinguishing applicants who have mastered the required knowledge and skills from those who have not. Therefore, prior to completion of construction (e.g., prior to the Title 10 of the *Code of Federal Regulations* 52.103(g) finding), alternatives for the in-plant job performance measures (JPMs) may be used at plants under construction for initial licensing and requalification examination purposes.

This examination standard (ES) provides guidance for a facility licensee of a reactor under construction that requests and is granted an exemption from the plant walkthrough requirement and proposes alternatives for in-plant JPMs in the actual plant. If future rulemaking activities result in an alternative to the plant walkthrough requirement, then some of the techniques in this examination standard may be applicable to meet that alternative.

This guidance is intended to be used in addition to the instructions in ES-3.2, "Developing Job Performance Measures." As construction of different sections of the facility becomes substantially complete and in-plant structures, systems and components (SSCs) near completion, usage of this method will become unnecessary for those areas and SSCs. Accordingly, on a case-by-case basis, for those tasks that are selected for in-plant JPMs in accordance with ES-3.2 where it is possible to both perform applicant training in the plant and administer part of an operating test in a plant walk-through, as determined by the NRC chief examiner, then the operating test would need to include in-plant items.

A. Developing Alternative Job Performance Measures

When developing in-plant JPMs using alternative methods such that the actual plant is not entered, the JPM should contain specific performance standards that allow the NRC examiner to evaluate the applicant's knowledge or ability (or both) to do the following:

1. Locate tools and equipment using plant layout diagrams, equipment diagrams, maps, or a combination of these, including how to get to the location in the plant where the task would be performed.

2. Describe the expected status/configuration of equipment before performing task.

3. Operate the equipment and explain how the applicant expects equipment and systems to respond to his or her actions, using props such as pictures of equipment or mockup equipment in lieu of actual equipment in the plant.

4. Use a simulated radiologically controlled area entry checkpoint with electronic dosimetry, radiation work permits, and other radiologically controlled area entry equipment.

4.1 DEVELOPING WRITTEN EXAMINATION OUTLINES

This examination standard contains the instructions for preparing written examination outlines for the written examination portion of the U.S. Nuclear Regulatory Commission (NRC) operator licensing initial examinations for reactor operator (RO) and senior reactor operator (SRO) license applicants at power reactor facilities. Preparing written examination outlines using the instructions in this examination standard, in conjunction with the applicable knowledge and abilities (K/A) catalog, ensures that the written examination includes a representative sample of the items specified in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' licenses."

A. Responsibilities

1. Facility Licensee

The facility licensee performs the following activities, as applicable, depending on the examination arrangements confirmed with the NRC regional office in accordance with the instructions in Examination Standard (ES)-2.1, "Preparing for Operator Licensing Initial Examinations," before the scheduled examination date:

a. If available, provide the NRC regional office any prescreened K/As for elimination from the written examination outline, with a description or basis for eliminating any K/A.

b. Establish examination security in accordance with ES-1.3, "Examination Security," before receiving the written examination outline from the NRC.

c. Review the proposed written examination outline and provide feedback to the NRC regional office in accordance with ES-2.3, "Reviewing and Approving Operator Licensing Initial Examinations."

d. Once the written examination outline is approved, discuss any deviations with the NRC chief examiner and follow the instructions in ES-4.2, "Developing Written Examinations."

2. NRC Regional Office

The NRC regional office performs the following activities:

a. Prepare the initial written examination outline in accordance with the instructions in Section B of this examination standard.

b. Verify that the facility licensee has established examination security (ES-1.3) and then submit the written examination outline to the facility licensee point of contact for review.

c. Review and approve the final written examination outline in accordance with the instructions in ES-2.3.

d. Review and approve any site-specific item or topic substitutions in accordance with the instructions in ES-4.2 for deviations.

B. Instructions for Preparing Written Examination Outlines

Prepare the applicable technology-specific outline (Form 4.1-BWR, "Boiling-Water Reactor Examination Outline"; Form 4.1-PWR, "Pressurized-Water Reactor Examination Outline"; Form 4.1-AP, "AP1000 Examination Outline"; or Form 4.1-ABWR, "Advanced Boiling-Water Reactor Examination Outline") and the common examination outline (Form 4.1-COMMON, "Common Examination Outline") according to the following instructions:

1. Use the latest revision of the applicable K/A catalog available at the time that the facility licensee requests the written examination outline. The applicable K/A catalog is defined in ES-8, "Glossary" as follows:

   > The revision of the technology- or vendor-specific (e.g., pressurized-water reactor, boiling-water reactor, AP1000) [K/A] catalog reviewed by the [NRC] and used to develop the written examination outline and operating test outline for initial operator licensing examinations.

2. Because several of the K/A catalogs are based on generic job and task analyses and not all facilities are the same, eliminate inapplicable or inappropriate K/A statements by (1) discarding randomly selected K/As during the outline development process or (2) prescreening the entire K/A catalog to eliminate inappropriate K/As before beginning the random selection process. Facility licensees can provide the NRC regional office with a list of "prescreened K/As" that do not apply for their plants, along with a basis for eliminating each K/A, before the NRC develops the written examination outline. Refer to the remainder of this section for specific requirements and guidance on K/A elimination. Facility licensees can also provide the NRC regional office with operationally important emergency/abnormal plant evolutions or plant systems if these topics are not represented on the examination outlines in this examination standard. The NRC regional office, in consultation with the Office of Nuclear Reactor Regulation (NRR) operator licensing program office, will determine the tier/group assignments for the topics before sampling.

3. Systematically and randomly select specific K/A statements (e.g., K1.03 or A2.11) from the applicable K/A catalog to complete each of the four tiers:

   - Tier 1, "Emergency and Abnormal Plant Evolutions"
   - Tier 2, "Plant Systems"
   - Tier 3, "Generic Knowledge and Abilities"
   - Tier 4, "Theory"

   A random and systematic sampling methodology is any methodology that meets the following criteria:

   a. reproducible, comprehensible, and yields an examination outline that is free of bias

   b. adheres to the applicable examination model

   c. minimizes the number of K/As related to any system or evolution (i.e., sample every system or evolution in the group once before selecting a second K/A for any system or evolution)

d. samples at the specific K/A statement level.

Refer to Section C of this examination standard for an example of a random and systematic sampling method.

4. Document the random and systematically selected Tier 1 and Tier 2 K/As on the appropriate technology-specific outline form (Forms 4.1-PWR, 4.1-BWR, 4.1-AP, or 4.1-ABWR). Document the random and systematically selected Tier 3 and Tier 4 K/As on the common examination outline form (Form 4.1-COMMON).

5. Observe the following when selecting individual K/As:

   a. Select only those K/As having an importance rating (IR) of 2.5 or higher. K/As that have IRs of less than 2.5 may be used if justified based on plant priorities; inform the NRC chief examiner if selecting K/As with an IR less than 2.5. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.

   b. For the SRO-only portion of the outline, include K/A statements that relate to the topics in 10 CFR 55.43(b) to ensure that the SRO examination tests at the appropriate license level and also do the following:

      - For Tiers 1 and 2, select from the shaded systems and K/A categories (i.e., the “A2” and “G” K/A categories, which are linked to 10 CFR 55.43, “Written examination: Senior operators,” and all the K/A categories for the fuel handling equipment, which is specifically identified for sampling in 10 CFR 55.43(b)(7)).

      - For Tier 3, select K/As linked to 10 CFR 55.43.

   c. Ensure that at least two topics from every applicable K/A category are sampled within Tier 1 and Tier 2 of the RO and SRO-only outline sections.

   d. Select topics from as many systems and evolutions as possible and sample every system or evolution in the group before selecting a second topic for any system or evolution. Treat the SRO examination, which consists of 75 RO questions and 25 SRO-only questions, as a 100-question test overall and adjust to ensure balance of coverage and appropriate sampling.

   e. For the generic K/A category in Tier 1 (i.e., Column “G” on the outline), select topics from Section 2, “Generic Knowledge and Abilities,” of the applicable K/A catalog that are relatable/relevant to the selected abnormal or emergency event.

   f. For the generic K/A category in Tier 2 (i.e., Column “G” on the outline):

      - For the RO outline section, select topics from Section 2 and Section 5, “Components,” of the applicable K/A catalog that are relatable/relevant to the selected system.
      - For the SRO-only outline section, select topics from Section 2 of the applicable K/A catalog that are relatable/relevant to the selected system.

g. For Tier 3 of the examination outline, randomly select K/As from Section 2 of the applicable K/A catalog so that the K/A categories “Conduct of Operations” and “Equipment Control” have two items each and the K/A categories “Radiation Control” and “Emergency Procedures/Plan” have one item each on the RO portion of the examination. For the SRO portion, randomly select two K/As for each category except for one category, which will have only one K/A.

h. For Tier 4 of the examination outline, randomly select K/As from Section 6, “Theory,” of the applicable K/A catalog so that the K/A categories “Reactor Theory” and “Thermodynamics” have three items each. Tier 4 topics selected must sample different theory subjects located within Section 6, “Theory,” of the applicable K/A catalog (e.g., only one question may test Reactor Theory subject 292001, “Neutrons”). Note that Tier 4 is limited to the RO portion of the examination.

i. Enter the K/A statement numbers, a brief description of each topic, the topics’ IRs for the license level of the examination (use the RO and SRO ratings for the RO and SRO-only portions, respectively), the question number, and the point totals (system, category, group, and tier) on the examination outline.

j. If fuel handling equipment is sampled in a category other than Category A2 or G on the SRO-only examination, enter it on the left side of Column A2 for Tier 2, Group 2 (step 5.c does not apply.)

k. Ensure that the point total for each group and tier in the proposed outline matches that specified in the table. The final point total for each group and tier may deviate by ±1 from that specified in the table based on NRC revisions. The final RO examination must total 75 points, and the SRO-only examination must total 25 points.

6. After completing the outline, check the selected K/As for balance of coverage within and across the four tiers as follows:

- Ensure that every applicable K/A category is sampled at least twice within Tier 1 and Tier 2 so that a valid sample will likely be maintained if some questions are deleted as a result of postexamination comments.

- Ensure that the K/A category totals are met for Tier 3 and Tier 4 in accordance with steps 5.g and 5.h.

- Ensure that the same generic K/A is only used once for either Tier 1 or Tier 2. Generic K/As used in Tier 1 or Tier 2 can be reused for Tier 3.

- Ensure that no emergency/abnormal plant evolution, system, or K/A category is oversampled (i.e., avoid selecting more than two K/A topics from a given system unless they relate to plant-specific priorities).

- Make any adjustments that might be necessary by systematically and randomly selecting replacement K/A statements.

- Document and justify all changes on Form 4.1-1, “Record of Rejected Knowledge and Abilities,” and submit the documentation with the completed/revised outline.

7. Review the written examination outline using the instructions in ES-2.3 before sending it to the facility licensee to begin question development.

8. Consult the instructions for deviations from the approved examination outline in ES-4.2 as needed.

C. Example of a Random and Systematic Sampling Methodology

This section gives an example of an acceptable random and systematic sampling methodology for selecting K/As within the defined structure of the examination outline to achieve as broad a sample as possible. Other methodologies may be used as long as they meet all of the above criteria.

The following process uses Form 4.1-BWR for illustration. Tokens are used to randomly select from the first column of items listed in each tier/group on Form 4.1-BWR. A computer-based random number generator could be used instead of tokens.

1. Sequentially number the items in the group and sequentially mark numbers on the same number of tokens. Assuming that 1 of the 21 emergency/abnormal plant evolutions in Tier 1, Group 1, was deleted before sampling because it was not applicable to the facility, 20 tokens, numbered from 1 to 20, should remain.

    a. Because the number of items remaining in the group (in this case 20) is the same as the required number of points for the group specified in the right-hand column of the examination outline, each item in the group would be sampled one time.

    b. If the number of items remaining in the group is smaller than the required number of points for the group (e.g., Tier 2, Group 1, has 23 items but requires 26 points), sample each item once and determine the rest of the sample by randomly selecting and removing tokens (in this case 3 of 23) until the required total number of points (26) is reached. Update Form 4.1-BWR to note the selected items.

    c. If the number of items remaining in the group is larger than the required number of points for the group (e.g., Tier 1, Group 2, has 20 items but only requires 7 points), randomly select and remove the required number of tokens (7) and note them on Form 4.1-BWR.

2. After selecting the topics to be sampled in each group as described in step 1, count the number of K/A categories in the group (e.g., six for each group in Tier 1 (i.e., K1, K2, K3, A1, A2, and G)) and sequentially annotate the same number of tokens (in this case six). For each emergency/abnormal plant evolution (and system) selected in step 1, randomly select and remove a token and note the K/A category on Form 4.1-BWR. If the emergency/abnormal plant evolution (or system) was sampled more than once in accordance with step 1.a, randomly select a second K/A category. If the selected K/A category contains no K/A statements that have an IR above 2.5, randomly and systematically select another K/A category, unless the lower importance is justified

based on plant-specific priorities. Then replace all tokens in the container and repeat the process for every selected item in each group.

3. Use a similar method to randomly select from among the K/A statements under each selected K/A category.

D. Forms

Form 4.1-BWR	Boiling-Water Reactor Examination Outline
Form 4.1-PWR	Pressurized-Water Reactor Examination Outline
Form 4.1-AP	AP1000 Examination Outline
Form 4.1-ABWR	Advanced Boiling-Water Reactor Examination Outline
Form 4.1-COMMON	Common Examination Outline
Form 4.1-1	Record of Rejected Knowledge and Abilities

Form 4.1-BWR Boiling-Water Reactor Examination Outline

Facility:														Date of Exam:						
Tier	Group	RO K/A Category Points												SRO-Only Points						
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total	A2		G		Total		
1. Emergency and Abnormal Plant Evolutions	1				N/A					N/A			20					7		
	2												6					3		
	Tier Totals												26					10		
2. Plant Systems	1												26					5		
	2												11					3		
	Tier Totals												37					8		
3. Generic Knowledge and Abilities Categories	CO			EC				RC		EM			6	CO	EC	RC	EM	7		
	2			2				1		1										
4. Theory	Reactor Theory					Thermodynamics							6							
	3					3														

Notes: CO = Conduct of Operations; EC = Equipment Control; RC = Radiation Control;
EM = Emergency Procedures/Plan

* These systems/evolutions may be eliminated from the sample when Revision 2 of the K/A catalog is used to develop the sample plan

** These systems/evolutions are only included as part of the sample (as applicable to the facility) when Revision 2 of the K/A catalog is used to develop the sample plan

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A	IR	#
295001 (APE 1) Partial or Complete Loss of Forced Core Flow Circulation &									
295003 (APE 3) Partial or Complete Loss of AC Power									
295004 (APE 4) Partial or Total Loss of DC Power									
295005 (APE 5) Main Turbine Generator Trip									
295006 (APE 6) Scram									
295016 (APE 16) Control Room Abandonment									
295018 (APE 18) Partial or Complete Loss of CCW									
295019 (APE 19) Partial or Complete Loss of Instrument Air									
295021 (APE 21) Loss of Shutdown Cooling									
295023 (APE 23) Refueling Accidents									
295024 (EPE 1) High Drywell Pressure									
295025 (EPE 2) High Reactor Pressure									
295026 (EPE 3) Suppression Pool High Water Temperature									
295027 (EPE 4) High Containment Temperature (Mark III Containment Only)									
295028 (EPE 5) High Drywell Temperature (Mark I and Mark II only)									
295030 (EPE 7) Low Suppression Pool Water Level									
295031 (EPE 8) Reactor Low Water Level									
295037 (EPE 14) Scram Condition Present and Reactor Power Above APRM Downscale or Unknown									
295038 (EPE 15) High Offsite Radioactivity Release Rate									
600000 (APE 24) Plant Fire On Site									
700000 (APE 25) Generator Voltage and Electric Grid Disturbances									
K/A Category Totals:							Group Point Total:		20/7

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A	IR	#
295002 (APE 2) Loss of Main Condenser Vacuum									
295007 (APE 7) High Reactor Pressure									
295008 (APE 8) High Reactor Water Level									
295009 (APE 9) Low Reactor Water Level									
295010 (APE 10) High Drywell Pressure									
295011 (APE 11) High Containment Temperature (Mark III Containment only)									
295012 (APE 12) High Drywell Temperature									
295013 (APE 13) High Suppression Pool Water									
295014 (APE 14) Inadvertent Reactivity Addition									
295015 (APE 15**) Incomplete Scram									
295017 (APE 17) High Offsite Release Rate									
295020 (APE 20) Inadvertent Containment Isolation									
295022 (APE 22) Loss of Control Rod Drive Pumps									
295029 (EPE 6) High Suppression Pool Water Level									
295032 (EPE 9) High Secondary Containment Area Temperature									
295033 (EPE 10) High Secondary Containment Area Radiation Levels									
295034 (EPE 11) Secondary Containment Ventilation High Radiation									
295035 (EPE 12) Secondary Containment High Differential Pressure									
295036 (EPE 13) Secondary Containment High Sump/Area Water									
500000 (EPE 16) High Containment Hydrogen									
K/A Category Point Totals:							Group Point Total:		6/3

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
203000 (SF2, SF4 RHR/LPCI) RHR/LPCI: Injection Mode														
205000 (SF4 SCS) Shutdown Cooling														
206000 (SF2, SF4 HPCI) High-Pressure Coolant Injection														
207000 (SF4 IC) Isolation (Emergency) Condenser														
209001 (SF2, SF4 LPCS) Low-Pressure Core Spray														
209002 (SF2, SF4 HPCS) High-Pressure Core Spray														
211000 (SF1 SLCS) Standby Liquid Control														
212000 (SF7 RPS) Reactor Protection														
215003 (SF7 IRM) Intermediate-Range Monitor														
215004 (SF7 SRMS) Source-Range Monitor														
215005 (SF7 PRMS) Average Power Range Monitor/Local Power Range Monitor														
217000 (SF2, SF4 RCIC) Reactor Core Isolation Cooling														
218000 (SF3 ADS) Automatic Depressurization														
223002 (SF5 PCIS) Primary Containment Isolation/Nuclear Steam Supply Shutoff														
239002 (SF3 SRV) Safety Relief Valves														
259002 (SF2 RWLCS) Reactor Water Level Control														
261000 (SF9 SGTS) Standby Gas Treatment														
262001 (SF6 AC) AC Electrical Distribution														
262002 (SF6 UPS) Uninterruptable Power Supply (AC/DC)														
263000 (SF6 DC) DC Electrical Distribution														
264000 (SF6 EGE) Emergency Generators (Diesel/Jet)														
300000 (SF8 IA) Instrument Air														
400000 (SF8 CCW) Component Cooling Water														
510000 (SF4 SWS*) Service Water														
K/A Category Point Totals:												Group Point Total:		26/5

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A	IR	#
201001 (SF1 CRDH) CRD Hydraulic														
201002 (SF1 RMCS) Reactor Manual Control														
201003 (SF1 CRDM) Control Rod and Drive Mechanism														
201004 (SF7 RSCS) Rod Sequence Control														
201005 (SF1, SF7 RCIS) Rod Control and Information														
201006 (SF7 RWMS) Rod Worth Minimizer														
202001 (SF1, SF4 RS) Recirculation														
202002 (SF1 RSCTL) Recirculation Flow Control														
204000 (SF2 RWCU) Reactor Water Cleanup														
214000 (SF7 RPIS) Rod Position Information														
215001 (SF7 TIP) Traversing In-Core Probe														
215002 (SF7 RBMS) Rod Block Monitor														
216000 (SF7 NBI) Nuclear Boiler Instrumentation														
219000 (SF5 RHR SPC) RHR/LPCI: Torus/Suppression Pool Cooling Mode														
223001 (SF5 PCS) Primary Containment and Auxiliaries														
226001 (SF5 RHR CSS) RHR/LPCI: Containment Spray Mode														
230000 (SF5 RHR SPS) RHR/LPCI: Torus/Suppression Pool Spray Mode														
233000 (SF9 FPCCU) Fuel Pool Cooling/Cleanup														
234000 (SF8 FH) Fuel Handling Equipment														
239001 (SF3, SF4 MRSS) Main and Reheat Steam														
239003 (SF9 MSIVLC) Main Steam Isolation Valve Leakage Control														
241000 (SF3 RTPRS) Reactor/Turbine Pressure Regulating														
245000 (SF4 MTGEN) Main Turbine Generator/Auxiliary														
256000 (SF2 CDS) Condensate														
259001 (SF2 FWS) Feedwater														
268000 (SF9 RW) Radwaste														
271000 (SF9 OG) Offgas														
272000 (SF7, SF9 RMS) Radiation Monitoring														
286000 (SF8 FPS) Fire Protection														
288000 (SF9 PVS) Plant Ventilation														
290001 (SF5 SC) Secondary Containment														
290003 (SF9 CRV) Control Room Ventilation														
290002 (SF4 RVI) Reactor Vessel Internals														
510001 (SF8 CWS*) Circulating Water														
K/A Category Point Totals:												Group Point Total:		11/3

Form 4.1-PWR Pressurized-Water Reactor Examination Outline

Facility: Date of Exam:

Tier	Group	RO K/A Category Points												SRO-Only Points		
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total	A2	G	Total
1. Emergency and Abnormal Plant Evolutions	1				N/A					N/A			18			6
	2												8			4
	Tier Totals												26			10
2. Plant Systems	1												28			5
	2												9			3
	Tier Totals												37			8

3. Generic Knowledge and Abilities Categories	CO	EC	RC	EM	6	CO	EC	RC	EM	7
	2	2	1	1						

4. Theory	Reactor Theory	Thermodynamics	6	
	3	3		

Notes: CO = Conduct of Operations; EC = Equipment Control; RC = Radiation Control; EM = Emergency Procedures/Plan

* These systems/evolutions may be eliminated from the sample when Revision 2 of the K/A catalog is used to develop the sample plan

** These systems/evolutions are only included as part of the sample (as applicable to the facility) when Revision 2 of the K/A catalog is used to develop the sample plan

Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery									
000008 (APE 8) Pressurizer Vapor Space Accident									
000009 (EPE 9) Small-Break LOCA									
000011 (EPE 11) Large-Break LOCA									
000015 (APE 15) Reactor Coolant Pump Malfunctions									
000022 (APE 22) Loss of Reactor Coolant Makeup									
000025 (APE 25) Loss of Residual Heat Removal System									
000026 (APE 26) Loss of Component Cooling Water									
000027 (APE 27) Pressurizer Pressure Control System Malfunction									
000029 (EPE 29) Anticipated Transient Without Scram									
000038 (EPE 38) Steam Generator Tube Rupture									
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer									
000054 (APE 54; CE E06) Loss of Main Feedwater									
000055 (EPE 55) Station Blackout									
000056 (APE 56) Loss of Offsite Power									
000057 (APE 57) Loss of Vital AC Instrument Bus									
000058 (APE 58) Loss of DC Power									
000062 (APE 62) Loss of Service Water									
000065 (APE 65) Loss of Instrument Air									
000077 (APE 77) Generator Voltage and Electric Grid Disturbances									
(W E04) LOCA Outside Containment									
(W E11) Loss of Emergency Coolant Recirculation									
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink									
K/A Category Totals:							Group Point Total:		18/6

Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)

E/APE # / Name	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
000001 (APE 1) Continuous Rod Withdrawal									
000003 (APE 3) Dropped Control Rod									
000005 (APE 5) Inoperable/Stuck Control Rod									
000024 (APE 24) Emergency Boration									
000028 (APE 28) Pressurizer Level Control Malfunction									
000032 (APE 32) Loss of Source Range Nuclear Instrumentation									
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation									
000036 (APE 36; BW/A08) Fuel Handling Incidents									
000037 (APE 37) Steam Generator Tube Leak									
000051 (APE 51) Loss of Condenser Vacuum									
000059 (APE 59) Accidental Liquid Radwaste Release									
000060 (APE 60) Accidental Gaseous Radwaste Release									
000061 (APE 61) Area Radiation Monitoring System Alarms									
000067 (APE 67) Plant Fire On Site									
000068 (APE 68; BW A06) Control Room Evacuation									
000069 (APE 69; W E14) Loss of Containment Integrity									
000074 (EPE 74; W E06 & E07) Inadequate Core Cooling									
000076 (APE 76) High Reactor Coolant Activity									
000078 (APE 78*) RCS Leak									
(W E01 & E02) Rediagnosis & SI Termination									
(W E13) Steam Generator Overpressure									
(W E15) Containment Flooding									
(W E16) High Containment Radiation									
(BW A01) Plant Runback									
(BW A02 & A03) Loss of NNI-X/Y									
(BW A04) Turbine Trip									
(BW A05) Emergency Diesel Actuation									
(BW A07) Flooding									
(BW E03) Inadequate Subcooling Margin									
(BW E08; W E03) LOCA Cooldown—Depressurization									
(BW E09; CE A13**; W E09 & E10) Natural Circulation									
(BW E13 & E14) EOP Rules and Enclosures									
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock									
(CE A16) Excess RCS Leakage									
(CE E09) Functional Recovery									
(CE E13*) Loss of Forced Circulation/LOOP/Blackout									
K/A Category Point Totals:							Group Point Total:		8/4

Form 4.1-PWR	PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)	Page 4

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump														
004 (SF1; SF2 CVCS) Chemical and Volume Control														
005 (SF4P RHR) Residual Heat Removal														
006 (SF2; SF3 ECCS) Emergency Core Cooling														
007 (SF5 PRTS) Pressurizer Relief/Quench Tank														
008 (SF8 CCW) Component Cooling Water														
010 (SF3 PZR PCS) Pressurizer Pressure Control														
012 (SF7 RPS) Reactor Protection														
013 (SF2 ESFAS) Engineered Safety Features Actuation														
022 (SF5 CCS) Containment Cooling														
025 (SF5 ICE) Ice Condenser														
026 (SF5 CSS) Containment Spray														
039 (SF4S MSS) Main and Reheat Steam														
059 (SF4S MFW) Main Feedwater														
061 (SF4S AFW) Auxiliary/Emergency Feedwater														
062 (SF6 ED AC) AC Electrical Distribution														
063 (SF6 ED DC) DC Electrical Distribution														
064 (SF6 EDG) Emergency Diesel Generator														
073 (SF7 PRM) Process Radiation Monitoring														
076 (SF4S SW) Service Water														
078 (SF8 IAS) Instrument Air														
103 (SF5 CNT) Containment														
053 (SF1; SF4P ICS*) Integrated Control														
K/A Category Point Totals:												Group Point Total:		28/5

Form 4.1-PWR	PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)	Page 5

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
001 (SF1 CRDS) Control Rod Drive														
002 (SF2; SF4P RCS) Reactor Coolant														
011 (SF2 PZR LCS) Pressurizer Level Control														
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation														
016 (SF7 NNI) Nonnuclear Instrumentation														
017 (SF7 ITM) In-Core Temperature Monitor														
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control														
029 (SF8 CPS) Containment Purge														
033 (SF8 SFPCS) Spent Fuel Pool Cooling														
034 (SF8 FHS) Fuel Handling Equipment														
035 (SF 4P SG) Steam Generator														
041 (SF4S SDS) Steam Dump/Turbine Bypass Control														
045 (SF 4S MT/G) Main Turbine Generator														
055 (SF4S CARS) Condenser Air Removal														
056 (SF4S CDS) Condensate														
068 (SF9 LRS) Liquid Radwaste														
071 (SF9 WGS) Waste Gas Disposal														
072 (SF7 ARM) Area Radiation Monitoring														
075 (SF8 CW) Circulating Water														
079 (SF8 SAS**) Station Air														
086 (SF8 FP) Fire Protection														
050 (SF 9 CRV*) Control Room Ventilation														
K/A Category Point Totals:												Group Point Total:		9/3

Form 4.1-AP AP1000 Examination Outline

Facility:		Date of Exam:																
Tier	Group	RO K/A Category Points												SRO-Only Points				
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total	A2		G		Total
1. Emergency and Abnormal Plant Evolutions	1				N/A					N/A			18					6
	2												8					4
	Tier Totals												26					10
2. Plant Systems	1												28					5
	2												9					3
	Tier Totals												37					8
3. Generic Knowledge and Abilities Categories	CO	EC		RC	EM								6	CO	EC	RC	EM	7
	2	2		1	1													
4. Theory	Reactor Theory			Thermodynamics									6					
	3			3														

Note: CO = Conduct of Operations; EC = Equipment Control; RC = Radiation Control;
EM = Emergency Procedures/Plan

E/APE # / Name	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
E-0, Reactor Trip or Safeguards Actuation									
ES-0.1, Reactor Trip Response									
ES-1.3, ADS Stage 1–3 Actuation Response									
ES-1.4, ADS Stage 4 Actuation Response									
A-313, Uncontrolled Cooldown									
A-336, Malfunction of Protection and Safety Monitoring System									
E-1, Loss-of-Coolant Accident									
A-342, Reactor Coolant Pump Malfunction									
A-337, Passive RHR Heat Exchanger Leak									
A-343, Loss of Normal Residual Heat Removal									
A-317, Loss of Component Cooling Water									
ES-0.2, Natural Circulation Cooldown									
FR-S.1, Response to Nuclear Power Generation									
E-3, Steam Generator Tube Rupture									
E-2, Faulted Steam Generator Isolation									
A-301, Rapid Power Reduction									
A-307, DAS Operations at Local Cabinets									
FR-C.1, Response to Inadequate Core Cooling									
A-323, Loss of 6.9-kV, 4,160-V, or 480-V Bus Power									
ES-1.1, Passive Safety System Termination									
A-345, Loss of Nuclear Service Water									
A-329, Loss of Instrument Air									
ECA-1.1, Loss-of-Coolant Accident Outside Containment									
FR-H.1, Response to Loss of Heat Sink									
SDP-1, Response to Loss of RCS Inventory During Shutdown									
SDP-2 Response to Loss of RNS During Shutdown									
K/A Category Totals:							Group Point Total:		18/6

E/APE # / Name	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
A-311, Rod Control System Malfunction									
A-308, Loss of Control Room AC									
A-320, Loss of Circulating Water									
A-302, Emergency Boration									
A-327, Startup Feedwater System Malfunction									
A-328, Malfunction of Feedwater Heaters and Extraction Steam									
FR-I.1 Response to High Pressurizer Level									
A-314, Fuel Handling Incident									
A-304, Steam Generator Tube Leak									
A-333, Main Turbine Malfunction									
FR-Z.1, Response to High Containment Pressure									
SDP-4, Response to Rising Nuclear Flux During Shutdown									
SDP-5, Response to RCS Cold Overpressure During Shutdown									
SDP-6 Response to Unexpected RCS Temperature Changes During Shutdown									
A-306, Evacuation of Control Room									
A-318, Condensate System Malfunctions									
FR-C-2, Response to Degraded Core Cooling									
FR-C.3, Response to Saturated Core Cooling									
FR-H.2, Response to Steam Generator Overpressure									
FR-Z.2, Response to Containment Flooding									
FR-Z.3, Response to High Containment Radiation									
FR-Z.4, Response to Low Containment Pressure									
A-332, Turbine Trip Without Reactor Trip									
ES-1.2, Post-LOCA Cooldown and Depressurization									
A-321, Loss of Data Display and Processing System									
FR-P.1, Response to Imminent Pressurized Thermal Shock Condition									
A-340, Reactor Coolant Leak									
FR-1.2, Response to Low Pressurized Level									
FR-1.3, Response to Voids in Reactor Vessel									
A-326, Feedwater System Malfunctions									
A-303, Loss of Plant DC Electric Power or AC Instrument Power									
A-348, Degraded Grid									
K/A Category Totals:							Group Point Total:		8/4

System Name / Safety Function	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
Reactor Coolant / 2, 4														
Steam Generator / 4														
Normal Residual Heat Removal / 4														
Passive Residual Heat Removal / 4														
Passive Core Cooling / 2														
Component Cooling Water / 8														
Pressurizer Pressure Control / 3														
Automatic Depressurization / 3														
Reactor Trip System / 7														
Engineered Safeguards Actuation / 2														
Diverse Actuation / 7														
Passive Containment Cooling / 5														
Main Steam / 4														
Main and Startup Feedwater / 4														
AC Electrical Distribution / 6														
Class 1E and Non 1E DC and UPS / 6														
Onsite Standby Power System / 6														
Service Water / 4														
Compressed Air / 8														
Containment System / 5														
Reactor Coolant Pump / 4														
Chemical and Volume Control / 1, 2														
K/A Category Point Totals:												Group Point Total:		28/5

System Name / Safety Function	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
Digital Rod Control / 1														
Pressurizer Level Control / 2														
Rod Position Indication / 1														
In-Core Instrument System / 7														
Containment Air Filtration / 8														
Containment Hydrogen Control / 5														
Main Control Room HVAC / 8														
Spent Fuel Pool Cooling / 8														
Condensate / 4														
Condenser Air Removal / 4														
Main Turbine and Main Turbine Control / 4														
Fuel Handling / 8														
Gaseous Radwaste / 9														
Radiation Monitoring / 7														
Circulating Water / 8														
Fire Protection / 8														
Steam Dump Control System / 4														
Nuclear Instrumentation System / 7														
Liquid Radwaste System / 9														
K/A Category Point Totals:												Group Point Total:		9/3

Form 4.1-ABWR Advanced Boiling-Water Reactor Examination Outline

Facility:														Date of Exam:					
Tier	Group	RO K/A Category Points												SRO-Only Points					
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total	A2		G		Total	
1. Emergency and Abnormal Plant Evolutions	1				N/A					N/A			20					7	
	2												6					3	
	Tier Totals												26					10	
2. Plant Systems	1												26					5	
	2												11					3	
	Tier Totals												37					8	
3. Generic Knowledge and Abilities Categories	CO		EC			RC		EM					6	CO	EC	RC	EM	7	
	2		2			1		1											
4. Theory	Reactor Theory				Thermodynamics								6						
	3				3														

Note: CO = Conduct of Operations; EC = Equipment Control; RC = Radiation Control;
EM = Emergency Procedures/Plan

E/APE # / Name	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
APE2001 Partial or Complete Loss of Forced Core Flow Circulation									
APE2003 Partial or Complete Loss of AC									
APE2004 Partial or Total Loss of DC Power									
APE2005 Main Turbine Generator Trip									
APE2006 Reactor Scram									
APE2015 Control Room Evacuation									
APE2017 Partial or Total Loss of CCW Reactor Building Cooling Water									
APE2018 Partial or Total Loss of Instrument Air									
APE2020 Loss of Shutdown Cooling									
APE2023 Plant Fire Onsite									
APE2024 Generator Voltage and Electric Grid Disturbances									
APE2022 Refueling Accidents									
EPE1001 High Drywell Pressure									
EPE1002 High Reactor Pressure									
EPE1003 Suppression Pool High Water Temperature									
EPE1004 High Drywell Temperature									
EPE1006 Low Suppression Pool Water Level									
EPE1007 Reactor Low Water Level									
EPE1008 High Secondary Containment Area Temperature									
EPE1009 High Secondary Containment Area Radiation Levels									
EPE1010 Reactor Building HVAC Exhaust High Radiation									
EPE1013 Scram Condition Present and Reactor Power above APRM Downscale or Unknown									
EPE1014 High Offsite Release Rate									
K/A Category Totals:							Group Point Total:		20/7

E/APE # / Name	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
APE2002 Loss of Main Condenser Vacuum									
APE2007 High Reactor Pressure									
APE2008 High Reactor Water Level									
APE2009 Low Reactor Water Level									
APE2010 High Drywell Pressure									
APE2011 High Drywell Temperature									
APE2012 High Suppression Pool Temperature									
APE2013 Inadvertent Reactivity Addition									
APE2014 Incomplete Scram									
APE2016 High Offsite Release Rate									
APE2019 Inadvertent Containment Isolation									
APE2021 Loss of CRD Pumps									
EPE1005 High Suppression Pool Water Level									
EPE1011 Secondary Containment High Differential Pressure									
EPE1012 Secondary Containment High Floor Drain Sump/Area Water Level									
K/A Category Point Totals:							Group Point Total:		6/3

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
SF1RRS & SF4RRS Reactor Recirculation System														
SF1RFC Recirculation Flow Control														
SF1SLC Standby Liquid Control														
SF2RHRLPFL RHR: Low-Pressure Flooder Mode														
SF2HPCF High-Pressure Core Flooder														
SF2RCIC & SF4RCIC Reactor Core Isolation Cooling														
SF2FWC Feedwater Control														
SF3ADS Automatic Depressurization System														
SF3SRV Safety Relief Valves														
SF4RHRSDC RHR: Shutdown Cooling Mode														
SF5RHRSPC RHR: Suppression Pool Cooling Mode														
SF5RHRSPR RHR: Drywell/Wetwell Spray Mode														
SF5LDIS Leak Detection and Isolation System														
SF6EPDS AC Electrical Distribution														
SF6VAC Vital AC Power Supply														
SF6DC Direct Current Power Supply														
SF6DGCTG Emergency Generators (Diesel/CTG)														
SF7RTIS Reactor Trip and Isolation System														
SF7SRNM Startup Range Neutron Monitor														
SF7ELCS ESF Logic and Control System														
SF7APRM Average Power Range Monitor/Local Power Range Monitor														
SF8IAS Instrument Air														
SF8RBCW Reactor Building Cooling Water														
SF8RSW Reactor Service Water														
SF9SGTS Standby Gas Treatment System														
K/A Category Point Totals:												Group Point Total:		26/5

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
SF1CRD Control Rod Drive														
SF1FMCRD Fine Motion Control Rod Drive Mechanism														
SF1RCIS Rod Control and Information System														
SF2RWCU Reactor Water Cleanup														
SF2CD Condensate														
SF2FW Feedwater														
SF2AFI Alternate Feedwater Injection														
SF3NBS & SF4NBS Main and Reheat Steam														
SF3EHC Steam Bypass and Pressure Control/Turbine Pressure Control														
SF4MT Main Turbine Generator and Auxiliaries														
SF5SEC Secondary Containment														
SF5PCS Primary Containment and Auxiliaries														
SF5RPV & SF9RPV Reactor Vessel Internals														
SF6I&C Instrumentation and Control Power Supply														
SF7ATIP Automated Traversing In-Core Probe														
SF7MRBM Multichannel Rod Block Monitor														
SF7NBI Nuclear Boiler Instrumentation														
SF7PICS Plant Information and Control System														
SF7SPTM Suppression Pool Temperature Monitoring														
SF7RSS Remote Shutdown System														
SF7APR Automatic Power Regulator														
SF7ATLM Automated Thermal Limit Monitor														
SF7RMS & SF9RMS Radiation Monitoring														
SF8FPS Fire Protection														
SF8FH Fuel Handling														
SF9FPC Fuel Pool Cooling/Cleanup														
SF9RD Radwaste														
SF90G Offgas														
SF9CRHVAC Control Room Habitability Area HVAC														
SF9HVAC Plant Ventilation Systems														
K/A Category Point Totals:												Group Point Total:		11/3

Form 4.1-COMMON Common Examination Outline

Facility:		Date of Exam:				
Generic Knowledge and Abilities—Tier 3 (RO/SRO)						
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.					
	2.1.					
	2.1.					
	2.1.					
	Subtotal		N/A		N/A	
2. Equipment Control	2.2.					
	2.2.					
	2.2.					
	2.2.					
	Subtotal		N/A		N/A	
3. Radiation Control	2.3.					
	2.3.					
	2.3.					
	Subtotal		N/A		N/A	
4. Emergency Procedures/ Plan	2.4.					
	2.4.					
	2.4.					
	Subtotal		N/A		N/A	
Tier 3 Point Total				**6**		**7**

Theory—Tier 4 (RO)				
Category	K/A #	Topic	RO	
			IR	#
Reactor Theory	6			
	6			
	6			
	Subtotal		N/A	
Thermodynamics	6			
	6			
	6			
	Subtotal		N/A	
Tier 4 Point Total				**6**

Form 4.1-1 Record of Rejected Knowledge and Abilities

Refer to Examination Standard (ES)-4.2, “Developing Written Examinations,” Section B.3, for deviations from the approved written examination outline.

Tier/Group	Randomly Selected K/A	Reason for Rejection

4.2 DEVELOPING WRITTEN EXAMINATIONS

This examination standard (ES) contains the instructions and guidelines for developing written examination questions and assembling the examination for the written examination portion of the NRC operator licensing initial examinations for RO and SRO license applicants at power reactor facilities. Preparing written examinations using the instructions and guidelines in this examination standard, in conjunction with the applicable K/A catalog and the approved written examination outline, ES-4.1, "Developing Written Examination Outlines"), ensures that the written examination includes a representative sample of the items specified in the regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' licenses."

A. Responsibilities

1. Facility Licensee

The facility licensee performs the following activities, as applicable, depending on the examination arrangements confirmed with the NRC regional office in accordance with the instructions in ES-2.1, "Preparing for Operator Licensing Initial Examinations," before the scheduled examination date:

a. Submit the reference materials necessary for the NRC regional office to prepare or review the written examination(s) in accordance with ES-2.1.

b. Prepare the proposed written examination(s) in accordance with the instructions in Section B of this examination standard.

c. (Optional) Submit up to 10 written examination questions to the NRC chief examiner as part of the presubmittal sample for preliminary review and comment.

d. Review the proposed written examination(s) in accordance with ES-2.3, "Reviewing and Approving Operator Licensing Initial Examinations."

e. Submit the proposed written examination(s) to the NRC regional office for review and approval.

f. Submit the final written examination to the NRC.

g. Assemble the final, approved written examinations:

   1. Format the examinations using a one-question-per-page layout by placing one complete question on each page, if possible.

   2. Use a cover sheet in the format shown in Form ES-4.2-3, "Reactor Operator Written Examination Cover Sheet," or Form ES-4.2-4, "Senior Reactor Operator Written Examination Cover Sheet," as applicable, for all RO and SRO written examinations. Fill out all items in the upper section of the cover sheet, except the name of the applicant, when assembling the examinations.

2. NRC Regional Office

The NRC regional office performs the following activities:

a. Verify that the questions are prepared in accordance with this examination standard.

b. Review the proposed written examination(s) in accordance with ES-2.3.

c. Approve the finalized written examination(s) in accordance with ES-2.3.

B. Instructions for Preparing Written Examinations

The examination author should use a combination of existing, modified, and new questions that match the specific K/A statements in the approved written examination outline and the criteria listed in this section to prepare the written examination.

1. License Level Criteria

a. In order to maintain examination quality and consistency, 50–60 percent of the questions on the RO written examination (38–45 questions) and at least 50 percent of the questions on the SRO-only portion of the written examination (13 questions) shall be written at the comprehension/analysis level.

b. A question at the RO level should test 1 (or more) of the 14 items listed under 10 CFR 55.41(b) that the K/A is linked to, or it should test at a RO level as determined from the facility licensee's learning objectives. An SRO-level question should test 1 (or more) of the 7 items listed under 10 CFR 55.43(b) that the K/A is linked to, or it should test at a level that is unique to the SRO job position as determined from the facility licensee's learning objectives.

c. Use the instructions and guidance for developing and reviewing SRO-level questions in Section E of this examination standard.

2. Specific Criteria for Each Tier

a. Ensure that Tier 1 questions test an applicant's knowledge of how to safely operate the plant during emergency and abnormal conditions. Satisfactory ways of achieving this objective include, but are not limited to: (1) information contained in the site's procedures, including alarm response procedures, abnormal operating procedures (AOPs), emergency operating procedures (EOPs), and their associated bases documents; (2) diagnosis that leads to selection of the procedures that should be used to respond to the evolution; (3) the progression of an event; and (4) the assessment of the integrated plant response to emergency or abnormal situations crossing several plant systems or safety functions, or both.

b. Ensure that Tier 2 questions focus on knowledge of plant systems, components, and/or their interrelations.

c. Ensure that Tier 3 questions focus on plant-wide generic K/As and not system-specific knowledge or knowledge of specific emergency/abnormal plant evolutions.

d. Ensure that Tier 4 questions focus on operationally valid knowledge of reactor theory and/or thermodynamics.

3. Deviations from the Approved Written Examination Outline

When selecting and developing questions, it may be necessary to deviate from the previously approved written examination outline. The following are common examples of reasons to deviate:

- The subject K/A is not relevant at the subject facility.
- It is not possible (without expending an unreasonable amount of resources) to prepare a psychometrically sound question related to the subject K/A.
- It is not possible to prepare a question at the correct license level related to the subject K/A.
- The subject K/A is more appropriately tested on the operating test than on the written examination. (A K/A only associated with an "ability" is not a sufficient reason to reject the K/A from the written examination. Therefore, Form 4.1-1 should be used to document why the operating test is a better evaluation tool.)
- It is not possible to prepare a question that is appropriate for its assigned tier (e.g., for K/As selected for Tier 3 questions, the subject K/A does not lend itself to developing a question that focuses on plantwide, generic concepts).

The fact that a K/A does not have a corresponding facility learning objective, was not covered in training, or is subject to selection in multiple tiers is not sufficient to eliminate the K/A from any tier of the outline.

Any time that it becomes necessary to deviate from the previously approved written examination outline, contact the NRC chief examiner for concurrence on the need to deviate and request a replacement K/A. The NRC chief examiner will randomly select and provide a replacement K/A. The examination author must document the eliminated K/A statements on Form 4.1-1, or equivalent, with an explanation of why the K/A was rejected.

4. Limits on Use of Bank Questions and Criteria for New Questions and Significantly Modified Bank Questions

A bank question is a written examination question taken from any facility licensee collection of questions that have previously appeared on any operator training-related examination at the facility. This definition includes NRC Generic Fundamentals Examination (GFE) bank questions and NRC examination questions used at other facility licensee sites. To avoid compromising the integrity and security of the examination and to enhance consistency, authors should observe the following limits on using bank questions when preparing the written examination:

- Limit the use of bank questions to no more than 75 percent of the questions for the examination (56 questions for the RO examination and 19 questions for the SRO-only portion). A bank question may have to be edited or replaced if it conflicts with another question on the examination or if it is necessary to meet the criteria on the written examination quality checklist (Form 2.3-4, "Written Examination Quality Checklist"). Correct technical and psychometric flaws that cause the question to have no or multiple correct answers regardless of when these flaws are identified.

- If the bank contains more than one question that fits a specific K/A statement, randomly select from among the available questions unless there is an appropriate basis for selecting a specific question (e.g., a particular question has a higher cognitive level, has better discrimination validity, is more operationally oriented, or addresses site-specific priorities).

- Write at least 10 new questions (8 for the RO examination and 2 for the SRO-only portion) at the comprehension/analysis level. Generally, if a question is created without referring to a bank question, it can be considered a "new" question.

- Select the remaining questions for the examination by significantly modifying bank questions so that an applicant does not recognize the question as a bank question. Significant modification can be met by any of the following:

  – Change at least one pertinent condition in the stem and at least one distractor.
  OR
  – Change the conditions in the stem such that one of the three distractors in the original question becomes the correct answer.
  OR
  – The NRC chief examiner agrees that the bank question is significantly modified, and an applicant would not be able to arrive at the correct answer because he or she recognizes the question from the bank.

- When significantly modifying a bank question, the intent or objective of the question does not have to change. Adding or deleting irrelevant information and making minor changes (e.g., the unit number, component train, or power level when it makes no difference) does not qualify as a significant modification to the question.

5. Length of the Written Examination

The applicants should be able to complete and review the RO examination within 4 hours and the SRO-only portion within 2 hours. (Refer to ES 4.3, "Administering Written Examinations," for examination administration time limits, which are longer.)

6. Instructions for Documenting Questions and for Reference Material

The author should use Form 4.2-1, "Written Examination Question Worksheet," or an equivalent form to document the required information that accompanies each proposed question submitted to the NRC for review and approval:

a. For every question, provide a technical reference, including the reference's revision or version number (if applicable) and a cross-reference to the facility licensee's examination question bank, if applicable. If the facility licensee has a learning objective applicable to the question, reference it as well. However, the absence of a learning objective does not invalidate the question if it has an appropriate K/A and technical reference.

b. For every question, explain briefly why the answer is correct and why each distractor is plausible but incorrect. This increases the efficiency of the examination review process and promotes the detection and correction of invalid questions before the examinations are approved for administration.

c. For every question, provide applicable source information as follows:

- new question
- bank question: Identify bank items that were used on an NRC licensing examination at the facility by indicating the examination location and year that it was administered.
- modified bank question: Explain how the bank question was significantly modified or include a copy of the original bank question.

d. The written examination for initial licensing is a closed-reference examination to test and evaluate the applicants' initial mastery of the required knowledge, skills, and abilities. Reference materials, such as diagrams, sketches, mimics, pictures, and portions of facility procedures, may be used on a selective basis, either embedded within a specific question or as attachments to the written examination. Ensure that all the following criteria are met when using reference material in the examination:

- Material is easy to read and clearly marked.
- Material provides an effective and objective way for the applicant to demonstrate knowledge of the topic or concept.
- Material does not give away the answers to other questions on the examination or improve the applicant's chances of guessing the correct answer by eliminating incorrect distractors.
- RO reference material cannot cue or give away an answer to an SRO question and vice-versa. (In accordance with ES-4.3, the SRO and RO written examinations must be given at the same time.)

C. General Guidelines Applicable to All Written Examination Questions

The following guidelines are applicable to all written examination questions, including open-reference-style questions that are used on an NRC-developed requalification examination. The guidelines are based in part on psychometrics—the process of applying sound qualitative processes to mental measurements. It is important to minimize the number of psychometric errors in NRC examinations because test items that are free of psychometric errors yield greater measurement validity.

Form 4.2-2, "Question Development Checklist," summarizes these guidelines and can be used as a job aid during the process of developing and reviewing written examination questions. Appendix B, "Examples of Written Examination Questions," provides examples that illustrate the psychometric errors that should be avoided. Additionally, Appendix A, "Overview of Generic Examination Concepts," contains an overview of generic concepts related to preparing and formatting content-valid written examinations and should be referred to as necessary while preparing the examination.

Examination authors should follow these guidelines:

1. Ensure that the concept being measured has a direct, important relationship to the ability to perform the job. Although Appendix A stresses the importance of relevant K/As and testing objectives, it is equally important that the construction of the question itself clearly reflects the importance of the topic.

   It is not always necessary to establish a direct, word-for-word match between a question and a facility learning objective. A broadly stated learning objective may support any number of related questions.

   Similarly, the absence of a facility learning objective does not preclude the development of a valid, K/A-based question. This is consistent with the concept of the NRC examination providing checks and balances on the facility licensee's training program, thereby alerting the facility licensee that it may need to develop such a learning objective.

   Although it is appropriate to develop questions regarding knowledge that is embedded in, or covered by, procedures, do not test knowledge that is trivial in nature.

2. Ensure that the question matches the intent of the K/A.

   It is very easy to wind up with a question that tests a relatively trivial aspect of an important K/A topic. When reviewing the draft question, consider whether it is likely that someone could answer the question correctly and still not meet the objective or intent of the K/A or perform the responsibilities or tasks for which the K/A is needed.

   To facilitate the translation of a K/A into a test question, consider the following prompts to help generate ideas for potential test questions:

   a. What are the common misconceptions about this topic?
   b. Why is this topic important to satisfactory job performance?
   c. Under which circumstances would it be important to understand this topic?
   d. What might an individual do if he or she does not understand this topic?
   e. What might be the consequences of a lack of knowledge about this topic?
   f. How can the individual demonstrate his or her knowledge of this topic?

   When selecting or writing questions for K/As that test coupled K/As (e.g., the A.2 K/A statements in Tiers 1 and 2 and a number of generic K/A statements, such as 2.4.1, in Tier 3), try to test both aspects of the K/A statement. If that is not possible without expending an inordinate amount of resources, limit the scope of the question to that aspect of the K/A statement requiring the highest cognitive level (e.g., the (b) portion of the A.2 K/A statements) or substitute another randomly selected K/A.

3. State the question unambiguously, precisely, and as concisely as possible, but provide all necessary information.

   Often the individuals who develop a question assume that certain stipulations or conditions are inherent in the question when, in fact, they are not. It is very difficult for the person who wrote a question to review it impartially or through the eyes of a new reader. Therefore, it is very important to have others review the questions to ensure that they include all necessary information and exclude all extraneous or superfluous information. For example, it is not necessary to provide a status for each annunciated

parameter that is in its normal (nonalarming) state. ES-2.3 provides additional guidance on examination reviews, and ES-1.2, "Guidelines for Taking NRC Examinations," gives the instructions to applicants on question clarity and assumptions.

However, as discussed in Appendix A, keep in mind that the key purpose of any test item is to assess important K/As at a level that distinguishes between safe and unsafe applicants. A test item's ability to make that distinction is referred to as its discrimination validity. For a question to differentiate at the appropriate level, the test author must exercise judgment in establishing the initial conditions posed in the stem of the question. Providing too much information may "lead the applicant to the answer" and decrease the validity of the question because the answer is obvious to all applicants.

For closed-reference questions related to a specific plant procedure, it is generally desirable for the question to cite the number and title of the subject procedure, thereby limiting the possibility of an alternative correct answer if another procedure happens to relate to the same activity. For open-reference questions, use caution to ensure that the question does not become a direct lookup, with a pointer to help the applicant find the answer.

4. Write the question at the highest level of knowledge reflected in the testing objective.

One of the most challenging aspects of question development is capturing the appropriate level of knowledge. The reference benchmark that the NRC uses to classify the levels of knowledge of test items is Bloom's taxonomy, a classification scheme that permits the grouping of items by the level (depth) of mental thought and performance required to answer the items. (Refer to Appendix B for references related to Bloom's taxonomy.) Although Bloom's taxonomy is most pertinent to written examination questions, it can also be applied to simulator scenarios and job performance measures. In ascending order, the three levels (depths) of mental thought and performance are the following (refer to Appendix B for examples of each level):

a. Level 1 (i.e., fundamental knowledge or simple memory) tests the recall or recognition of discrete bits of information. Examples include knowledge of terminology, definitions, set points, patterns, structures, procedural steps and cautions, and other specific facts.

b. Level 2 (i.e., comprehension) involves the mental process of understanding the material by relating it to its own parts or to some other material. Examples include rephrasing information in different words, describing or recognizing relationships, showing similarities and differences among parts or wholes, and recognizing how systems interact, including consequences or implications.

c. Level 3 (i.e., analysis, synthesis, or application) testing is a more active and product-oriented testing approach, which involves the multifaceted mental process of assembling, sorting, or integrating the parts (information bits and their relationships) to predict an event or outcome, solve a problem, or create something new. This level requires mentally using the knowledge and its meaning to solve problems.

Although test questions should be written to reflect the level of knowledge that is most appropriate for a specific K/A, the written examination should avoid high percentages of

questions on fundamental knowledge. When choosing between two levels of knowledge, try to write the question to reflect the higher level. In general, test items at the comprehension and analysis levels are the most operationally oriented and, therefore, tend to be the most valid and discriminatory measure of operator knowledge and safe performance. Questions that require only memorization or recall are not acceptable for use on open-reference examinations.

5. Establish a level of difficulty that distinguishes between applicants who have and have not mastered the required K/As and skills. Avoid unnecessarily difficult or irrelevant questions.

As discussed conceptually in Appendix A, both the level of knowledge and the difficulty of an item are at the heart of examination discrimination. Authors should develop examinations that are estimated to center around the 80-percent cut score level, with individual item difficulty estimated to fall in the 70- to 90-percent difficulty range. (These parameters should not be viewed as precise benchmarks but rather as approximate end points.) Authors of written examinations should consider the results of past examinations when preparing a new one. Past performance on individual test questions may provide a basis for generating new questions and for estimating the level of difficulty of the examination. For example, questions that everyone answered incorrectly may indicate that the topic did not receive sufficient emphasis in training or that the item was poorly worded. Conversely, questions that everyone answered correctly may indicate that the item was written at too low a level or that the distractors were not very plausible.

Because item difficulty can usually be decreased or increased through revision, the examination author need not be overly preoccupied with difficulty when writing the items. Instead, the author should focus on achieving a valid measure of the concept he or she is attempting to evaluate.

When determining the appropriate level of difficulty, it may be helpful to think of two groups of individuals, one composed of experienced operators and the other of typical applicants, and evaluate the likelihood that each group of individuals will be able to answer the question. If at least 80 percent of the job incumbents or license applicants should be able to answer the question as written based on the expected knowledge levels for the position (RO or SRO), the item is likely written at an appropriate difficulty level. Authors and reviewers of written examinations may also consider the following factors in an effort to identify questions that are unnecessarily difficult or irrelevant:

a. Could someone do the job safely and effectively even without being able to answer the question? If so, is it because (1) the content is inappropriate, (2) the wording is unclear, or (3) the level of understanding is too great?

b. What aspects of the item or option might cause the most difficulty? Has the item been made artificially difficult? Can a person understand the principle being tested and still miss the item?

Estimates of difficulty made by the written examination author and reviewers may vary somewhat but should not vary widely. Unless there is some reason to doubt the estimates of some reviewers, the average estimate may be taken as a basis for assessing the suitability of item difficulty for the examination. Items should be revised if estimates fall well below or above the 70- to 90-percent target range.

Research has shown that when authors write test items in their own area of specialization, they tend to underestimate the difficulty of a concept or principle being tested. This tendency can manifest itself in two ways: (1) the author will view items of average difficulty as being easy or (2) in an effort to include plausible misleads among distractors in a multiple-choice test item, the author may make the item even more difficult. For this reason, an estimate of item difficulty made by the reviewers will probably be more accurate than one made by the author of the item.

Authors of written examinations should take care not to develop an examination with wide swings of individual item difficulty. For example, writing half of the items where 60-percent of the applicants would be expected to get the answer correct and the other half of the items where 100-percent of the applicants would be expected to get the answer correct, would yield an average of 80 percent for the entire examination; however, this approach has numerous flaws. The items at the 100-percent level, by design, would be meaningless, since they would fail to differentiate at any level because the expectation is that nearly everyone would answer the question correctly. On the other hand, those written where 60-percent of the applicants would be expected to get the answer correct, by design, would also not differentiate and would likewise be unfair because 40 percent of the applicants would not be expected to answer those items correctly.

6. Limit the question to one concept or topic, unless the synthesis of the concepts is being tested. There is a common misconception that testing for multiple K/A topics in one question is a time-efficient way to examine. However, questions containing a variety of topics and issues only serve to confuse the examinee about the purpose of the question and what is expected in terms of a correct response. Develop each individual question to test the selected K/A topic and make that topic (as well as the intent of the question) clear to both the reviewer and the examinee.

7. Avoid copying text directly from training or other reference material. Another common tendency among written examination authors is to copy sentences directly from reference material and turn them into test questions. Unfortunately, questions written in this way generally encourage rote memorization. Furthermore, copying from reference material can cause ambiguity or deficiency in questions because the replicated material often draws its meaning and importance from its surrounding context. Therefore, the test question often omits important assumptions or stipulations stated elsewhere in the material. Finally, such questions can frequently be answered correctly by examinees who do not really understand the concept but do remember the specific wording on a page of reference material. Conversely, examinees who understand the topic, but not in the exact way it was written in the material, may miss the question because of unstated assumptions or other missing information.

8. Avoid “backward logic” questions that ask for what should be provided in the question and give what should be required in the examinee’s response. Appendix B provides examples of backward logic questions.

   In addition to testing on valid topics, it is important to test on those topics in a way that is consistent with how the K/A should be remembered and used. Do not test on the topic in a backward way.

9. Ensure that each question is technically accurate.

10. Ensure that each question is free of confusing or ambiguous language.

D. Instructions for Constructing Multiple-Choice Questions

1. All written examination questions must be in the multiple-choice format. Use four answer options. Each question is worth one point. The four-distractor multiple-choice item with only one correct answer is the only style that is considered acceptable for NRC examinations.

   Do not use test items with multiple correct answers from which examinees must select the "most correct" answer because such items significantly reduce the reliability of examination results by increasing the effect of examiner subjectivity in the examination development and grading processes.

   The five-answer option contributes nothing to the question, and any format with fewer than four distractors makes guessing correctly more probable.

2. The following four basic models are acceptable and may be used in combination with one another:

   Model A:

   A. correct answer
   B. plausible incorrect answer
   C. plausible incorrect answer
   D. plausible incorrect answer

   This model depicts the traditional multiple-choice design format with one correct single-word/phrase answer followed by three incorrect single-word/phrase options. Note that all options are of similar length.

   Model B:

   A. correct answer
   B. plausible misconception
   C. plausible incorrect answer
   D. plausible incorrect answer

   This variation of Model A uses a plausible misconception as one of the three incorrect answers. Again, note that all options are of similar length.

   Model C:

   A. correct answer with correct condition (e.g., because, since, when, if, and other such conditions)

   B. correct answer with plausible incorrect condition

   C. plausible incorrect answer with correct condition

D. plausible incorrect answer with incorrect condition

Model C depicts an acceptable design that uses answers with conditions (i.e., a setting, event, cause, or effect) that may make the answer correct or incorrect. Note that Model C shows only one correct answer with its correct condition, and all options are similar in length.

Model D:

A. correct answer
B. plausible incorrect answer
C. correct answer with plausible incorrect condition
D. plausible incorrect answer with incorrect condition

Model D is useful when it is not possible to create four options of similar length. This model shows paired lengths (two long and two short options). This approach prevents any one option from standing apart (by being either too long or too short) from the remaining options.

When using Model C or D, it is particularly important to maximize the plausibility of any incorrect conditions that appear in multiple distractors to minimize the chances that examinees will be able to eliminate those distractors by detecting one piece of implausible information.

3. Do not use “all of the above” or “none of the above.”

“All of the above” questions provide inadvertent clues to the examinee. When the “all of the above” option is the correct response, the examinee must simply recognize that two options are correct to answer the question correctly. Similarly, when “all of the above” is used as a distractor, the examinee only needs to be able to determine that one option is incorrect in order to eliminate this option. “None of the above” responses should not be used with “best answer” multiple-choice questions, since it may always be defensible as a response. Note that a question might fall into this category even if the words “all of the above” or “none of the above” do not appear in the answer choices.

4. Do not present a collection of true/false (T/F) statements as a multiple-choice item.

As previously discussed, each item should focus on one K/A topic that is determined by the stem of the question. A question containing answer options related to many separate issues does not increase the efficiency of the question. To the contrary, questions with multiple topics confuse the examinee about the meaning and purpose of the question.

As a way of determining whether a test item is a collection of T/F statements, check whether the answer can be determined, or the distractors can be rejected, without the information contained in the stem. If so, the question is likely a T/F collection. Appendix B provides sample questions that illustrate this psychometric deficiency.

5. Define the question, task, or problem in the stem of the question. In designing multiple-choice questions that are operationally based and require an application/use scenario, consider providing the conditions in the first part of the question, separated by

a double space from the body of the question and blocked to the left column with each condition bulleted, as in the following example:

Given the following conditions:

- Both main feed pumps tripped.
- Auxiliary feedwater (AFW) automatically started.
- AFW valves reset to control steam generator water level.
- AFW suction pressure decreased to 7 psig.

Which ONE of the following describes the AFW pump response for the given conditions?

A. Suction will automatically shift to the nuclear service water system.
B. Suction will automatically shift to the upper surge tank.
C. Trip when suction pressure decreases to 5 psig.
D. Trip after a 6-second time delay.

6. Include as much necessary information as possible about the problem or situation in the stem, leaving only the solution, action, or effect for the answer options. Consider the following "poor" and "better" examples:

(Poor) At 50-percent power:

A. The equilibrium xenon reactivity worth is approximately equal to the equilibrium xenon worth at 100-percent power.

B. The equilibrium xenon reactivity worth is approximately one-half the equilibrium xenon worth at 100-percent power.

C. The equilibrium xenon reactivity worth is approximately two-thirds the equilibrium xenon worth at 100-percent power.

D. The equilibrium xenon reactivity worth is approximately three-fourths the equilibrium xenon worth at 100-percent power.

(Better) How does the equilibrium xenon reactivity worth at 50-percent power compare to the equilibrium xenon reactivity worth at 100-percent power?

A. equal to
B. one-half
C. two-thirds
D. three-fourths

7. When possible, avoid using negatively stated stems. Try to write the question in a positive manner (e.g., instead of "do not open the valve," use "keep the valve closed"). If a negative stem is necessary, highlight the negative word (e.g., *not, never, least*).

It is very tempting to write negatively stated questions, since they can be constructed by picking three true statements out of the reference material and changing a fourth statement to make it false. However, studies have shown that examinees do not do as

well on negatively stated questions because they overlook the negative word or because negatively stated questions require examinees to select an answer that is not true or characteristic, which can be somewhat confusing. In addition, these questions tend to emphasize negative learning. For example, consider the following stem of a multiple-choice question:

> During 100-percent power operation, the feedwater heater 2A high-level dump valve opens inadvertently. The condensate pumps will not do which of the following:

This stem can be made to read positively:

> During 100-percent power operation, the feedwater heater 2A high-level dump valve opens inadvertently. The condensate pumps will do the following:
>
> A. Increase flow to maintain feedwater flow rate.
> B. Trip because of a runout condition.
> C. Have no response.
> D. Trip because of low suction pressure.

Although a negatively stated question is sometimes unavoidable, *never* use a negatively stated stem with a negatively stated answer option, as illustrated by example E.3 in Appendix B.

8. Provide sufficient counterbalance in questions with multipart answers.

Multiple-choice questions can legitimately contain multipart answer options. However, if the answers contain too many parts or too many options for each part, cues indicating the correct answer may be unavoidable. Consider the following example:

> The reactor coolant system (RCS) is in hot standby with no reactor coolant pumps (RCPs) running. If the once-through steam generator pressure is decreased, according to the plant verification procedure, which of the following temperature responses indicate the presence of natural circulation?
>
> A. T-H increases; T-C remains the same.
> B. T-H increases; T-C decreases.
> C. T-H decreases; T-C decreases.
> D. T-H remains the same; T-C decreases.

The examinee could choose the correct answer (c) without knowing about the T-C temperature response in this situation, since “T-H decreases” only occurs in option “C.”

Notice that two-part answers, with each part containing a two-option response, can provide complete counterbalance, since all contingencies can be covered in four responses (provided that the responses meet plausibility requirements), as in the following example:

> Which of the following is a definition of quadrant power tilt ratio?
>
> A. minimum upper detector output divided by average upper detector output

B. maximum upper detector output divided by average upper detector output
C. minimum upper detector output divided by average lower detector output
D. maximum upper detector output divided by average lower detector output

If a multipart question format is used, the recommended format is one in which the two-part answer options consist of a two-level response (e.g., yes/no, off/on) and a reason, as in the following example:

Which of the following describes the behavior of equilibrium xenon reactivity over core life?

A. It decreases because of the increased fuel burnup.
B. It decreases because of the decrease in plutonium-xenon yield.
C. It increases because of the increase in thermal flux.
D. It increases because of the decrease in boron concentration.

Note: For multipart questions, both parts of the question must test a topic/concept that is related to the associated K/A.

Sometimes, to improve their plausibility, distractors may include secondary pieces of information that have lower relative importance and discriminatory value than the key point of the distractor. However, those secondary pieces of information are not irrelevant; the value of the question should be considered as a whole and not discounted because the answer choices contain information of lower importance.

9. When possible, include common misconceptions as distractors. Since the purpose of the examination is to differentiate between competent and less-than-competent examinees, consider questions involving topics for which there are common misconceptions about important K/A topics. For example, the following question was based on a common misconception about a loss of subcooling margin:

During a small-break loss-of-coolant accident with a resultant loss of subcooling margin, why are the RCPs secured?

A. to prevent pump damage resulting from operation under two-phase conditions

B. to prevent core damage resulting from rapid phase separation upon subsequent loss of RCS flow

C. to reduce RCS pressure by removing the pressure head developed by the RCPs

D. to remove the heat being added to the RCS by the operating RCPs

10. Make all answer options homogeneous. Ensure there is only one correct answer and that the distractors are highly plausible. Consider the following “poor” and “better” examples:

On a loss of condenser circulating water intake canal, the upper surge tank, hotwell, and condensate storage tank will supply sufficient feedwater to allow decay heat removal for approximately:

Poor		Better	
A.	15 minutes	A.	8 hours
B.	8 hours	B.	24 hours
C.	48 hours	C.	48 hours
D.	3 months	D.	72 hours

Notice how one method of changing the difficulty level of a question is to vary the similarity of the answer options. The distractors should be similar enough to be chosen by those who do not meet the testing objective, yet different enough so they do not test trivial issues or distinctions. Also note how the answer options in each case are listed in order of magnitude.

11. If the answer options have a logical or a timeline sequence, put them in order (as in no. 10 above).

12. Avoid overlapping answer options, as in the following example:

The self-powered neutron detector uses rhodium, which decays with a half-life of 42 seconds. How long will it take for a detector to indicate approximately 95 percent of an instantaneous power-level change?

Poor		Better	
A.	2 to 4 minutes	A.	1 to 2 minutes
B.	4 to 6 minutes	B.	3 to 4 minutes
C.	6 to 8 minutes	C.	5 to 6 minutes
D.	8 to 10 minutes	D.	7 to 8 minutes

13. Do not include trivial distractors with more important distractors. In the search for distractors, it is very tempting to include relatively trivial facts along with options that focus on more important issues or concepts, as in the following example:

Which of the following is true concerning the turbine?

A. The turbine is rotated at low speed when shut down to prevent distortion of the turbine casing.

B. Turbine eccentricity is the measure of turbine speed.

C. The turbine blades are cooled by hydrogen gas.

D. Technical specifications require that at least one turbine overspeed protection system must be operable in Mode 2.

Relative to the other options, option “C” could be considered a trivial distractor. Even if included as an incorrect answer, relatively unimportant information jeopardizes the

content validity of the question. Also, note that this question consists of a collection of T/F statements as described in no. 4 above.

14. Vary the position of the correct answer; avoid a pattern. Make sure that the position of the correct answer is randomized throughout the examination. This means that options "A," "B," "C," and "D" should be correct about an equal number of times, but in no specific order.

15. Avoid "specific determiners" that give clues as to the correct answer. Specific determiners include the following:

    a. distractors that do not follow grammatically from the stem, as in the following example:

        During 100-percent normal power operation, a single steam flow element in the steam generator feedwater control system fails high. This will cause the following:

        A. the feedwater valves to increase steam generator level slightly before returning the level to normal

        B. before returning the level to slightly above normal, the feedwater valves to increase the steam generator level significantly

        C. the feedwater valves to increase the steam generator level to the level of a reactor trip

        D. the feedwater valves to increase the steam generator level slightly and maintain the increased level

    Note the improvement when distractor "B" is reworded as follows:

        B. the feedwater valves to increase the steam generator level significantly before returning the level to slightly above normal

    b. options that can be judged correct or incorrect without reading the stem

    c. equivalent or synonymous options, which rule out both options for an examinee who recognizes the equivalence

    d. an option that includes another option, also called a "subset" (e.g., (A) less than 5; (B) less than 3)

    e. implausible distractors

    f. a correct answer that is longer or shorter than the distractors

    g. qualifiers in the correct answer (e.g., probably and ordinarily) unless they are also used in the distractors

    h. words such as "never" or "always" that suggest an incorrect option

i. a correct option that differs from the distractors in favorableness, style, or terminology, as in the following example:

Which action or occurrence is likely to cause water hammer?

A. maintaining the discharge line from an auto starting pump filled with fluid

B. water collecting in a steamline

C. prewarming of steam lines

D. slowly closing the discharge valve of an operating pump

In the above question, all options except for "B" (the correct answer) describe preventive actions, while option "B" describes a condition that occurs as a result of negligence or oversight. A test-wise examinee would only need to know that water hammer is not a desired occurrence to determine that "B" is the least favorable and, therefore, the correct answer.

j. When appropriate, use distractors that are generically correct statements, but do not correctly answer the question, as illustrated in the following example:

Preparations are being made for refueling, and the following plant conditions exist:

- The refueling cavity is filled with the transfer tube gate valve open.
- The SFP LO LEVEL and CTMT SUMP HI LEVEL annunciators are in alarm.

Which ONE of the following is the required IMMEDIATE ACTION in response to these conditions?

A. Verify alarms by checking the containment sump level recorder and spent fuel level indication.

B. Sound the containment evacuation alarm.

C. Initiate containment ventilation isolation.

D. Initiate control room ventilation isolation.

Answer "A" is a generic good practice, but it is not responsive to the conditions specified in the stem of the question. It is not a required immediate action, nor is it an appropriate response in light of the mutually confirmatory annunciators that are in alarm.

E. Instructions for Developing and Reviewing SRO-Level Questions

1. The 25 questions for the SRO-level written examination, also known as "SRO-only questions," help the NRC evaluate the additional knowledge, skills, and abilities required

for performing licensed senior operator duties. SRO-level questions must be consistent with the cognitive level of their associated K/A statement.

Several generic K/As in Section 2 of the applicable K/A catalogs are specifically linked to one or more topics specified in 10 CFR 55.43(b), and all of the Category A2, AA2, and EA2 K/A statements are (or, in the case of NUREG-1123, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Boiling Water Reactors," should be) similarly linked. Consequently, the K/As for the SRO-portion of the written examination will be drawn from those K/A categories (denoted by Columns "A2" and "G" in the SRO-only section of the applicable written examination outline) and from all K/A categories related to the fuel handling facilities, which are specifically identified for sampling in 10 CFR 55.43(b)(7). The fact that a K/A is linked to both 10 CFR 55.41, "Written examination: operators," and 10 CFR 55.43, "Written examination: Senior operators," does not mean that the K/A cannot be used to develop an SRO-level question, nor does it exclude the K/A from sampling on the RO examination. However, to be used on the SRO-portion of a written examination, a question developed from a K/A linked to both 10 CFR 55.41 and 10 CFR 55.43 must either test at the level of the 10 CFR 55.43(b) item number(s) that the K/A is linked to, or test at a level that is unique to the SRO job position as determined by the facility licensee training program. Similarly, K/A topics linked to 10 CFR 55.41(b) might also be appropriate for developing SRO-level questions if the questions developed evaluate K/As at a 10 CFR 55.43(b) level or at a level that is unique to the SRO job position as determined from the facility licensee's learning objectives. The fact that a K/A does not reference 10 CFR 55.43 does not, in and of itself, disqualify the K/A from testing on the SRO-portion of a written examination.

2. Each SRO-level question must be tied to one of the 10 CFR 55.43(b) items. If a facility licensee desires to evaluate a K/A that is not tied to one of the 10 CFR 55.43(b) items, then the licensee must classify the K/A as "unique to the SRO position" and provide documentation that ties the K/A to the facility licensee's SRO job position duties in accordance with the systematic approach to training, as in the following examples:

   - The question is linked to a learning objective that is specifically labeled in the lesson plan as being SRO-only (e.g., some facility licensee lesson plans have columns in the margin that differentiate auxiliary operator, RO, and SRO learning objectives).

   - The question is linked to a task that is labeled as an SRO-only task, and the task is *not* listed in the RO task list. Note: The fact that a facility licensee trains its ROs to master certain 10 CFR 55.43 K/As and skills does *not* mean that they can no longer be used as a basis for SRO-only questions.

3. Examination authors should use the 10 CFR 55.43(b) topic-based guidance and examples (a–g below) when developing SRO-level questions.

a. Conditions and Limitations in the Facility License [10 CFR 55.43(b)(1)]

Examples of SRO-only examination items for this topic include the following:

- reporting requirements when the maximum licensed thermal power output is exceeded

- administration of fire protection program requirements, such as compensatory actions associated with inoperable sprinkler systems and fire doors

- required actions necessary when a facility does not meet the administrative controls listed in Technical Specifications (TS) Section 5 or 6, depending on the facility (e.g., shift staffing requirements)

- National Pollutant Discharge Elimination System requirements, if applicable

- processes for TS and final safety analysis report changes

Note: The analysis and selection of required actions for TS Sections 3 and 4 may be more appropriately listed for the 10 CFR 55.43(b)(2) topic.

b. Facility Operating Limitations in the Technical Specifications and Their Bases [10 CFR 55.43(b)(2)]

Examples of SRO-only examination items for this topic include the following:

- application of required actions (TS Section 3) and surveillance requirements (SRs) (TS Section 4) in accordance with rules of application requirements (TS Section 1)

- application of generic limiting condition for operation (LCO) requirements (LCOs 3.0.1 through 3.0.7; SRs 4.0.1 through 4.0.4)

- knowledge of TS bases that are necessary to analyze TS-required actions and terminology; such knowledge should be beyond that associated with "above the line" TS information or plant systems knowledge, as shown in the following examples:

  – [TS bases required to analyze TS-required actions] For a given facility, TS 3.7.14, "Spent Fuel Pool Water Level," Action A.1, requires suspending movement of irradiated fuel assemblies in the spent fuel pool *immediately* if spent fuel pool water level is not within limits. However, the basis information for this TS action clarifies that this does not preclude movement of a fuel assembly to a safe position. Thus, despite the wording of the TS action, the correct application (taking the basis into account), would be to first complete an in-progress fuel movement *before* suspending movement.

  – [terminology] For another facility, TS 3.4.7, "Residual Heat Removal (RHR) Shutdown Cooling System—Hot Shutdown," Action A.2, requires verifying that an "alternate method of decay heat removal" is available for each inoperable RHR shutdown cooling subsystem within 1 hour of one or two RHR shutdown cooling subsystems becoming inoperable. However, Action A.2 does not detail the composition of these methods. The basis information for this TS action clarifies that decay heat removal by ambient losses, the condensate/main steam systems, the reactor water cleanup system, and a combination of an emergency core cooling system pump and a safety relief valve are all possible means of satisfying this requirement.

- the same items listed above for the technical requirements manual (TRM) and offsite dose calculation manual (ODCM)

SRO-only knowledge generally cannot be claimed for questions that can be answered *solely* based on knowledge of ≤ 1-hour action statements and the safety limits since ROs are typically required to know these items. SRO-only knowledge generally cannot be claimed for questions that can be answered *solely* based on expected RO TS knowledge. ROs are typically expected to know the LCO statements and associated applicability information (i.e., the information above the double line separating the ACTIONS from the LCO and associated applicability statements in the standardized TS, as shown in the example in Figure 4.2-1).

Figure 4.2-1 Example of "Above the Line" TS Information

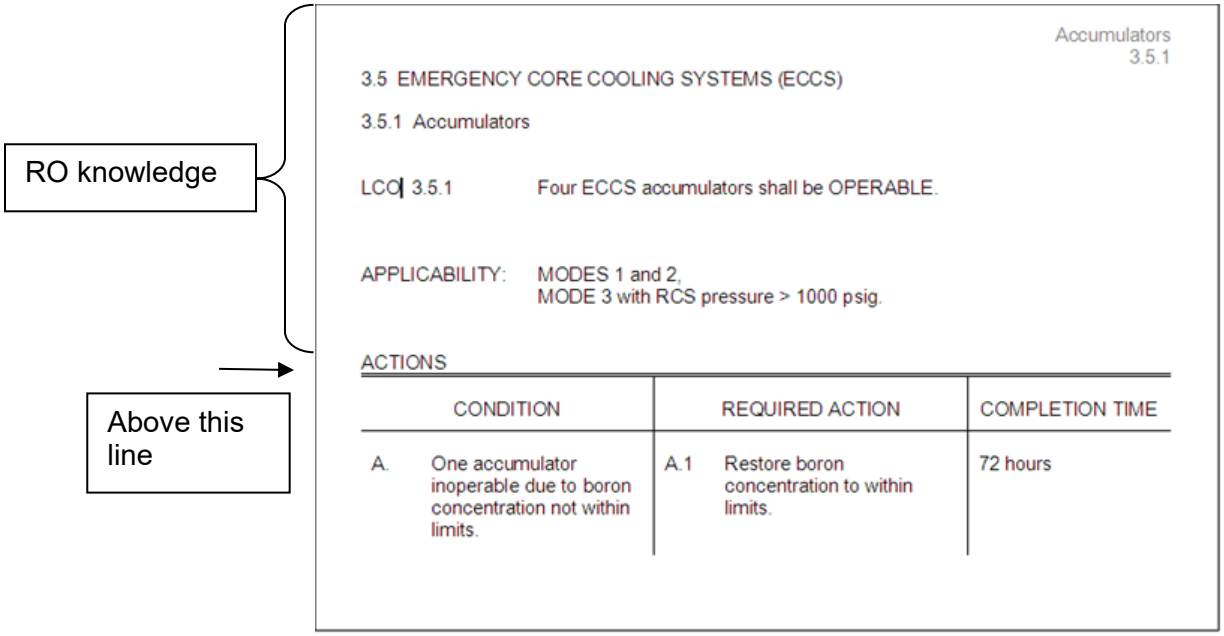
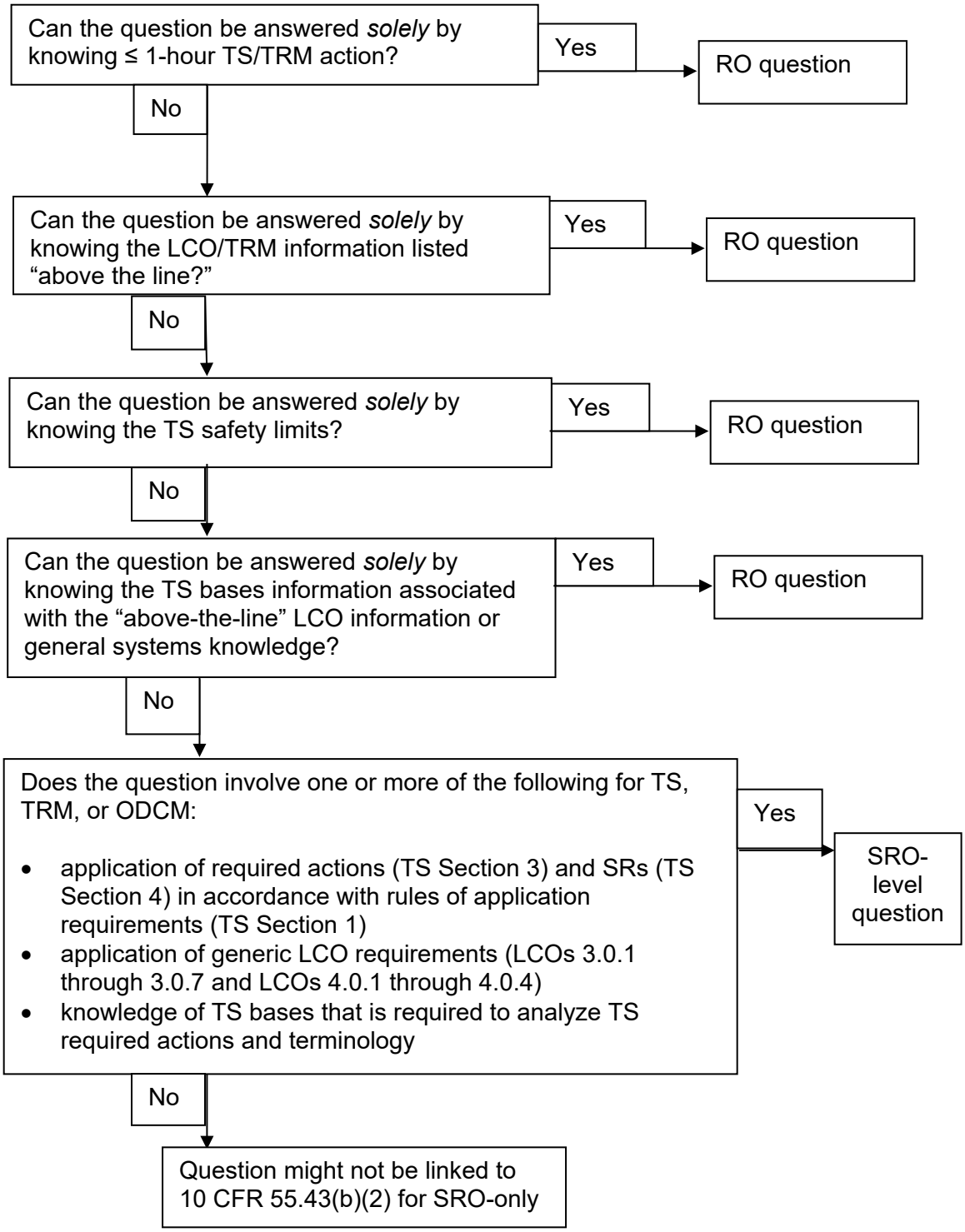


Figure 4.2-2 Screening for SRO-Only Questions Linked to 10 CFR 55.43(b)(2) (TS)



c. Facility Licensee Procedures Required to Obtain Authority for Design and Operating Changes in the Facility [10 CFR 55.43(b)(3)]

Some examples of SRO-only examination items for this topic include the following:

- screening and evaluation processes under 10 CFR 50.59, “Changes, tests, and experiments”
- administrative processes for temporary modifications
- administrative processes for disabling annunciators
- administrative processes for the installation of temporary instrumentation
- processes for changing the plant or plant procedures

Appendix B provides an example of a satisfactory SRO-level question related to this topic.

d. Radiation Hazards that May Arise during Normal and Abnormal Situations, including Maintenance Activities and Various Contamination Conditions [10 CFR 55.43(b)(4)]

Some examples of SRO-only examination items for this topic include the following:

- process for gaseous/liquid release approvals (i.e., release permits)
- analysis and interpretation of radiation and activity readings as they pertain to the selection of administrative, normal, abnormal, and emergency procedures
- analysis and interpretation of coolant activity, including comparison to emergency plan criteria or regulatory limits (or both)
- process for authorizing emergency exposure limits

SRO-only knowledge should not be claimed for questions that can be answered *solely* based on RO knowledge of radiological safety principles (e.g., radiation work permit requirements, stay time, and derived air concentration hours).

e. Assessment of Facility Conditions and Selection of Appropriate Procedures during Normal, Abnormal, and Emergency Situations [10 CFR 55.43(b)(5)]

This topic involves both (1) assessing plant conditions (normal, abnormal, or emergency) and then (2) selecting a procedure or section of a procedure to mitigate or recover, or with which to proceed. One area of SRO-level knowledge (with respect to selecting a procedure) is knowledge of the content of the procedure versus knowledge of the procedure’s overall mitigative strategy or purpose.

The applicant’s knowledge can be evaluated at the level of 10 CFR 55.43(b)(5) by ensuring that the additional knowledge of the procedure’s content is required to correctly answer the written test item, as in the following examples:

- knowledge of when to implement attachments and appendices, including how to coordinate these items with procedure steps
- knowledge of diagnostic steps and decision points in the EOPs that involve transitions to event-specific subprocedures or emergency contingency procedures

- knowledge of administrative procedures that specify hierarchy, implementation, or coordination of plant normal, abnormal, and emergency procedures

Another area of SRO-level knowledge (with respect to selecting a procedure) is knowledge of decision points within the facility's emergency plan. These include emergency action level declarations and protective action recommendations since these would subsequently lead to the implementation of various subprocedures within the emergency plan.

SRO-only knowledge should *not* be claimed for questions that can be answered *solely* using "systems knowledge," such as the following:

- how the system works
- system flowpath
- component locations

SRO-only knowledge should *not* be claimed for questions that can be answered *solely* using fundamental knowledge of the following:

- the basic purpose of a procedure, the overall sequence of events that will occur, or the overall mitigative strategy of a procedure

- any AOP entry condition

- plant parameters that require <u>entry</u> into major EOPs:

  – major EOPs for Westinghouse: E0, E1, E2, E3, ECA-0.0, and red/orange functional restoration procedures

  – major EOPs for General Electric: reactor vessel control, primary containment control, secondary containment control, and radioactive release control

  – major EOPs for Combustion Engineering: standard posttrip actions and optimal recovery procedures

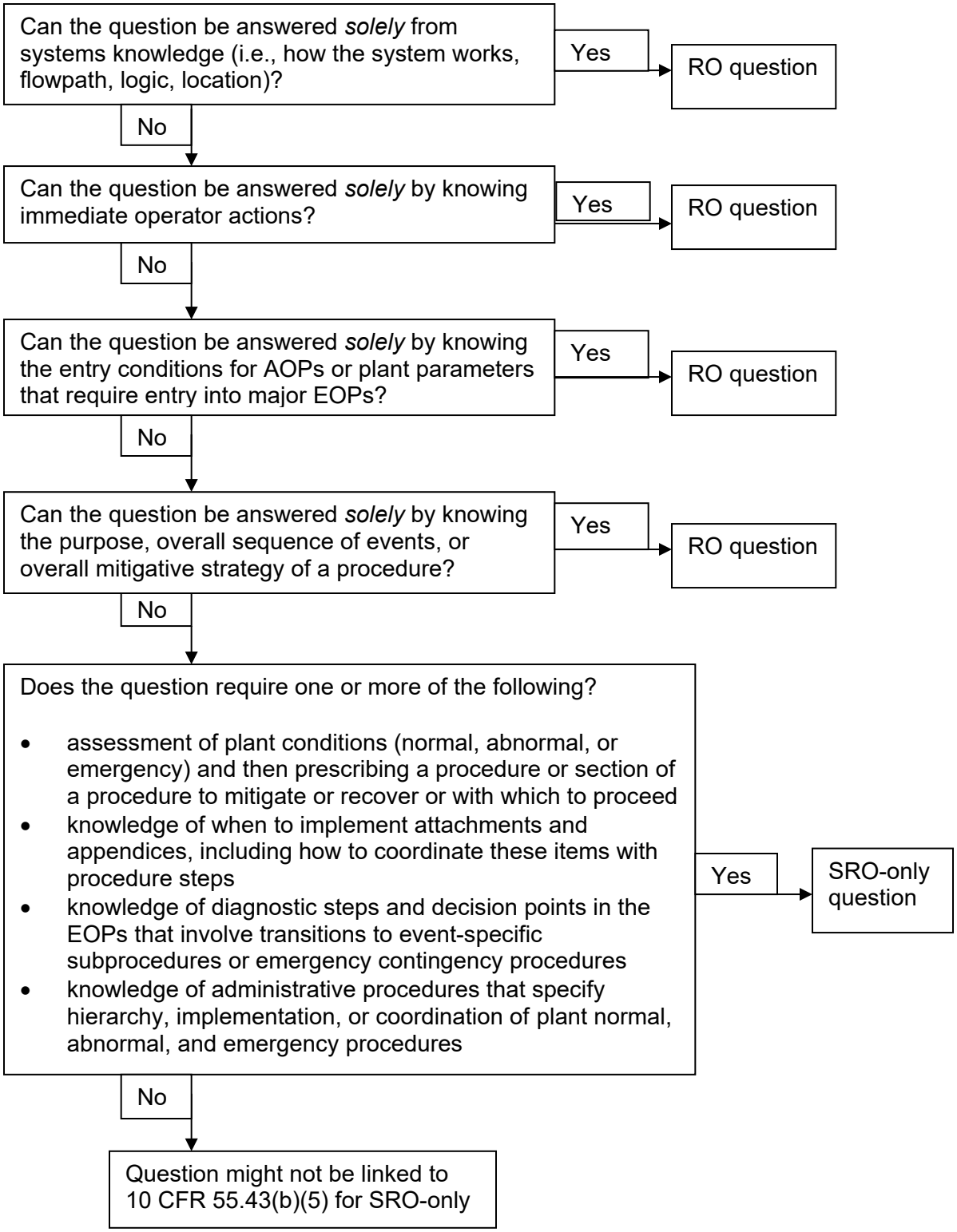
  – major EOPs for Babcock and Wilcox: EOP entry, loss of subcooling margin, lack of heat transfer, excessive heat transfer, steam generator tube rupture, and inadequate core cooling

  – major EOPs for AP1000: E0, E1, E2, E3, and red/orange functional restoration procedures

- immediate operator actions of a procedure

Appendix B provides several satisfactory and unsatisfactory examples of test items related to 10 CFR 55.43(b)(5).

Figure 4.2-3 Screening for SRO-Only Questions Linked to 10 CFR 55.43(b)(5) (Assessment and Selection of Procedures)



f. Procedures and Limitations Involved in Initial Core Loading, Alterations in Core Configuration, Control Rod Programming, and Determination of Various Internal and External Effects on Core Reactivity [10 CFR 55.43(b)(6)]

Some examples of SRO-only examination items for this topic include the following:

- evaluation of core conditions and emergency classifications based on core conditions
- administrative requirements associated with low-power physics testing processes
- administrative requirements associated with refueling activities, such as approvals required to amend core loading sheets or administrative controls of potential dilution paths or activities
- administrative controls associated with the installation of neutron sources
- knowledge of TS bases for reactivity controls

g. Fuel Handling Facilities and Procedures [10 CFR 55.43(b)(7)]

Some examples of SRO-only examination items for this topic include the following:

- refuel floor SRO responsibilities
- assessment of fuel handling equipment SR acceptance criteria
- prerequisites for vessel disassembly and reassembly
- decay heat assessment
- assessment of SRs for the refueling mode
- reporting requirements
- emergency classifications

F. Forms

Form 4.2-1 Written Examination Question Worksheet
Form 4.2-2 Question Development Checklist
Form 4.2-3 Reactor Operator Written Examination Cover Sheet
Form 4.2-4 Senior Reactor Operator Written Examination Cover Sheet

Form 4.2-1 Written Examination Question Worksheet

Examination Outline Cross-Reference:	Level	RO	SRO
	Tier #	_____	_____
	Group #	_____	_____
	K/A #	_____	
	Importance Rating	_____	_____

Knowledge and Ability (K/A) Statement:

Proposed Question:

Proposed Answer: ____

Explanation:

Technical Reference(s): _____
(Attach if not previously provided, _____
including version/revision number.) _____

Proposed references to be provided to applicants during examination: _____

Learning Objective: _____ (required, if available)

Question Source: Bank # _____
Modified Bank # _____ (note changes or attach parent)
New _____

Question History: Last NRC Exam _____ (if applicable)

Question Cognitive Level: Memory or Fundamental Knowledge _____
Comprehension or Analysis _____

10 CFR Part 55 Content: 10 CFR 55.41 _____
10 CFR 55.43 _____

Comments:

Form 4.2-2 Question Development Checklist

1. Does the concept being measured have a direct, important relationship to the ability to perform the job?

2. Does the question match the testing objective and intent of the knowledge or ability?

3. Is the question clear, concise, and easy to read? Could it be stated more simply and still provide the necessary information? Should it be reworded or split into more than one question?

4. Is each question stated positively, unless the intent is to test knowledge of what not to do?

5. Does the question provide all necessary information, stipulations, and assumptions needed for a correct response? Does the stem include as much information as possible?

6. Is the question written at the highest appropriate level of knowledge or ability for the job position of the person being tested?

7. Is the question free of unnecessary difficulty, trickiness, or irrelevance?

8. Is the question limited to one concept or topic? Is it something other than a collection of true/false items?

9. Does the question have face validity?

10. Are key points underlined or highlighted?

11. Is each question separate and independent of all other questions?

12. Are the answer options homogeneous and are the distractors highly plausible? Is there only one correct answer? Are common misconceptions used as distractors? Is the question free of trivial distractors and overlapping answer options?

13. Does the question avoid the use of “none of the above” and “all of the above”?

14. Does each question have four answer options?

15. Are the answer options for the questions ordered sequentially?

16. Is the question free of “specific determiners” (e.g., logical or grammatical inconsistencies, incorrect answers that are consistently different, verbal associations between the stem and the answer options)?

Form 4.2-3 Reactor Operator Written Examination Cover Sheet

U.S. Nuclear Regulatory Commission Reactor Operator Written Examination	
Applicant Information	
Name:	
Date:	Facility/Unit
Region: I ☐ II ☐ III ☐ IV ☐	Reactor Vendor/Type:
Start Time:	Finish Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. To pass the examination, you must achieve a final grade of at least 80 percent. You have 6 hours to complete this portion of the examination.

Applicant Certification

All work done on this examination is my own. I have neither given nor received aid.

_____
Applicant's Signature

Results	
Examination Points	_____ Points
Applicant's Points	_____ Points
Applicant's Grade	_____ Percent

Form 4.2-4 Senior Reactor Operator Written Examination Cover Sheet

U.S. Nuclear Regulatory Commission
Senior Reactor Operator Written Examination

Applicant Information	
Name:	
Date:	Facility/Unit
Region: I ☐ II ☐ III ☐ IV ☐	Reactor Vendor/Type:
Start Time:	Finish Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. To pass the examination, you must achieve a final grade of at least 80 percent overall, with 70 percent or better on the senior reactor operator (SRO)-only items if given in conjunction with the reactor operator (RO) exam; SRO-only exams given alone require a final grade of 80 percent to pass. You have 9 hours to complete the combined examination and 3 hours if you are only taking the SRO-only portion.

Applicant Certification

All work done on this examination is my own. I have neither given nor received aid.

_____
Applicant's Signature

Results	
RO/SRO-Only/Total Examination Points	_____ / _____ / _____ Points
Applicant's Points	_____ / _____ / _____ Points
Applicant's Grade	_____ / _____ / _____ Percent

4.3 ADMINISTERING WRITTEN EXAMINATIONS

This examination standard (ES) contains the instructions and guidelines for administering the written examination portion of the NRC operator licensing initial examinations for RO and SRO license applicants at power reactor facilities. It includes instructions for proctoring the written examinations and conducting postexamination reviews of the written examinations.

Generally, the facility licensee administers the written examination in accordance with the instructions contained herein, although the NRC regional office may choose to administer the examination at its discretion.

All participants in the examination administration process must also be mindful of their responsibilities for examination security and integrity.

A. Responsibilities

1. Facility Licensee

The facility licensee has the following responsibilities with regards to administering the written examination:

a. Establish, implement, and maintain procedures to control examination security and integrity, as required under Title 10 of the *Code of Federal Regulations* (10 CFR) 55.49, "Integrity of examinations and tests," and 10 CFR 55.40(b)(2).

b. Provide a single room suitable for administering the written examination. To ensure examination integrity, the room must be large enough so that there is only one applicant per table, with a 1-meter (3-foot) space between tables.

c. The examination room and supporting restroom facilities (i.e., the examination area) must be located to prevent the applicants from having contact with all other facility and contractor personnel during the written examination.

d. If desired and compatible with examination security requirements, arrange for the applicants to have lunch, coffee, or other refreshments during the examination.

e. Before the scheduled examination date, familiarize the applicants with the examination guidelines contained in Examination Standard (ES)-1.2, "Guidelines for Taking NRC Examinations."

f. Provide the necessary number of copies of the approved examinations, answer sheets, and handouts for each applicant, as directed and approved by the NRC chief examiner. Make an English dictionary, steam tables, and the Generic Fundamentals Equations and Conversions Sheet, Form 4.3-1, available in the examination room. Use machine-gradable answer sheets if desired, but this is not required.

g. As discussed in Section C, document and collect any comments for NRC consideration during the grading process. Submit these comments to the NRC as part of the postexamination package (refer to ES-4.4, "Grading and Documenting Written Examinations"). The facility licensee may also request an informal meeting with the NRC chief examiner to discuss the examination questions and resolve concerns.

2. NRC Regional Office

The NRC regional office has the following responsibilities with regards to administering the written examination:

a. The NRC regional office may, at its discretion, administer the examination in accordance with the instructions in Section B.

b. An NRC examiner inspects the examination area to ensure its adequacy. This can occur during the preparatory site visit, during operating test administration, or, if the NRC is on site, during written examination administration. Additionally, if NRC examiners are on site during administration, the NRC examiners should periodically monitor the examination to ensure that the proctor is appropriately addressing the applicants' questions.

c. If NRC examiners are not on site during administration, an NRC point of contact must be available to respond to facility licensee questions while the examinations are being given. For NRC-authored examinations, either the NRC chief examiner or another examiner familiar with the examination content must be available to respond to the applicants' questions by telephone.

B. Written Examination Administration Instructions

The written examination is administered after it is approved by the NRC for administration and when all license applications have been received and reviewed by the NRC regional office. To maintain uniform conditions for licensing operators, administer the written examination within 30 days of the operating test. This may not be possible under certain circumstances, such as a weather or health emergency. Obtain concurrence from the NRR operator licensing program office if more than 30 days will elapse between the completion of one and the start of the other.

1. Prepare

a. A proctor must be present at all times to monitor the applicants while they are taking the written examination. Ensure that all proctors clearly understand their responsibilities and the instructions in this section before distributing examinations.

   For NRC-administered examinations, the NRC chief examiner should consider using an NRC examiner or other NRC employee to ensure that enough people are available to perform proctoring duties, as needed. The NRC may arrange for facility licensee employees to proctor the examination for brief periods if it is necessary for the NRC staff to take a short break.

b. Ensure at least one individual who is familiar with the questions (i.e., an NRC examiner or facility licensee examination author) is available to clarify examination questions for the applicants during the examination.

c. Remove from the examination area, or otherwise remove from the applicants' view, any wall charts, models, or other training materials that might compromise examination integrity.

d. Verify each applicant's identity and examination level against Form 2.2-1, "List of Applicants," before beginning the examination. Resolve any errors or absences and update the form if necessary.

e. Document the seating arrangement of the applicants during the examination on a chart or equivalent diagram.

f. If the applicants will use machine-gradable answer forms that offer more than four answer choices (e.g., "a" through "e"), use a straight edge to line out the inapplicable column(s) before distributing the forms.

g. Clear the memory on any programmable calculators available for applicant use.

h. Ensure that the applicants' electronic devices are secured such that applicants cannot use them during the examination.

2. Start the Examination

a. Remind the applicants that they may use calculators to complete the examination and that only the reference materials provided with the examination are allowed in the examination area.

b. Pass out the examinations, blank answer sheets, and all required handouts approved by the NRC chief examiner (e.g., steam tables, equation sheets, and all approved reference material for each portion of the examination).

c. Ensure that RO applicants only get references associated with the RO examination and that SRO applicants get references associated with the examination sections that they are taking (e.g., an SRO-upgrade examinee who is only taking the SRO-only portion of the examination would only receive references associated with the SRO-only portion of the examination).

For SRO applicants taking both sections of the SRO examination (i.e., RO and SRO-only), provide both portions of the examination, including approved reference material, at the start of the examination. The NRC does not require examinees to complete the RO portion of the examination before starting the SRO-only portion of the examination.

d. Instruct the applicants not to review the examination until told to do so.

e. Provide each applicant with a copy of ES-1.2 and brief the applicants using Parts A and B of ES-1.2, which contains the guidelines that will be in effect during the written examination.

f. Instruct the applicants to verify that they have a complete examination by checking their cover sheet and the number of pages in the examination. RO applicants should have a 75-question examination and SRO applicants should have a 100-question examination, unless they have obtained a waiver (ES-2.2, "Applications, Medical Requirements, and Waiver and Excusal of Examination and Test Requirements") to upgrade their RO licenses with a 25-question SRO-only examination or they are taking the 40-question SRO examination limited to fuel handling.

g. Answer any questions that the applicants may have about the examination policies.

h. Start the examination and record the start time.

i. Follow the allotted times for the examination:

- 3 hours for the 25-question SRO-upgrade examination
- 4 hours for the SRO examination limited to fuel handling
- 6 hours for the RO examination
- 9 hours for the combined RO/SRO examination

3. Monitor the Examination

a. When proctoring the examination, remain fully attentive to the applicants during the examination. The proctor cannot engage in any activity that diverts attention from the applicants and may possibly cause the examination to be compromised (e.g., read or grade exams).

b. When responding to questions raised by applicants during the examination, be extremely careful not to lead the applicants or give away answers when clarifying questions. If there is any doubt about how to respond to an applicant's question, withhold additional guidance and instruct the applicant to do his or her best with the information that is provided.

c. Provide any question changes or clarifications unambiguously to all applicants in the room (use a chalk board or white board, etc.) and announce this information to all the applicants.

d. Document any changes to questions made during the examination in ink on the NRC's master copy and a copy that is retained by the facility licensee staff after the examination is administered. The NRC chief examiner will review and approve any changes during the grading process (ES-4.4).

e. Document all applicant questions and associated answers or clarifications about the test items on the written examination made during examination administration (verbatim if possible) and provide these to the NRC chief examiner after the examination.

f. Periodically advise the applicants of the time that remains to complete the examination. Typically, a chalk board or white board is available and can be used for this purpose.

4. Complete the Examination

a. As the applicants complete the examination, ensure that they sign the examination cover sheet and staple it on top of their answer sheets. Record the official start time and the time at which each applicant completed the examination in the space provided on the examination cover sheet. Collect the examination packages, including the questions, answer sheets, cover sheets, and any reference materials provided with the examination. Verify that all applicants have entered their names on both the answer and cover sheets.

b. Remind the applicants to leave the examination area, as previously defined.

c. When the allotted time has elapsed, instruct the remaining applicants to stop work, sign their examination cover sheets, and turn in their examinations.

d. Do not exceed the allotted time for taking each examination (above), except for unavoidable situations (e.g., loss of power, building evacuation, emergency response). If a time extension is necessary, the facility licensee must first notify the NRC regional office to ensure that a point of contact remains available to respond to questions. The applicant is responsible for ensuring his or her physical capability to complete the examination in the allotted time.

e. Inform the NRC when all the applicants have completed the examination.

f. Deliver the completed examination packages, the marked-up master examinations, the list of applicant questions and answers, and the seating chart to the NRC chief examiner or the appropriate facility licensee representative, as applicable, for review and grading in accordance with the instructions in ES-4.4.

C. Postexamination Reviews and Comments

This section contains instructions for collecting examination comments from applicants and the facility licensee. The facility licensee must collect all comments from the applicants during the examination administration and postexamination reviews and submit them to the NRC. If on site during examination administration, the NRC may participate in the postexamination review and collect comments in person. The postexamination comments are submitted to the NRC regional office as part of the postexamination package. ES-4.4 contains the instructions for that submittal.

Comment collection involves the following steps:

1. Document all applicant questions and answers or clarifications about items on the written examination made during any postexamination reviews with the facility licensee training staff (verbatim if possible).

2. If the NRC administered the examination, then the NRC chief examiner ensures that the master copy of the examination reflects all changes made to questions during the administration of the examination. The NRC chief examiner also provides a copy of the master examination and answer key to the facility licensee staff.

3. Evaluate all questions posed by the applicants during the examination, any pen-and-ink changes made on the master examination during administration, and any postexamination review comments from the facility licensee or applicants.

4. Document all comments in the following:

   - Indicate the source of the comment (i.e., facility licensee or applicant). If the applicant submits the comment, indicate the docket number associated with the comment. Note that the NRC examination report will not identify examination comments by applicant docket number.

- List the question, answer, and reference.

- State the comment and recommend whether the answer key should be changed (i.e., delete the question, accept a different answer, or accept multiple answers). Explain why the recommendation is being made. Include the facility licensee's position for each applicant comment.

- Support the comment with a reference and provide a copy if it was not included in the original reference material submittal. (Note: The NRC will not change the examination without a reference to support the comment.)

5. Encourage facility licensees to discuss their postexamination comments with the NRC chief examiner before formally submitting any comments in writing.

6. Submit the comments to the NRC regional office as part of the postexamination package in accordance with the instructions in ES-4.4.

7. The NRC will review all postexamination comments submitted by the facility licensee and individual applicants. Commenters should consider the instructions in ES-4.4, Section C, before submitting postexamination comments to the NRC.

D. Forms

Form 4.3-1 Generic Fundamentals Equations and Conversions Sheet

EQUATIONS

$\dot{Q} = \dot{m}c_p\Delta T$

$\dot{Q} = \dot{m}\Delta h$

$\dot{Q} = UA\Delta T$

$\dot{Q} \propto \dot{m}^3_{\text{Nat Circ}}$

$\Delta T \propto \dot{m}^2_{\text{Nat Circ}}$

$K_{eff} = 1/(1-\rho)$

$\rho = (K_{eff} - 1)/K_{eff}$

$SUR = 26.06/\tau$

$$\tau = \frac{\bar{\beta}_{eff} - \rho}{\lambda_{eff}\ \rho}$$

$$\rho = \frac{\ell^*}{\tau} + \frac{\bar{\beta}_{eff}}{1 + \lambda_{eff}\ \tau}$$

$\ell^* = 1.0 \ \text{x}\ 10^{-4}$ sec

$\lambda_{eff} = 0.1\ \text{sec}^{-1}$ (for $\rho > 0$)

$DRW \propto \varphi^2_{tip}/\varphi^2_{avg}$

$P = P_o e^{t/\tau}$

$P = P_o 10^{SUR(t)}$

$A = A_o e^{-\lambda t}$

$N = S/(1 - K_{eff})$

$CR_1(1 - K_{eff_1}) = CR_2(1 - K_{eff_2})$

$1/M = CR_1/CR_x$

$A = \pi r^2$

$F = PA$

$\dot{m} = \rho A\vec{v}$

$\dot{W}_{Pump} = \dot{m}\Delta P\upsilon$

$P = I^2R$

$P = IE$

$P_A = \sqrt{3}IE$

$P_T = \sqrt{3}IEpf$

$P_R = \sqrt{3}IE\sin\theta$

Thermal Efficiency = Net Work Out/Energy In

$$\frac{g(z_2 - z_1)}{g_c} + \frac{(\vec{v}_2^2 - \vec{v}_1^2)}{2g_c} + \upsilon(P_2 - P_1) + (u_2 - u_1) + (q - w) = 0$$

$g = 32.2$ ft/sec^2

$g_c = 32.2$ lbm-ft/lbf-sec^2

CONVERSIONS

1 MW = 3.41 x 10^6 Btu/hr	°C = (5/9)(°F − 32)	1 ft^3_{water} = 7.48 gal
1 hp = 2.54 x 10^3 Btu/hr	°F = (9/5)(°C) + 32	1 gal_{water} = 8.35 lbm
1 Btu = 778 ft-lbf	1 kg = 2.21 lbm	1 Curie = 3.7 x 10^{10} dps

4.4 GRADING AND DOCUMENTING WRITTEN EXAMINATIONS

This examination standard (ES) contains the instructions and guidelines for grading the written examination portion of the NRC operator licensing initial examinations for RO and SRO license applicants at power reactor facilities. This examination standard also includes instructions for evaluating and revising written examinations after they are administered and for the NRC review of proposed examination changes and grading.

The facility licensee grades the written examinations, evaluates the outcome, and submits the examination results to the responsible NRC regional office for review. The NRC reviews the grading and the examination results and considers any examination changes recommended by the facility licensee and individual applicants before making licensing decisions.

A. Responsibilities

1. Facility Licensee

The facility licensee performs the following activities:

- Review and resolve any questions and comments that arose during or after the administration of the examination (refer to Examination Standard (ES)-4.3, "Administering Written Examinations").
- Grade the examinations using the instructions in Section B.
- A facility licensee manager or supervisor must confirm the quality of the grading and inform the NRC that he or she concurs with the individual and collective examination results, including the justification for any proposed examination changes in the postexamination package submitted to the NRC regional office.
- Submit the postexamination package to the NRC regional office for review.

2. NRC

The NRC performs the following activities:

- The NRC may opt to perform steps in the initial grading (Section B), particularly if the NRC examiners participated in the examination's development or administration.
- The NRC reviews the examination grading in accordance with the instructions in Section C and ensures that the examinations were graded in accordance with the instructions in Section B.
- The NRC reviews any subsequent examination changes.

B. Instructions for Written Examination Grading and Evaluation

The primary developer of the examination should perform the steps in this section; however, another equally qualified individual can perform the grading if the examination developer is not available, the number of applicants is large, or if there is a need to expedite the grading process.

The examination should be graded as soon as possible after it was administrated, in accordance with the following steps:

1. Make two copies of each applicant's answer sheet (save one on site in the event that the original is lost and give the other to the NRC in the postexamination package) or, if submitting the postexamination package electronically to the NRC, scan the original answer sheet before grading. Ensure that the marks on the machine-graded answer sheets are legible to support copying or scanning. Perform the grading on the original answer sheet.

2. If the examinations are graded by machine, attach a copy of each applicant's profile report to his or her answer sheet; ensure that the report or answer sheet contains the information listed in step 3.

3. If the examinations are graded manually, document the following on the original answer sheet for each applicant:

   - indicate which questions were answered incorrectly
   - indicate which questions (if any) were deleted
   - note the final number of incorrect answers by RO/SRO/Total section (if the answer sheet is more than one page long, it is helpful to note the total number of incorrect answers on each page to aid in tabulating the final grade)
   - note the ratio of the final number of correct answers on the answer sheet to the total number of questions by RO/SRO/Total section

   Note: These are preliminary grades and subject to change based on the NRC's acceptance of changes to the examination or examination answer key. Do not communicate these preliminary grades to the NRC staff until the operating test has been administered to each applicant.

4. If it is necessary to change a grade during the grading process, line out the original grade on the answer sheet in such a way that it remains legible. Briefly explain the reason for the change on the applicant's answer sheet and initial the change. Do not use "white-out" or other methods that obscure the change.

5. Evaluate the overall group performance on each examination question to identify any indications of a problem with the question or a deficiency in the facility licensee training program. Consider using a table to summarize the applicants' answers on each question or including a machine automated analysis to identify items with which the applicants had problems.

   Based on this evaluation, determine, for a faulty question, whether the question should be deleted, the answer key changed, or the question revised before reuse (or a combination of these).

6. For changes to the examination or answer key made during examination administration or as a result of an applicant or facility licensee comment, annotate the changes on the

master examination and answer key and document the reason. Then, regrade the examinations as necessary.

7. Submit the following examination documentation (also known as the postexamination package) to the NRC chief examiner (marked "addressee only") as soon as possible, but not more than 20 calendar days after all parts of the operator licensing initial examination have been administered:

   - the graded written examinations (i.e., each applicant's original answer and examination cover sheets) plus a clean copy of each applicant's answer sheet
   - the master written examinations and answer keys, annotated to indicate any changes made while administering and grading the examinations
   - any questions asked by the applicants and the answers given to the applicants during the written examination (ES-4.3)
   - all examination administration or postexamination review comments made by the facility licensee and the applicants after the written examination and operating tests (ES-4.3)
   - the seating chart for the written examination (ES-4.3)
   - documentation (through a cover letter or other correspondence) of facility licensee management or supervisor concurrence
   - the results of any performance analysis for the written examination, with recommended substantive changes
   - Form 1.3-1, "Examination Security Agreement," with a pre- and post-examination signature by every individual who had detailed knowledge of any part of the operating tests or written examinations before they were administered

     Note: If the completion of Form 1.3-1 is delayed due to issues associated with the collection of postexamination signatures, it is acceptable for the facility licensee to forward this form to the NRC chief examiner at a later date, as agreed to by the NRC chief examiner. Any delay in submitting the postexamination package will likely result in a delay in the final licensing actions.

8. Evaluate any applicant questions and facility licensee and applicant comments and recommendations that do not result in answer key changes or question deletions to determine whether the associated test questions might benefit from editorial changes before they are used on another examination.

9. Before depositing the questions in any examination bank, revise the questions to incorporate all changes, comments, and enhancements, as appropriate.

C. Instructions for NRC Review of Grading and Examination Changes

An examiner-qualified person performs the following steps (1–3) and the NRC chief examiner performs the following steps (4–7).

1. Upon receipt, immediately inventory the postexamination package to ensure that all required materials have been submitted. Inform the responsible NRC supervisor of any obvious deficiencies and contact the facility licensee to determine the status of any missing documentation.

2. Discuss all grading discrepancies with the grader or previous reviewer before making any changes and document any changes by carefully lining out the original entry so that it remains legible, entering the revision with a brief explanation, and initialing the change. These changes may be documented electronically provided that the original entry is apparent, the individual making the change is identified, and an explanation for the change is included. Do not use "white-out" or other methods that obscure the original entry.

3. Review proposed examination changes and perform an independent grading review as follows:

    a. If the written examination was graded by machine or using a template, ensure that the template accurately parallels the approved, finalized answer key.

    b. Independently analyze *each* examination and answer key change made or recommended by the facility licensee or a license applicant to determine whether it is justified. During the analysis, keep in mind that both the facility licensee and the NRC had previously agreed that the written examination met the requirements of NUREG-1021 before the examination was administered (refer to the examination approval letter).

    c. Despite the extensive reviews performed by both the NRC and the facility licensee before examination administration, it is possible that errors may be discovered only after an examination has been administered. The NRC will consider examination changes for the following types of errors, if identified and adequately justified by the facility licensee or an applicant:

        - a question with an unclear stem that confused the applicants or did not provide all the necessary information (to assist in determining whether an unclear stem confused the applicants, closely evaluate any applicant questions asked during the examination; also evaluate the question stem to determine whether the information provided could reasonably result in the applicant misunderstanding the intent of the question or the validity of the answer choices)

        - unintended typographical errors in a question or on the answer key

        - newly discovered technical information that supports a change in the answer key

- a question testing the wrong license level (RO versus SRO) or not linked to job requirements

d. The NRC will not accept examination changes for the following types of question errors identified after examination administration:

- a question that does not exactly match its referenced K/A statement
- a question for which references would be needed to provide the correct answer, even though the facility licensee and the NRC previously agreed that the question should be closed-reference
- a question that tests minutiae, even though the facility licensee and the NRC previously agreed that the question did not test minutiae
- a question that contains psychometric errors that do not increase its difficulty or make the question confusing (e.g., a question with two implausible distractors or a collection of true or false answers would be unsatisfactory during preexamination review, but neither problem would justify deleting the question after examination administration)

e. If a question is determined to have two correct answers, the NRC will accept both answer options as correct. However, there cannot be two correct answers if both answer options contain conflicting information. Conflicting information is present when two answer options contain plant information that cannot be true or exist at the same time. For example, if a part of an answer option states that operators are required to insert a manual reactor scram and a part of another answer states that a manual scram is not required, then the NRC will not accept both answers as correct because a facility cannot have a manual scram be both required and not required at the same time. The question will be deleted.

f. If a question is determined to have three or more correct answers or there is no correct answer, the NRC will delete the question.

g. Ensure that a valid facility licensee reference exists to support examination changes.

h. Annotate NRC-approved changes on the master examination and answer key.

i. Independently review and regrade each applicant's examination.

j. Calculate and enter the following in the applicable Results Area on each applicant's coversheet (Form 4.2-3, "Reactor Operator Written Examination Cover Sheet," and Form 4.2-4, "Senior Reactor Operator Written Examination Cover Sheet"):

- Examination Points = original test point total minus one point for each deleted question for the RO, SRO-only, and Total examination sections
- Applicant's Points = the applicant's total correct answers for the RO, SRO-only, and Total examination sections

- Applicant's Grade = the applicant's points divided by the examination points for each part of the examination (RO, SRO, and Total)

For the Applicant's Grade, *do not round up or down, but instead truncate the examination score in the tenths place*. For example, if an applicant correctly answers 59 of 75 questions, the score is documented as a 78.6.

k. Record the scores in the Written Examination Summary of the applicant's Form 5.1-2, "Individual Examination Report," and record the name of the NRC independent reviewer (person who performed step 3 of Section C).

l. In the Examiner Recommendation area of the applicant's Form 5.1-2, "Individual Examination Report," make a recommendation for the written examination by checking the "Pass" or "Fail" (or "Excuse/Waive" if the written examination was excused or waived in accordance with ES-2.2, "Applications, Medical Requirements, and Waiver and Excusal of Examination and Test Requirements") block and signing and dating in the row for the written examination recommendation.

To pass the examination, the applicant must achieve an overall grade of at least 80 percent, with a 70 percent or better on the SRO-only items, if applicable.

Retake and SRO-upgrade applicants who take only the SRO examination must achieve a grade of 80 percent or higher to pass.

4. The NRC chief examiner performs an additional independent grading review using the final, approved answer key and the original applicant answer sheet (or a clean copy of the answer sheet, if necessary) for each applicant with a borderline grade. Borderline grades are defined as those between 78 and 82 percent overall, between 66 and 74 percent on the SRO-only portion, and between 76 and 84 percent if the RO portion was waived.

5. The NRC chief examiner reviews the written examination results and the facility licensee's performance analysis (if applicable) for indications of the following:

   - deficiencies in the applicants' training program, so that they may be addressed in the examination report
   - poor question construction; any significant problems can be addressed in the examination report, and the questions can be corrected before reuse
   - any indications that the examination was compromised

6. Once the NRC grading review is complete, the NRC chief examiner makes a final recommendation and then signs and dates the NRC chief examiner block on each applicant's Form 5.1-2.

7. The NRC chief examiner forwards the examination results to the licensing official in accordance with ES-5.1, "Issuing Operator Licenses and Postexamination Activities."

D. Instructions for NRC Management Review of Grading and Examination Changes

NRC regional management reviews the written examination results and any generic findings, deficiencies, or issues to determine whether any followup action is required. Specific followup items include the following:

1. If the facility licensee recommends deleting or changing the answers to four or more of the questions on an RO written examination (or two or more on an SRO only exam) that it developed, consider asking the facility licensee to explain why so many post examination changes were necessary and what actions will be taken to improve future license examinations. As discussed in ES-5.1, "Issuing Operator Licenses and Postexamination Activities", the NRC will also consider post examination deletions and changes when evaluating the quality of the facility licensee's proposed examination for documentation in the examination report.

2. If seven or more of the questions on an RO examination and/or two or more on a SRO only examination are deleted during the grading process, evaluate the remainder of the examination to ensure that it still satisfies the test outline sampling requirements in ES-4.1, "Developing Written Examination Outlines." The NRC regional office must consult with the NRR operator licensing program office if the validity of the examination is in question.

3. If the content validity of the examination is affected (e.g., several knowledge and ability (K/A) topics are not covered, or the majority of the remaining K/As are associated with a small number of systems) as a result of deleting questions, the NRR operator licensing program office will decide if the examination should be voided.

5.1 ISSUING OPERATOR LICENSES AND POSTEXAMINATION ACTIVITIES

This examination standard (ES) describes the activities that the U.S. Nuclear Regulatory Commission (NRC) regional office performs after all parts of the operator licensing initial examination have been administered and graded in accordance with Examination Standard (ES)-3.5, "Administering Operating Tests"; ES-3.6, "Grading and Documenting Operating Tests"; ES-4.3, "Administering Written Examinations"; and ES-4.4, "Grading and Documenting Written Examinations," of this NUREG. This ES also includes instructions for notifying the facility licensee and applicants of the examination results and issuing licenses.

The NRC regional office is responsible for the activities in this ES. The regional office may use Form 5.1-1, "Postexamination Check Sheet," to track completion of the administrative activities after the examinations are administered.

A. Compile Examination Results and Reports

The NRC chief examiner ensures that any operating test licensing recommendation that deviates from the nominal grading instructions in ES-3.6 (e.g., recommending a simulator test failure based on a performance deficiency with serious safety consequences or a passing grade despite multiple performance deficiencies related to the same rating factor) receives written concurrence from the Office of Nuclear Reactor Regulation (NRR) operator licensing program office before completing the licensing or denial action.

The NRC chief examiner ensures that the examination results package is complete and contains the following items for each applicant:

- Form 5.1-2, "Individual Examination Report"
- operating test:
  - Form 3.3-1, "Scenario Outline," reflecting the "as-run" scenarios (pen-and-ink markups of the original scenario outlines are acceptable)
  - if the applicant failed the simulator operating test: Form 3.3-2, "Required Operator Actions," reflecting the "as-run" scenarios but without any examiner notes on applicant performance (pen-and-ink markups of the original/approved scenarios are acceptable)
  - Form 3.6-1, "Job Performance Measure Grade Report"
  - Form 3.6-2, "Reactor Operator Simulator Scenario Grade Report," or Form 3.6-3, "Senior Reactor Operator Simulator Scenario Grade Report"
  - Form 3.6-4, "Operating Test Comments," and any other supporting documentation
  - if the applicant failed the overall walkthrough or administrative topics job performance measures (JPMs): a copy of all JPMs that the applicant failed, reflecting the "as-administered" JPM conditions but without any examiner notes on applicant performance (pen-and-ink markups of the original/approved JPMs are acceptable)

- written examination:
  - written examination cover sheet
  - original answer sheet
  - if the applicant failed the written examination: a copy of the master written examination and answer key

The NRC chief examiner records the overall and individual results of the operating test and written examination on Form 5.1-3, "Power Plant Examination Results Summary."

The NRC chief examiner provides the examination results packages to the NRC regional operator licensing assistant to prepare the respective applicant letters—preliminary results letter, denial letter, pass letter, or license—and then forwards the examination results packages and letters to the regional licensing official.

B. Licensing Action

The NRC Regional Administrator or his or her designee, who must be at or above the Branch Chief level, makes the licensing decision for each applicant who took the examination; short-term designees shall not make licensing decisions unless specifically authorized in writing, with any limitations, by the Regional Administrator. This individual is referred to as the licensing official throughout this ES.

The licensing official performs the following activities:

- Independently review each applicant's examination results and associated examiner recommendations.
- Check the "Issue License" or "Deny License" block in the "Licensing Action" section of each applicant's Form 5.1-2, and sign and date each form.
- Sign each applicant's license, denial letter, preliminary results letter, or pass letter (as applicable).

If the licensing official does not believe that the operating test or written examination documentation supports the final recommendation, he or she must consult with the examiner of record and the NRC chief examiner to discuss and resolve any disagreements.

If the licensing official overturns the examiner's recommendation, the licensing official must annotate the associated examination material as follows:

- For the written examination, line out and initial the master written examination and answer key and provide an explanation of the change on the answer key.
- For the operating test, line out and initial the affected performance deficiency evaluations and ensure that the new performance deficiency evaluations and an explanation of the changes are entered on Form 3.6-4, and attach the comment form to the applicant's Form 5.1-2.

C. Issue Licenses

Final license issuance involves the following activities:

(1) Before issuing a license, the NRC regional office shall ensure that the applicant has satisfied the health requirement of Title 10 of the *Code of Federal Regulations* (10 CFR) 55.33, "Disposition of an initial application," through either (1) a certification by the facility licensee that the applicant's medical condition and general health will not adversely affect the performance of assigned operator job duties or cause operational errors endangering public health and safety or (2) a Commission determination, considering the recommendations and supporting evidence of the facility licensee and of the examining physician, that specific license conditions will accommodate any medical defects of the applicant. The instructions in ES-2.2, "Applications, Medical Requirements, and Waiver and Excusal of Examination and Test Requirements," provide additional information.

(2) Before issuing a license, the NRC regional office must ensure that the applicant has completed any deferred eligibility items.

(3) Before issuing a license, the NRC regional office must ensure that senior reactor operator (SRO)-upgrade applicants and individuals who initially received a pass letter are up to date in the facility licensee's requalification training program.

(4) The NRC regional office issues a license to the applicant in the form of a letter. Letter 5.1-1, "Sample Reactor Operator License," and Letter 5.1-2, "Sample Senior Reactor Operator License," of this ES provide sample licenses.

D. Notify Applicants of Examination Results

The NRC regional office expects to complete the actions for initial operator license applications within 30 days of receiving the postexamination package from the facility licensee.

The NRC regional office notifies the applicants of the examination results, after the licensing official reviews and approves them, by sending the applicable letter (described below) along with the following materials (sent either electronically or in hard copy):

- a copy of Form 5.1-2, Form 3.6-1, Form 3.6-2/3, and Form 3.6-4
- a copy of Form 3.3-1
- a copy of Form 3.3-2 (if the applicant failed the simulator operating test), reflecting the "as-run" scenario conditions but *without* any examiner notes on the applicant's performance (pen-and-ink markups of the original, approved scenarios are acceptable)
- a copy of all JPMs that the applicant failed (if the applicant failed the operating test in the overall walkthrough or administrative topics JPMs), reflecting the "as-administered" JPM conditions but *without* any examiner notes on the applicant's performance (pen-and-ink markups of the original, approved JPMs are acceptable)

- a copy of the applicant's written examination cover and answer sheets
- a copy of the master written examination and answer key (if the applicant failed the written examination)

1. Preliminary Results Letter

Under 10 CFR 55.31(b), the Commission may at any time after the application has been filed require further information under oath or affirmation to enable it to determine whether to grant or deny the application. A preliminary results letter is one such method of gathering further information (see Letter 5.1-3, "Sample Preliminary Results Letter"). The NRC issues a preliminary results letter when the NRC regional office grading results indicate that the applicant failed any portion of the operator licensing initial examination. This letter gives the applicant the option to provide further information to be used in an informal NRC staff review. The applicant should respond to the 10 CFR 55.31(b) request (i.e., the preliminary results letter) within 20 days from the date of the request, or within such other time as the letter may specify. Inquiries, communications, and reports concerning the application must be filed as specified in 10 CFR 55.5, "Communications." To account for mail delivery, if applicable, the region should delay issuing further correspondence for an additional 5 calendar days to ensure that the 20 days have expired.

2. Denial Letter

The NRC issues a denial letter when the Commission is unable to make the findings in 10 CFR 55.33(a) (addressing health and passing the written examination and operating test) or, if applicable, the Commission is unable to approve a conditional license under 10 CFR 55.33(b). As a prerequisite to a denial letter, the staff will typically wait until, as applicable, an applicant does not request an informal NRC staff review within 20 days (or within such other time as may be specified), or the NRC staff upholds the preliminary results following an informal NRC staff review.

A denial letter is required under 10 CFR 2.103(b). If applicable, this letter may provide instructions on how the applicant may reapply under 10 CFR 55.35, "Re-applications" (for failures of the written examination or operating test, or both) or under 10 CFR 55.31(c) (for medical conditions). Because 10 CFR 55.35(a) sets the permissible earliest time for filing a reapplication based on "the date of the denial," some applicants may elect to respond to a 10 CFR 55.31(b) request for informal NRC staff review by asking the NRC to immediately send the denial letter. The NRC should promptly send the denial letter and firmly set the date of the denial to be used with regard to 10 CFR 55.35(a), as well as the date of denial to demand a hearing under 10 CFR 2.103(b). An applicant may reapply under 10 CFR 55.35 or supplement under 10 CFR 55.31(c) (or both) during the pendency of a hearing on a previous application. An applicant is not required to waive or decline to exercise the right to demand a hearing as a prerequisite to reapplying.

A sample denial letter is available as Letter 5.1-4, "Sample Denial Letter," of this ES. Note: If the NRC staff upholds the preliminary results following an informal NRC staff review, the agency sends a slightly different version of this denial letter to the applicant (see Operator Licensing Manual Chapter (OLMC) 500, "Processing Requests for Administrative Reviews and Demands for Hearings," issued November 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20230A201), or the most current revision of this OLMC).

3. Pass Letter

The NRC issues a pass letter (see Letter 5.1-5, "Sample Pass Letter") if an applicant has passed the requisite written examination and operating test in accordance with 10 CFR 55.41, "Written examination: Operators," and 10 CFR 55.45, "Operating tests," or 10 CFR 55.43, "Written examination: Senior operators," and 10 CFR 55.45, and the applicant's general medical condition meets the minimum standards under 10 CFR 55.33(a)(1) or may be accommodated with appropriate conditions under 10 CFR 55.33(b), but to date the applicant has not completed all of the elements of 10 CFR 55.31, "How to apply." This letter notifies the applicant that the NRC will issue his or her license when the incomplete (i.e., deferred) items are resolved. The NRC regional office will issue a license when the applicant or facility licensee, as appropriate, completes the deferred items.

E. Notify Facility Licensee of Examination Results

The NRC regional office notifies the facility licensee of the examination results after the licensing official reviews and approves them.

The NRC regional office should notify the facility licensee's designated representative of the examination results by telephone and confirm the results by mailing or sending electronically a copy of Form 5.1-3 under a separate cover letter. For each applicant who failed or demonstrated deficiencies, the regional office will also send the facility licensee a copy of the applicant's Form 5.1-2, Form 3.6-1, Form 3.6-2/3, Form 3.6-4, and written examination answer sheet.

The NRC expects the facility licensee to use its systems approach to training process to analyze and determine the need for additional training for any applicant who passed the NRC examination but had knowledge or performance deficiencies, or both.

NRC regional management, or the licensing official, should consider calling the facility licensee management counterpart to discuss the examination outcome and lessons learned. Any pertinent feedback on the examination process should be forwarded to the Office of Nuclear Reactor Regulation operator licensing program office for consideration.

F. Special Circumstances for Senior Reactor Operator-Upgrade Applicants

If an SRO-upgrade applicant did not complete the SRO-upgrade training program or failed the SRO-upgrade examination, NRC regional management shall ensure that the reactor operator (RO) licensee complies with the requirements of 10 CFR 55.53(e), (f), and (h) and 10 CFR 55.59(a) before resuming active duties as an RO.

Similarly, the NRC regional office shall ensure that SRO-upgrade applicants who passed and did not participate in RO requalification training while they were enrolled in the SRO-upgrade training program comply with 10 CFR 55.59(a). If an applicant missed the annual operating test or the comprehensive requalification written examination required by 10 CFR 55.59(a)(2) and then did not take the RO portion of the licensing written examination, the applicant must complete additional training in accordance with 10 CFR 55.59(b) and must make up the missed requalification examination to verify proficiency in the topics under 10 CFR 55.41 before resuming licensed duties as an RO or commencing duties as an SRO (which requires testing on items under 10 CFR 55.41 and 10 CFR 55.43). The NRC would consider the requirements of 10 CFR 55.59(a)(2)(i) to be satisfied if the applicant repeats the applicable portions (to be

determined using a systems approach to training) of the license training program and passes a comprehensive audit examination covering the topics required by 10 CFR 55.41.

G. Determine Quality of Submitted Examination

After examination administration and once all postexamination comments have been resolved, the NRC regional office will determine the quality of the submitted written examination and operating test material based on the following for documentation in the examination report (refer to the most current revision of OLMC 510, "Operator Licensing Examination Reports" (Revision 0, issued September 2021 ADAMS Accession No. ML21109A143):

(1) For each of the submitted written examination questions (RO and SRO questions shall be considered separately), following the written examination review performed in ES-2.3, "Reviewing and Approving Operator Licensing Initial Examinations," Section C.3, and documented on Form 2.3-5, "Written Examination Review Worksheet," determine the percentage of submitted questions that were determined to be unsatisfactory. Include any questions that were deleted during the grading process, or for which the answer key had to be changed, in the count of unsatisfactory questions.

Note: As long as changes were incorporated to result in satisfactory test items, do not count any presubmittal sample test items reviewed by the NRC before the final licensee examination submittal.

Note: Do not count questions from past NRC examinations (at any facility) unless the facility licensee's current use caused the current unsatisfactory status after the last NRC approval of the test item. (For example, the question's reference changed, but the question was not revised accordingly, or the question was previously associated with a different knowledge and abilities (K/A) statement and its current K/A pairing results in a K/A mismatch flaw.)

Note: Do not count flaws of a less serious nature (e.g., editorial clarifications or enhancements, single implausible distractors) that were corrected before the examination was administered.

(2) To determine the total percentage of unsatisfactory operating test items, total the number of JPMs and scenario events that were marked unsatisfactory following the operating test review performed in ES-2.3, Section C.4, and divide by the total number of JPMs and scenario events (i.e., 4 of 15 JPMs were marked unsatisfactory (U), and 3 of 33 scenario events were marked U, resulting in 7 of 48 or 14.6 percent). Update line items on Form 2.3-3, "Operating Test Review Worksheets," with postexamination changes and include those changes in this calculation.

Note: If the review indicated that a scenario event did not require verifiable action(s), do not include this event as part of the total number of events unless the event was used to meet one of the minimum required for an applicant according to Form 3.4-1, "Events and Evolutions Checklist."

Note: Do not count JPMs and scenario events that were previously used on past NRC examinations and required replacement or substantial modification unless the facility licensee caused the current unacceptable flaw after the last NRC approval of the test item. (For example, the JPM reference changed, but the JPM was not revised accordingly.)

Note: Do not count flaws of a less serious nature (e.g., editorial clarifications or enhancements) that were corrected before the test was administered.

H. Reference Material

If an applicant was denied a license based on an examination failure, the reference materials should be retained during the period in which the applicant may request an informal NRC staff review, demand a hearing, or both. If an applicant requests an informal NRC staff review, demands a hearing, or both, the NRC chief examiner shall consult with the assigned attorney before returning or destroying any document related to the examination.

I. Examination Report and NRC Recordkeeping

The NRC should prepare the examination report using the instructions in the current revision of OLMC 510 and follow the instructions for NRC examination recordkeeping activities in the current revision of OLMC 520, "Operator Licensing Examination Records and Documentation" (Revision 0, issued September 2021 ADAMS Accession No. ML21109A210) and Management Directive 3.53, "NRC Records and Document Management Program."

J. Forms and Letters

Form 5.1-1	Postexamination Check Sheet
Form 5.1-2	Individual Examination Report
Form 5.1-3	Power Plant Examination Results Summary
Letter 5.1-1	Sample Reactor Operator License
Letter 5.1-2	Sample Senior Reactor Operator License
Letter 5.1-3	Sample Preliminary Results Letter
Letter 5.1-4	Sample Denial Letter
Letter 5.1-5	Sample Pass Letter

Form 5.1-1 Postexamination Check Sheet

Postexamination Check Sheet	
Facility:	**Dates of Examination:**
Activity Description	**Date Complete**
1. *Received postexamination package from facility licensee and verified complete. (ES-4.4)	
2. *Reviewed and incorporated any necessary facility and applicant written examination comments. NRC grading of written examination completed. (ES-4.4)	
3. *Reviewed and incorporated any necessary facility and applicant operating test comments. NRC grading of operating test completed. (ES-3.6)	
4. *Completed NRC chief examiner review of operating test and written examination grading. (ES-3.6 and ES-4.4)	
5. Completed licensing official review.	
6. Mailed licenses, preliminary results, and pass letters.	
7. Notified facility licensee of results.	
8. Issued the examination report (refer to Operator Licensing Manual Chapter (OLMC) 510, "Operator Licensing Examination Reports").	
9. Returned reference material after final resolution of any informal NRC staff reviews, hearing demands, or both.	
10. Performed examination recordkeeping activities (refer to OLMC 520, "Operator Licensing Examination Records and Documentation," and Management Directive 3.53, "NRC Records and Document Management Program").	
* Activity may not be applicable for a retake examination. If this activity does not apply, place an "N/A" in the Date Complete column.	

Form 5.1-2 Individual Examination Report

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

U.S. Nuclear Regulatory Commission
Individual Examination Report

Applicant's Name:			Docket Number: 55-		
I	**R**	**Examination Type (Initial or Retake)**	Facility Name:		
		Reactor Operator	Facility Description		Hot
		Senior Reactor Operator—Instant			Cold
		Senior Reactor Operator—Upgrade			BWR
		Senior Reactor Operator—Limited to Fuel Handling			PWR
					_____

Written Examination Summary

Name—NRC Independent Reviewer:		Overall	SRO-only
	Applicant Points		
Name—NRC Chief Examiner:	Examination Points		
Date Administered:	Applicant Grade (%)		

Operating Test Summary

Name—Examiner of Record:	Dates Administered:
Overall Walkthrough (S)atisfactory, (U)nsatisfactory, (E)xcused, or (W)aived	
Administrative Topics (S, U, E, or W)	
Simulator Operating Test (S, U, E, or W)	

Examiner Recommendations

	Pass	**Fail**	**Excuse/Waive**	**Signature and Date**
Written Examination, Independent Reviewer				
Operating Test, Examiner of Record				
Final Recommendation, Chief Examiner/Designee				

Licensing Action

	Issue License	Licensing Official's Signature	Date
	Deny License		

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Form 5.1-3 Power Plant Examination Results Summary

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Power Plant Examination Results Summary	
Facility:	Plant Status: Hot ☐ Cold ☐
Written Examination Date: Prepared by: Facility ☐ NRC ☐	Operating Test Date(s): Prepared by: Facility ☐ NRC ☐
NRC Examiners:	

Overall Results					
# Total Applicants		# Passed	% Passed	# Failed	% Failed
RO					
SRO					

Individual Results						
Name	Docket # 55-(__)	Type(1)	Written Grade Overall/SRO-Only	Operating Test(2)		
				W-T	ADM	SIM

NOTES:

(1) 1=RO; 2=SRO-I; 3=SRO-U; 4=RO-Retake; 5=SRO-I-Retake; 6=SRO-U-Retake; 7=SRO-Fuel Handling

(2) P=Passed; F=Failed; W=Waived; E=Excused

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Power Plant Examination Results Summary
(Continuation Sheet)

Facility:

Written Examination/Operating Test Date(s):

Individual Results

Name	Docket # 55-(___)	Type[1]	Written Grade Overall/SRO-Only	Operating Test[2]		
				W-T	ADM	SIM

NOTES:

(1) 1=RO; 2=SRO-I; 3=SRO-U; 4=RO-Retake; 5=SRO-I-Retake; 6=SRO-U-Retake; 7=SRO-Fuel Handling
(2) P=Passed; F=Failed; W=Waived; E=Excused

Letter 5.1-1 Sample Reactor Operator License

NRC Letterhead

(Date)

LICENSE

(Applicant's Name)
(Street Address)
(City, State ZIP Code)

Under the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended, and subject to the conditions and limitations incorporated herein, the U.S. Nuclear Regulatory Commission hereby licenses you to manipulate all controls of the (Name of facility, facility license number).

Your license number is OP-(number), and your docket number is 55-(number). The effective date is (date). Unless this license is terminated, renewed, or upgraded sooner, it shall expire 6 years from the effective date.

This license is subject to the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) 55.53, "Conditions of licenses," with the same force and effect as if fully set forth herein.

While performing licensed duties, you shall observe the operating procedures and other conditions specified in the facility license authorizing operation of the facility. [You shall also comply with the following condition(s):

- You shall wear corrective lenses while performing the activities for which you are licensed.]

The issuance of this license is based on an examination of your qualifications, including the representations and information contained in your application for this license.

A copy of this license has been made available to the facility licensee.

For the U.S. Nuclear Regulatory Commission,

(Name and title of licensing official)

Docket No.: 55-(number)

cc: (Facility representative who signed the applicant's NRC Form 398)

[ ] Include for any license conditions necessary to accommodate medical defects.

Letter 5.1-2 Sample Senior Reactor Operator License

NRC Letterhead

(Date)

LICENSE

(Applicant's Name)
(Street Address)
(City, State ZIP Code)

Under the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, as amended, and subject to the conditions and limitations incorporated herein, the U.S. Nuclear Regulatory Commission hereby licenses you to direct the [licensed] [[fuel handling]] activities of [licensed] operators at, and to manipulate [all] [[fuel handling]] controls of, the (Name of facility, facility license number).

Your license number is SOP-(number), and your docket number is 55-(number). The effective date is (date). Unless this license is terminated, renewed, or upgraded sooner, it shall expire 6 years from the effective date.

This license is subject to the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) 55.53, "Conditions of licenses," with the same force and effect as if fully set forth herein.

While performing licensed duties, you shall observe the operating procedures and other conditions specified in the facility license authorizing operation of the facility. [[[You shall also comply with the following condition(s):

- You shall wear corrective lenses while performing the activities for which you are licensed.]]]

The issuance of this license is based on an examination of your qualifications, including the representations and information contained in your application for this license.

A copy of this license has been made available to the facility licensee.

For the U.S. Nuclear Regulatory Commission,

(Name and title of licensing official)

Docket No.: 55-(number)

cc: (Facility representative who signed the applicant's NRC Form 398)

[ ] Include only for unrestricted senior operators.
[[ ]] Include only for senior operators limited to fuel handling under 10 CFR 55.53(c).
[[[ ]]] Include for any license conditions necessary to accommodate medical defects.

Letter 5.1-3 Sample Preliminary Results Letter

NRC Letterhead

[Date]

[Applicant's Name]
[Street Address]
[City, State ZIP Code]

Dear [Mr./Ms. Applicant's Name]:

This is to inform you that the preliminary results of the [operating test, written examination, or operating test and written examination] taken by you on [date(s)], in connection with your application for a [reactor operator, senior reactor operator, or limited senior reactor operator] license for the [facility name], indicate that you ***did not*** pass that [test, examination, or test and examination]. Enclosed is a copy of the preliminary results of your [operating test, written examination, or operating test and written examination], indicating the areas in which you exhibited deficiencies. [A copy of the master answer key is also provided.]

You have three options: (1) you may take no action, in which case the preliminary results will become the final results and the U.S. Nuclear Regulatory Commission (NRC) will issue you a letter denying your license application; (2) you may, within 20 days of the date of this letter, provide additional information to the NRC and request that the NRC staff conduct an informal review of the preliminary results in light of that information; or (3) you may request that the NRC issue you a letter denying your license application without delay. The letter denying your license application will inform you of your right to demand a hearing on the denial and provide you with instructions on how to demand a hearing. The letter will also explain when you may file a new application.

A request for an NRC staff informal review must identify the portions of your [operating test, written examination, or operating test and written examination] that you believe were graded incorrectly. In addition, you must provide the basis, including supporting documentation (such as procedures, instructions, computer printouts, and chart traces), in as much detail as possible, for your arguments that certain of your responses were graded incorrectly. The NRC will review your arguments and finalize the grading of your [operating test, written examination, or operating test and written examination]. Depending on the final results, the NRC will send you either (1) a notification of passing the licensing examination or (2) a letter denying your license application, as described above. Responses to this preliminary results letter must be submitted to

[the Regional Administrator of Region I. Submissions by mail or hand delivery must be addressed to the Regional Administrator at U.S. Nuclear Regulatory Commission, 2100 Renaissance Boulevard, Suite 100, King of Prussia, PA 19406–2713; where e-mail is appropriate, it should be addressed to RidsRgn1MailCenter.Resource@nrc.gov.]

[the Regional Administrator of Region II. Submissions by mail or hand delivery must be addressed to the Regional Administrator at U.S. Nuclear Regulatory Commission, 245 Peachtree Center Avenue, NE., Suite 1200, Atlanta, Georgia 30303–1257; where e-mail is appropriate, it should be addressed to RidsRgn2MailCenter@nrc.gov.]

[the Regional Administrator of Region III. Submissions by mail or hand delivery must be addressed to the Regional Administrator at U.S. Nuclear Regulatory Commission, 2443 Warrenville Road, Suite 210, Lisle, IL 60532–4352; where e-mail is appropriate, it should be addressed to RidsRgn3MailCenter@nrc.gov.]

[the Regional Administrator of Region IV. Submission by mail or hand delivery must be addressed to the Regional Administrator at U.S. Nuclear Regulatory Commission, 1600 E. Lamar Blvd., Arlington, TX 76011–4511; where e-mail is appropriate, it should be addressed to RidsRgn4MailCenter@nrc.gov.]

If you have any questions, please contact me at [number].

Sincerely,

[Name], Chief
[Branch]
[Division]

Docket No.: 55-[number]

Enclosure:
As stated

cc w/o enclosure: Senior Facility Licensee Representative
cc w/enclosure: Facility Licensee Training Manager

CERTIFIED MAIL—RETURN RECEIPT REQUESTED

Letter 5.1-4 Sample Denial Letter

NRC Letterhead

[Date]

[Applicant's Name]
[Street Address]
[City, State Zip Code]

Dear [Mr./Ms. Applicant's name]:

[By letter dated [date], the U.S. Nuclear Regulatory Commission (NRC) informed you of the preliminary results of the [operating test, written examination, or operating test and written examination] taken by you on [date(s)], in connection with your application for a [reactor operator, senior reactor operator, or limited senior reactor operator] license for the [facility name]. That letter indicated that you did not pass that [test, examination, or test and examination]. In response, [you did not, within 20 days of the date of that letter, provide additional information to the NRC and request that the NRC staff conduct an informal review of the preliminary results in light of that information] [you requested that the NRC issue you a letter denying your license application without delay]. Consequently, the preliminary results of your [operating test, written examination, or operating test and written examination] now become the final results and a denial of your license application.]

Under Title 10 of the *Code of Federal Regulations* (10 CFR) 55.33, "Disposition of an initial application," the NRC will approve an initial application for [a reactor operator license/a senior reactor operator license] if it finds that (1) the applicant's medical condition and general health will not adversely affect the performance of assigned operator job duties or cause operational errors endangering public health and safety and (2) the applicant has passed the requisite written examination and operating test. Your application was denied because the NRC determined that [, considering the recommendations and supporting evidence of the facility licensee and of the examining physician, you do not satisfy the health requirement/you did not pass [the written examination/the operating test/either the written examination or the operating test].

* Under 10 CFR 55.31(c), you may submit a further medical report at any time as a supplement to your application.

** Under 10 CFR 55.35, "Re-applications," you may file a new application [2/6/24] months after the date of this letter.

[Because you passed the written examination but did not pass the operating test, you may request, in the new application, to be excused from reexamination on the written examination. The NRC may grant this request at the agency's discretion if it determines that sufficient justification is presented.]

[Because you passed the operating test but did not pass the written examination, you may request, in the new application, to be excused from reexamination on the operating test. The NRC may grant this request at the agency's discretion if it determines that sufficient justification is presented.]

[Because you passed the written examination and the (administrative topics, control room/in-plant systems, simulator) part of the operating test but did not pass the remainder of the operating test, you may request, in the new application, to be excused from reexamination on the written examination and the (administrative topics, control room/in-plant systems, simulator) part of the operating test. The NRC may grant this request at the agency's discretion if it determines that sufficient justification is presented.]

[Because you did not pass either the written examination or the operating test, you will be required to retake both the written examination and the operating test.]

Under 10 CFR 2.103(b)(2), you may demand a hearing on this denial of your application within 20 days after the date of this letter. Under 10 CFR 2.307(a), you may request an extension of this time limit if you can show good cause.

A demand for a hearing shall be filed in accordance with 10 CFR Part 2, "Agency rules of practice and procedure," which is accessible electronically from the NRC Library on the NRC's Web site at https://www.nrc.gov/reading-rm/doc-collections/cfr/. Generally, a demand for a hearing should explain why you believe that the NRC's denial of your application was in error and why you believe that you have, in fact, satisfied the requirements for license issuance.

[Consult with the Office of the General Counsel/regional counsel for the most up-to-date E-Filing language.]

A demand for a hearing must be filed in accordance with the NRC's E-Filing rule (Volume 72 of the *Federal Register*, page 49139; August 28, 2007). The E-Filing process requires participants to submit and serve all adjudicatory documents over the Internet, or in some cases, to mail copies on electronic storage media. Detailed guidance on making electronic submissions may be found in the Guidance for Electronic Submissions to the NRC and on the NRC Web site at https://www.nrc.gov/site-help/e-submittals.html. Participants may not submit paper copies of their filings unless they seek an exemption in accordance with the procedures described below.

To comply with the procedural requirements of E-Filing, at least 10 days before the filing deadline, the participant should contact the Office of the Secretary by e-mail at hearing.docket@nrc.gov or by telephone at 301-415-1677 to (1) request a digital identification (ID) certificate, which allows the participant (or its counsel or representative) to digitally sign submissions and access the E-Filing system for any proceeding in which it is participating and (2) advise the Secretary that the participant will be submitting a demand for a hearing. Based upon this information, the Secretary will establish an electronic docket for the hearing in this proceeding if the Secretary has not already established an electronic docket.

Information about applying for a digital ID certificate is available on the NRC's public Web site at https://www.nrc.gov/site-help/e-submittals/getting-started.html. Once a participant has obtained a digital ID certificate and a docket has been created, the participant can then submit a demand for a hearing. Submissions must be in Portable Document Format (PDF). Additional guidance on PDF submissions is available on the NRC's public Web site at https://www.nrc.gov/site-help/electronic-sub-ref-mat.html. A filing is considered complete at the time the document is submitted through the NRC's E-Filing system. To be timely, an electronic filing must be submitted to the E-Filing system no later than 11:59 p.m. eastern time on the due date. Upon receipt of a transmission, the E-Filing system time-stamps the document and sends the submitter an e-mail notice confirming receipt of the document. The E-Filing system also

distributes an e-mail notice that provides access to the document to the NRC's Office of the General Counsel and any others who have advised the Office of the Secretary that they wish to participate in the proceeding, so that the filer need not serve the document on those participants separately. Therefore, applicants and other participants (or their counsel or representative) must apply for and receive a digital ID certificate before adjudicatory documents are filed so that they can obtain access to the documents through the E-Filing system.

A person filing electronically using the NRC's adjudicatory E-Filing system may seek assistance by contacting the NRC's Electronic Filing Help Desk through the "Contact Us" link located on the NRC's public Web site at https://www.nrc.gov/site-help/e-submittals.html, by e-mail to MSHD.Resource@nrc.gov, or by a toll-free call at 1-866-672-7640. The NRC Electronic Filing Help Desk is available between 9 a.m. and 6 p.m. eastern time, Monday through Friday, excluding Federal Government holidays.

Participants who believe that they have a good cause for not submitting documents electronically must file an exemption request, in accordance with 10 CFR 2.302(g), with their initial paper filing stating why there is good cause for not filing electronically and requesting authorization to continue to submit documents in paper format. Such filings must be submitted by (1) first-class mail addressed to the Office of the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Rulemaking and Adjudications Staff, or (2) courier, express mail, or expedited delivery service to the Office of the Secretary, 11555 Rockville Pike, Rockville, MD 20852, Attention: Rulemaking and Adjudications Staff. Participants filing adjudicatory documents in this manner are responsible for serving the document on all other participants. Filing is considered complete by first-class mail as of the time of deposit in the mail, or by courier, express mail, or expedited delivery service upon depositing the document with the provider of the service. A presiding officer, having granted an exemption request from using E-Filing, may require a participant or party to use E-Filing if the presiding officer subsequently determines that the reason for granting the exemption from use of E-Filing no longer exists.

Documents submitted in adjudicatory proceedings will appear in the NRC's electronic hearing docket, which is available to the public at https://adams.nrc.gov/ehd, unless excluded pursuant to an order of the Commission or the presiding officer. If you do not have an NRC-issued digital ID certificate as described above, click "cancel" when the link requests certificates and you will be automatically directed to the NRC's electronic hearing dockets where you will be able to access any publicly available documents in a particular hearing docket. Participants are requested not to include personal privacy information, such as social security numbers, home addresses, or personal phone numbers in their filings, unless an NRC regulation or other law requires submission of such information. For example, in some instances, individuals provide home addresses in order to demonstrate proximity to a facility or site. With respect to copyrighted works, except for limited excerpts that serve the purpose of the adjudicatory filings and would constitute a Fair Use application, participants are requested not to include copyrighted materials in their submission.

If you have any questions, please contact me at [telephone number].

Sincerely,

[Name], Chief
[Branch]
[Division]

Docket No.: 55-[number]

Enclosure: As stated

cc w/o enclosure: Senior Facility Licensee Representative
cc w/enclosure: Facility Licensee Training Manager

CERTIFIED MAIL—RETURN RECEIPT REQUESTED

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* Use for application denials for failure to meet the health requirement.

** Use for application denials for failure to pass the written examination or operating test, or both.

Letter 5.1-5 Sample Pass Letter

NRC Letterhead

(Date)

(Applicant's Name)
(Street Address)
(City, State ZIP Code)

Dear (Mr./Ms. Applicant's Name):

The purpose of this letter is to forward to you the results of the site-specific operating test and written examination taken by you on (date(s)) in connection with your application for a (reactor operator, senior reactor operator, limited senior reactor operator) license for the (facility name). Copies of your operating test and written examination answer sheets are enclosed.

However, we will not issue your license [until your employer certifies in writing that you have acquired all of the training and experience for which you were previously granted a waiver] [[until we determine that your medical condition and general health are satisfactory for licensing]].

If you have any questions, please contact (name) at (telephone number).

Sincerely,

(Name and title of licensing official)

Docket No.: 55-(number)

Enclosure: As stated

cc w/o enclosure: Senior Facility Licensee Representative
cc w/enclosure: Facility Licensee Training Manager

[ ] Use only for applicants who need to complete training or experience before licensing.
[[ ]] Use only for applicants whose medical condition is still under review.

5.2 APPLICATION DENIALS AND REQUESTS FOR INFORMAL NRC STAFF REVIEW

This examination standard (ES) describes the options and associated responsibilities with respect to license application denials and informal NRC staff reviews.

A. Background

An applicant who, upon initial NRC review, fails to pass the written examination or operating test, or both, is notified of his or her results in accordance with Examination Standard (ES)-5.1, "Issuing Operator Licenses and Postexamination Activities," through a preliminary results letter. This letter describes the nature of the deficiencies noted and informs the applicant of his or her available options. Before a denial, an applicant may request an informal NRC staff review of the license examination grading results. After the denial, applicants may reapply for a license in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 55.35, "Re-applications," demand a hearing on the denial under 10 CFR 2.103(b), or both.

Under 10 CFR 55.31(c), an applicant whose application has been denied because of a medical condition or his or her general health may submit a further medical report at any time as a supplement to the application.

B. Applicant Responsibilities

The applicant has the following responsibilities:

1. An applicant who receives a preliminary results letter and receives the opportunity to provide additional information in accordance with 10 CFR 55.31(b) may request reconsideration of the preliminary results through an informal NRC staff review. Applicants must submit such requests following the instructions of 10 CFR 55.5, "Communications." The applicant's submittal must clearly state the basis for the request and the item(s) for which he or she requests additional review, and it must include documentation supporting the item(s) in contention.

2. An applicant who receives a preliminary results letter and receives the opportunity to provide additional information in accordance with 10 CFR 55.31(b) may respond using the methods described in 10 CFR 55.5 stating that he or she will not submit additional information and that the NRC should set the application denial date. The NRC will then promptly issue a denial letter acknowledging the waiver of an informal NRC staff review. The denial will be accompanied by a description of hearing rights, as applicable, and provide guidance for reapplication under 10 CFR 55.35 or medical supplementation under 10 CFR 55.31(c).

3. An applicant whose application for a license has been denied because of failure to pass the written examination or operating test, or both, may file a new application 2 months after the date of denial. The application must be submitted on Form NRC 398, "Personal Qualification Statement—Licensee," and include a statement signed by an authorized representative of the facility licensee by whom the applicant will be employed that states in detail the extent of the applicant's additional training since the denial and certifies that the applicant is ready for reexamination. An applicant may file a third application 6 months after the date of denial of the second application, and he or she may file further successive applications 2 years after the date of denial of each prior application. The

applicant shall submit each successive application on Form NRC 398 and include a statement of additional training. An applicant who has passed in the immediately preceding examination either the written examination or operating test and failed the other may request in a new application on Form NRC 398 to be excused from reexamination on the portions of the examination or test that the applicant has passed. The Commission may in its discretion grant the request, if it determines that the applicant has presented sufficient justification.

4. An applicant whose application for a license has been denied because of failure to pass the written examination or operating test, or both, may demand a hearing within 20 days from the date of the denial or such longer period as may be specified in the denial under 10 CFR 2.103(b)(2). The application denial letter (see Letter 5.1-4 for a sample) provides detailed guidance related to the process of demanding a hearing. Under 10 CFR 2.307(a), the applicant may request an extension of this time limit if he or she can show good cause. A demand for a hearing shall be filed in accordance with 10 CFR Part 2, "Agency Rules of Practice and Procedure," which is accessible electronically from the NRC Library on the agency's Web site at https://www.nrc.gov/reading-rm/doc-collections/cfr/. Generally, a demand for a hearing should explain why the applicant believes that the NRC's denial of his or her application was in error and why the applicant believes that he or she has, in fact, satisfied the requirements for license issuance. Applicants must submit such requests electronically in accordance with the requirements of 10 CFR 2.302, "Filing of documents." Detailed guidance on making electronic submissions may be found on the NRC's Web site at https://www.nrc.gov/site-help/e-submittals.html.

C. Facility Licensee Responsibilities

The facility licensee has the following responsibilities:

1. The NRC may ask the facility licensee to provide reference materials, technical support, and a confirmation of the validity of the test items to allow the agency to resolve any concerns raised by an applicant.

2. The facility licensee should ensure that any written examination questions that are determined to be invalid (e.g., those that have no correct answer or multiple correct answers) as a result of NRC staff review are retrieved from any examination bank into which they have been deposited and corrected or discarded.

D. NRC Responsibilities

The NRC has the following responsibilities:

1. The NRC conducts informal NRC staff reviews of preliminary examination results for a license under 10 CFR Part 55, "Operators' licenses," if requested by an applicant, in accordance with the current revision of OLMC 500, "Processing Requests for Administrative Reviews and Demands for Hearings" (the October 2020 revision is available at Agencywide Documents Access and Management System (ADAMS) Accession No. ML20230A201).

2. The NRC conducts hearings related to 10 CFR Part 55 license denials, if demanded by an applicant, in accordance with 10 CFR Part 2.

3. When the NRR operator licensing program office has concurred in the results of an informal NRC staff review that new information showed that the requirements of 10 CFR 55.33 were met or when ordered as a result of a hearing, the NRC regional office will (1) issue a license, (2) update the master examination file to reflect any test item deletions or answer key changes, and (3) consider the need to correspond with the facility licensee about the quality of the examination.

4. When the NRR operator licensing program office has concurred on the results of an informal NRC staff review that new information did not show that the requirements of 10 CFR 55.33 were met, the NRC regional office will inform the applicant of the denial of the application.

5.3 MAINTAINING, CHANGING, AND RENEWING OPERATOR LICENSES

This examination standard (ES) provides instructions for maintaining an NRC operator license and the procedures for changing operator license information, processing license renewal applications, and denying applications for license renewal.

A. Maintaining an Operator License

1. Requalification Training and Testing

a. The regulation in Title 10 of the *Code of Federal Regulations* (10 CFR) 55.53(h) imposes a condition that requires licensed operators to complete a requalification program, as described by 10 CFR 55.59, "Requalification." The requirement applies to all licensed operators, even if they do not maintain watch-standing proficiency under 10 CFR 55.53(e). The regulations in 10 CFR 55.59(a)(1) require licensed operators to successfully complete a requalification program that is conducted for a continuous period not to exceed 24 months in duration. Under 10 CFR 55.59(c)(1), the facility licensee is required to conduct the requalification program for a continuous period not to exceed 2 years.

To avoid exceeding the 24-month/2-year duration requirement, a requalification program must be completed within the anniversary month of the second year. For example, if a licensed operator requalification program began on June 1, 2018, the facility licensee would have until June 30, 2020, to complete the program to ensure compliance with 10 CFR 55.59(a)(1) and (c)(1).

Under 10 CFR 55.59(a)(2), each licensed operator must pass a comprehensive requalification written examination and an annual operating test as part of the 24-month requalification program; therefore, the examination must occur *during* the requalification program rather than after its completion. Although the comprehensive written examinations are generally conducted on the same 24-month frequency, their timing can be adjusted somewhat near the end of the 24-month program to account for outages and other events, thereby resulting in some longer testing intervals if an examination is advanced during one 24-month program cycle and returned to its normal timing during the following cycle. Thus, the interval between the administrations of successive comprehensive requalification written examinations may exceed 24 months for individual licensed operators. As long as a licensed operator successfully completes the facility licensee's Commission-approved requalification program, including its required comprehensive written examination, within 24 months, as required by 10 CFR 55.59(a)(1), the operator's comprehensive requalification written examination can be administered more than 24 calendar months from the administration of his or her last comprehensive written examination without requesting an exemption in accordance with 10 CFR 55.11, "Specific exemptions."

For example, consider a licensed operator who took a comprehensive requalification written examination on August 18, 2012, for a facility licensee requalification training program that ran for 24 months, according to 10 CFR 55.59(a)(1) and 10 CFR 55.59(c)(1), from October 1, 2010, through September 30, 2012. If that operator's next comprehensive requalification written examination is scheduled for September 27, 2014, the operator will exceed 24 calendar months between successive

comprehensive requalification written examinations, but the licensed operator is still in compliance with 10 CFR 55.59(a)(1) and (2) and 10 CFR 55.59(c)(1). The licensed operator will have successfully completed two consecutive requalification training programs, including comprehensive written examinations, within the 24-month requalification program time limit according to 10 CFR 55.59(a)(1) and 10 CFR 55.59(c)(1).

b. Newly licensed operators must enter the requalification training and examination program promptly upon receiving their licenses. As they just passed the initial licensing examination and have received none of the requalification training, new operators may be excused from taking any annual operating test or comprehensive written examination that is scheduled to be administered during the first requalification training cycle (nominally lasting about 6 weeks) in which the operators participate. However, operators who complete one or more training cycles before the scheduled annual test or comprehensive examination should take the test or examination to ensure that they do not exceed the allowed testing intervals.

c. If an operator has not met the requirements of 10 CFR 55.59(a)(1) and (2), the Commission may require the operator to complete additional training in accordance with 10 CFR 55.59(b) and to submit evidence to the Commission of his or her successful completion of this training before returning to licensed duties. The following examples are the most common extenuating circumstances that result in an operator not meeting the requalification requirements:

- temporary assignment to the Institute of Nuclear Power Operations
- participation in a foreign interchange program
- college attendance
- military assignment

The facility licensee should notify the NRC regional office when any licensed operator is suspended from the requalification program with the details of the facility licensee's plan to ensure that the operator's qualifications and status are acceptable before he or she resumes licensed duties.

The NRC regional office will confirm its expectations for the operator's return to licensed duties and the need for the facility licensee to certify when the actions have been completed in accordance with 10 CFR 55.59(b). The agency will document this in a letter to the facility licensee with a copy to the operator.

2. Proficiency Watches

a. NRC regulations include minimum requirements for the number of shifts and general types of functions that ROs and SROs must complete in order to maintain active status. The regulation at 10 CFR 55.53(e) states that "[t]o maintain active status, the licensee shall actively perform the functions of an operator or senior operator on a minimum of seven 8-hour or five 12-hour shifts per calendar quarter." This requirement may be completed with a combination of complete 8- and 12-hour shifts (in a position appropriately credited for watch-standing proficiency as discussed below) at sites having a mixed-shift schedule, and watches shall not be truncated when the operator satisfies the minimum quarterly requirement (56 hours). Overtime may be credited if the overtime work is in a position appropriately credited for watch-standing proficiency. Working

overtime as an extra “helper” after the official watch has been turned over to another watch-stander does not count toward proficiency time.

b. In accordance with 10 CFR 55.4, “Definitions,” “[a]ctively performing the functions of an operator or senior operator” means “that an individual has a position on the shift crew that requires the individual to be licensed as defined in the facility technical specifications, and that the individual carries out and is responsible for the duties covered by that position.” Therefore, to meet these regulatory requirements, ROs and SROs will be responsible for actively performing the functions of an operator or senior operator, for the required number of quarterly shifts, and while in a position on a shift crew that requires an operator or senior operator, as appropriate, license under the facility technical specifications.

c. Watch-standing proficiency credit may also be appropriate for certain licensed RO or SRO shift crew positions that exceed those required by a facility’s technical specifications. However, to credit watch-standing proficiency for such excess positions, the facility licensee should have in place the following procedural administrative controls:

- a list of all the licensed shift crew positions, including title, description of duties, and indication of which positions are required by technical specifications

- for shift crew positions in excess of those required by technical specifications, a description of how the position is *meaningfully and fully* engaged in the functions and duties of the analogous minimum licensed position(s) required by technical specifications

For example, technical specifications for a dual-unit facility with a common control room require two SROs per shift. The facility licensee could credit watch-standing proficiency for three SROs per shift, with one SRO responsible for overall plant operation and the other two SROs each responsible for the command and control of a single unit. In this case, the third SRO would be entitled to watch-standing proficiency credit because he or she is performing duties analogous to the second SRO (who is required by technical specifications). Similarly, a dual-unit facility with a common control room could credit watch-standing proficiency for four ROs (two per unit) per shift even if technical specifications require only three ROs if the fourth RO is performing duties analogous to the third RO (who is required by technical specifications).

If a facility cannot justify, as explained above, crediting watch-standing proficiency for shift crew positions in excess of technical specifications or does not implement administrative controls as described above, an individual who stands watch in an excess position shall not receive proficiency credit. In order to maintain an active license under such circumstances, each licensed individual would have to rotate into a licensed shift crew position required by technical specifications for the minimum of seven 8-hour or five 12-hour shifts per calendar quarter, with sufficient administrative controls to document those activities.

Facility licensees that are uncertain whether shift crew positions in excess of those required by technical specifications qualify for watch-standing proficiency credit should contact their NRC regional office.

d. An individual with an SRO license could maintain only the RO portion of his or her license in an active state by performing the functions of an RO for a minimum of seven

8-hour or five 12-hour shifts per calendar quarter under 10 CFR 55.53(e). Moreover, an inactive SRO may reactivate only the RO portion of his or her license under 10 CFR 55.53(f)(2) by completing a minimum of 40 hours of shift functions, including a plant tour, under the direction of an operator and in the position to which the individual will be assigned. However, the fact that an SRO license holder is routinely standing watches only as an RO does *not* maintain his or her proficiency as an SRO. Therefore, before such an SRO can resume duties that require an SRO license, he or she must reactivate that portion of the license under 10 CFR 55.53(f)(2) by completing a minimum of 40 hours of shift functions, including a plant tour, under the direction of a senior operator and in the SRO position to which the individual will be assigned.

e. To maintain the supervisory portion of an SRO license active, an SRO must stand at least *one* complete watch (8- or 12-hour shift) per calendar quarter in a shift crew position credited for SRO-only supervisory licensed duties. The remainder of complete watches (to meet the required minimum of seven 8-hour or five 12-hour shifts per calendar quarter) may be performed in either a credited SRO or RO position. An SRO may stand all of his or her required watches in credited SRO-only supervisory positions, and the RO portion of the license will still be considered active. Similarly, for an SRO to reactivate the supervisory portion of his or her SRO license under 10 CFR 55.53(f)(2), he or she must complete a minimum of 40 hours of shift functions, including a complete plant tour and required shift turnover procedures, under the direction of an SRO in a credited SRO-only supervisory position. An SRO who reactivates his or her license in this manner automatically reactivates the RO portion of the license; an additional 40 hours of under-direction watches in a credited RO position are not required.

f. Individuals who are licensed on two (or more) comparable units at a facility are not required to establish proficiency on each of the comparable units unless they hold a separate license for each unit. Performing the required seven 8-hour or five 12-hour shifts of watch-standing per calendar quarter on a single unit maintains the license active for all comparable units identified in the license. Similarly, individuals who are licensed on two (or more) comparable units at a facility are not required to reactivate their license on each of the comparable units identified in the license. Performing the required 40 hours of under-direction watches on a single unit, including a plant tour, reactivates the license for all comparable units identified in the license.

g. In addition to the under-direction watch requirements discussed above, the following clarifies license reactivation under 10 CFR 55.53(f):

- The 40 hours of under-direction watches required by 10 CFR 55.53(f)(2) shall only be credited for standing watches in an RO or SRO position appropriately credited for maintaining license proficiency. It is not appropriate to credit reactivation watch hours while under the direction of an active license holder who is standing watch in an “extra” or noncredited position.

- When performing under-direction watches, only one under-direction watch-stander shall be assigned to an active license holder. Given that the inactive operator must complete (not just observe) 40 hours of shift functions, it would not be appropriate to divide under-direction watch functions among multiple individuals.

- The 40 hours of under-direction watches for license reactivation do not need to occur in complete shifts or to be completed on consecutive days. All 40 hours should occur within a reasonable timeframe (e.g., 30 days), and at least one complete on-coming shift turnover and one complete off-going shift turnover must be performed while under the direction of the active license holder. Once the operator completes all the requirements for license reactivation, the license is considered active for the remainder of the current calendar quarter, with proficiency watches (i.e., seven 8-hour or five 12-hour shifts) required to maintain the license in an active state during subsequent calendar quarters.

- The 40 hours of under-direction watches do not need to occur in the control room; they may be performed wherever the duties of the credited licensed position are performed.

- The 40 hours of under-direction watches must include at least one complete plant tour. Since it is a part of the 40 hours of under-direction watches, the plant tour must be performed under the direction of an active license holder. Although the regulations do not define the scope of a complete plant tour, the NRC expects that this tour will include all readily accessible major areas of the plant that are routinely toured by in-plant operators and that contain safety-related equipment. If a facility has developed a checklist of areas to tour, it is generally inappropriate to skip plant areas and mark the items as "nonapplicable" unless there is sufficient justification (e.g., personnel or radiation hazard).

h. Senior operators limited to fuel handling under 10 CFR 55.53(c) (i.e., limited SROs or LSROs) would generally be unable to maintain an active status as defined in 10 CFR 55.53(e). Therefore, under 10 CFR 55.53(f), an authorized representative of the facility licensee must certify that, among other things, the LSRO has completed one shift under the direction of an active senior operator before resuming activities authorized by the license. Ideally, such a watch should be performed primarily in the fuel handling area during refueling operations (i.e., at a time when the presence of a senior operator is required under 10 CFR 50.54(m)(2)(iv)). This would clearly meet the requirements of 10 CFR 55.53(f)(2), which mandates that the licensee must complete one shift of shift functions under the direction of a senior operator in the position to which the licensee will be assigned. It also meets the definition of "actively performing the functions of [a] senior operator" in 10 CFR 55.4, which requires the licensee to fill a position on the shift crew that requires the individual to be licensed and to carry out and be responsible for the duties covered by that position. This also ensures that the inactive LSRO's activities are adequately supervised. However, given the infrequency and short duration of shift functions that require the presence of an LSRO on the refueling floor, it may not always be practical for a facility licensee to delay its LSRO reactivations until those shift functions are actually underway. In such instances, the facility licensee can satisfy the intent of the regulation by implementing a reactivation program that specifies, in detail, the refueling tasks and activities that an LSRO must satisfactorily complete or walk through on-station in order to demonstrate watch-standing proficiency.

To properly reactivate an LSRO license in accordance with 10 CFR 55.53(f), the individual should stand a watch under the direction and *in the presence of* an active SRO or LSRO, who will directly oversee the inactive LSRO's activities and enable an authorized representative of the facility licensee to certify that the operator's qualifications are current and valid, as required by 10 CFR 55.53(f)(1). The NRC gives

its requirements for the conduct of under-instruction or training watches in 10 CFR 55.13, "General exemptions," which allows trainees to manipulate the controls of a facility "[u]nder the direction and in the presence of a licensed operator or senior operator." The responses to Questions 252 and 276 in NUREG-1262, "Answers to Questions at Public Meetings Regarding Implementation of Title 10, Code of Federal Regulations, Part 55 on Operators' Licenses," issued November 1987 (Agencywide Documents Access and Management System Accession No. ML15198A217), state that the responsible person should closely monitor a trainee's activities.

If a facility licensee needs to reactivate an SRO license as an LSRO (strictly for the purpose of supervising refueling activities), the operator must complete one shift under direction performing refueling activities, as discussed above, and the facility licensee must ensure that the operator is administratively restricted from performing full SRO duties.

If a facility licensee is unable to comply with the LSRO license reactivation requirements in 10 CFR 55.53(f)(2) even under the conditions discussed above, the licensee may, under 10 CFR 55.11, request an exemption from the requirements in 10 CFR 55.53(e) and propose alternative criteria for maintaining active LSRO licenses. The Commission may grant such exemptions from the regulatory requirements as it determines are authorized by law and will not endanger life or property and are otherwise in the public interest. Such requests should provide the following information:

- the reason why the facility licensee is unable to comply with the requirements of 10 CFR 55.53(f)(2), as clarified above, for reactivating its LSRO licenses to supervise fuel handling
- the nature of the fuel handling activities that a licensee will have to complete to remain "active" and an explanation of how those activities would maintain an operator's proficiency to supervise actual core alterations (identify those activities that must be performed and those that may be simulated and explain how the simulation will be accomplished)
- the minimum duration and frequency of the fuel handling activities required to remain "active"
- the nature, duration, and frequency of the training related to fuel handling that is given to its licensed fuel handlers

3. Medical Standards

a. In accordance with Subpart C, "Medical Requirements," of 10 CFR Part 55 and 10 CFR 55.33(a)(1), the medical condition and general health of licensed operators must be such that it will not adversely affect the performance of assigned operator duties or cause operational errors endangering public health and safety. Therefore, licensed operators must be examined by a physician and determined to be fit every 2 years (measured from the date of the last physical examination rather than from the date of licensing). In addition, under 10 CFR 55.57(a)(6), their fitness must be certified on NRC Form 396, "Certification of Medical Examination by Facility Licensee," every time the license is renewed. As noted on NRC Form 396, the physician and facility licensee may use the 1983, 1996, 2013, or most recently endorsed version of American National Standards Institute (ANSI)/American Nuclear Society (ANS) 3.4, "Medical Certification

and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants," when making their fitness determinations. These versions of the standard include provisions for those cases in which the operator can demonstrate complete capacity to perform licensed duties and conditional licenses for those cases in which compensatory measures may be required to ensure public health and safety (refer to Section C.3.c below). However, in all cases, the examining physician and facility licensee must submit a recommendation and supporting evidence on or with NRC Form 396 to enable the NRC to make a licensing decision.

b. If, during the term of the license, an operator is *temporarily* unable to meet medical standards but is expected to meet those standards again in the future, the facility licensee may administratively classify that operator's license as "inactive" or require compensatory measures, such as taking any medications as prescribed during the temporary period to maintain medical qualifications, or impose other operating restrictions to accommodate the operator's medical condition until the operator is once again certified to meet all medical standards by the facility licensee. Similarly, if the operator's medical condition precludes the operator from completing the requalification training program under 10 CFR 55.59(a), the facility licensee shall administratively control the operator's activities until he or she completes the additional training requirements of 10 CFR 55.59(b), including notification of the NRC.

The facility licensee does not need to notify the NRC nor request a conditional license concerning an operator's temporary disability, including the temporary use of prescribed medications, provided that the facility licensee administratively prevents the operator from performing licensed duties or otherwise compensates for or restricts the operator, as appropriate, throughout the period of his or her temporary disability. If the disability extends beyond the date of license expiration, the operator may apply for timely license renewal in accordance with 10 CFR 55.55(b) and 10 CFR 55.57(a). In that event, the facility licensee should document the nature of the operator's temporary disability on the medical certificate and submit a revised certificate to the NRC after the physician determines that the operator meets the requirements of 10 CFR 55.33(a)(1). The NRC will not renew the operator's license until the staff finds that all the conditions specified in 10 CFR 55.57(b) are satisfied.

c. If the facility licensee determines that an operator's medical condition is *permanently* disqualifying in accordance with ANSI/ANS 3.4, the facility licensee shall notify the NRC within 30 days of learning of the diagnosis (see 10 CFR 50.74, "Notification of change in operator or senior operator status," and 10 CFR 55.25, "Incapacitation because of disability or illness"). If an operator develops a permanent medical condition that is not identified in ANSI/ANS 3.4, but the examining physician believes that it could affect the operator's performance or cause operator errors, it would be prudent to report the condition to the NRC or at least contact the appropriate NRC regional office to ask whether the condition should be reported.

While most of the medical conditions/disabilities identified in ANSI/ANS 3.4, including those that result in failure to meet the minimum requirements for medical qualification, are likely to be permanent, the examining physician is responsible for evaluating each operator's medical condition on a case-by-case basis and assessing whether the operator will be capable of meeting medical standards in the foreseeable future. For example, the facility licensee should report to the NRC a condition for an operator who takes medication to meet the minimum standard for blood pressure (i.e., less than or

equal to 160/100 millimeters of mercury (mmHg)), unless the physician has reasonably determined that the condition will be controllable without medication in the foreseeable future. In addition, many physicians prescribe blood pressure medication before an individual reaches the 160/100 mmHg limit, and facility licensees should consider reporting this to the NRC as well.

When reporting a permanent disqualifying medical condition, if a conditional license is requested, the facility licensee shall provide medical certification and evidence on NRC Form 396 and recommend the exact wording of any license restriction that might be necessary. A permanent disqualifying condition is always reportable, even if it is being controlled and regardless of whether the compensatory measures are recognized in the applicable version of ANSI/ANS 3.4.

d. In accordance with 10 CFR 55.33(b), if an operator's general medical condition does not meet the minimum standards under 10 CFR 55.33(a)(1), the NRC may condition the license to accommodate the medical defect. The NRC will consider the recommendations and supporting evidence provided on or with NRC Form 396 in determining the appropriate license condition. The following medical restrictions and conditions are illustrative but not all-inclusive:

- An operator may be required to wear corrective lenses while performing licensed duties if his or her vision does not meet medical standards.

- An operator may be required to wear a hearing aid while performing licensed duties if his or her hearing does not meet medical standards.

- An RO who is at risk of sudden incapacitation may have a no-solo restriction that requires another licensed operator to be in view when the restricted operator is performing control manipulations, and someone capable of summoning assistance must be present at all other times while the restricted operator is performing licensed duties. The analogous SRO restriction would require another licensed operator to be in view when the restricted operator is performing control manipulations and another senior operator to be present on site at all other times while the restricted operator is performing SRO licensed duties, or someone capable of summoning assistance must be present at all other times while the restricted operator is performing RO licensed duties. For LSROs, the no-solo restriction would require someone capable of summoning assistance to be in view when the restricted LSRO is performing licensed LSRO duties.

- An operator may be required to take medication as prescribed, if an operator's medical qualification is contingent on taking a prescription medication.

- An operator may be required to use a therapeutic device, such as a continuous positive airway pressure therapy machine, as prescribed by a doctor, if an operator's medical qualification is contingent on using that device.

- An operator whose medical condition is acceptable but unstable may be required to submit followup medical status reports (i.e., prognosis, treatment, and ability to perform licensed duties) at 3-, 6-, or 12-month intervals.

- An operator with respiratory problems may be restricted from performing licensed activities that require the use of a respirator.

e. With regard to prescription medications, it is important that the examining physician understand what medical conditions are contained in the applicable version of ANSI/ANS 3.4. For example, the fact that a licensed operator is diagnosed with gastroesophageal reflux disease and placed on the appropriate prescription medication would, in all likelihood, not be reportable to the NRC, since this condition is not addressed in ANSI/ANS-3.4. However, when assessing *any* prescription medication, the examining physician needs to consider (1) the possible side effects of the medication, drug interactions, and dosages to ensure that they will not cause operational errors or affect the operator's capacity to safely perform licensed duties and (2) any delay in taking a medication that might be expected to result in the incapacity of the operator.

   In addition, the actual wording of the license condition on medication will *not* specify a particular medical condition or medication, but it will simply state that the operator must "take medication as prescribed." Therefore, physician-prescribed changes in medication or dosing for an existing medical condition are not required to be reported to the NRC unless the examining physician believes that the operator's medical condition has become unstable (therefore requiring followup medical status reports to the NRC) or that the operator requires a no-solo license restriction. However, any new permanently disqualifying medical condition(s), requiring new medication(s), must be reported to the NRC.

B. Changes to an Operator License

1. Downgrading a Senior Reactor Operator License

If a facility licensee and SRO desire to permanently downgrade the SRO's license, the licensee may do so by submitting a written request to the NRC regional office. In such instances, the NRC regional office will (1) amend the license to restrict the operator's activities to those authorized for an RO under 10 CFR Part 55, (2) condition the license to prohibit the operator from directing the licensed activities of licensed operators, and (3) inform the operator and facility licensee in writing that the license will not be subject to renewal under 10 CFR 55.57, "Renewal of licenses," and that a new application (NRC Form 398) will be required under 10 CFR 55.31 if the operator desires to maintain an RO license upon expiration of the amended SRO license. The expiration date of the original license will not change, and the operator may transition to the RO requalification program upon receipt of the amended license.

2. Amendments

An amendment is required to change information on the operator license. Some examples of changes that require an amendment include the following:

- legal name (such as first or last name)
- type of license (such as the downgrade of an SRO license to an RO license)
- permanent medical condition or restriction

- addition of another unit at a multiunit site (requested using NRC Form 398; also see ES-2.2, “Applications, Medical Requirements, and Wavier and Excusal of Examination and Test Requirements”)

The following types of changes do not require an amendment to the operator license:

- mailing address
- e-mail address
- education
- additional industry experience
- editorial issues (such as a typographical error)
- new facility medical contact
- use of a new ANS/ANSI standard (ANSI/ANS 3.4 or ANSI/ANS 15.4, “Selection and Training of Personnel for Research Reactors”)

If there is a question as to whether a change requires a license amendment, the facility licensee should contact the NRC regional office for clarification.

A request to amend an operator license requires a signature from the affected licensed operator in accordance with 10 CFR 55.31(b); 10 CFR 55.31(d); 10 CFR 55.9, “Completeness and accuracy of information”; 10 CFR 55.61, “Modification and revocation of licenses”; and Sections 107 and 182a of the Atomic Energy Act of 1954, as amended. The NRC will not amend the operator’s license in response to the amendment request without a signed statement of fact from the affected licensed operator. For the purpose of medical condition license amendments, the affected licensed operator can satisfy this requirement by signing the NRC Form 396. To meet this requirement, the facility licensee may e-mail or submit using the NRC’s Electronic Information Exchange the operator-signed license amendment request to the NRC regional office.

3. Change in Operator or Senior Operator Status

Under 10 CFR 50.74, each facility licensee shall notify the appropriate Regional Administrator as listed in Appendix D, “United States Nuclear Regulatory Commission Regional Offices,” to 10 CFR Part 20 within 30 days of the following in regard to a licensed operator or senior operator:

- permanent reassignment from the position for which the facility licensee has certified the need for a licensed operator or senior operator under 10 CFR 55.31(a)(3)
- termination of any operator or senior operator
- permanent disability or illness as described in 10 CFR 55.25

C. License Renewal

The license renewal application differs in some respects from the initial license application. An operator who wishes to renew a license must comply with the requirements of 10 CFR 55.57(a), as follows:

1. The operator will complete and sign NRC Form 398, including the operator's experience under the current license, the approximate number of hours that the operator spent on operating shifts, and the date and results of the applicant's most recent requalification written examination and annual operating test. The senior management representative on site shall provide evidence that the operator has safely and competently discharged his or her license responsibilities and has satisfactorily completed the facility's approved requalification program by checking the corresponding certification box and signing in the designated space on NRC Form 398.

2. The facility licensee must certify on NRC Form 396 that a physician has performed a medical examination within the previous 2 years, as required by 10 CFR 55.21, "Medical examination," and submit that form along with NRC Form 398.

3. The operator must submit NRC Forms 396 and 398 not less than 30 days before the expiration date of the license. In accordance with 10 CFR 55.55(b), if the operator files an application for renewal at least 30 days before the date of expiration, the license does not expire until the NRC has dispositioned the application for renewal. If the application is received more than 60 days in advance, the NRC regional office should contact the facility licensee to determine whether it would prefer to have the license renewed immediately with a new effective date (the license will not be predated, nor will it exceed a 6-year license term) or to resubmit the application within the 60- to 30-day window preceding the expiration date.

   If an operator is waiting to take a reexamination after failing a requalification examination, the operator *should still make timely application* for license renewal under the provisions of 10 CFR 55.55(b).

   Under 10 CFR 55.55(a), each operator license and senior operator license expires 6 years after the date of issuance, upon termination of employment with the facility licensee, or upon determination by the facility licensee that the licensed individual no longer needs to maintain a license. Under 10 CFR 55.55(b), if a licensee files an application for renewal or an upgrade of an existing license on NRC Form 398 at least 30 days before the expiration of the existing license, it does not expire until the Commission has finally determined the disposition of the application for renewal or for an upgraded license. Filing by mail will be deemed to be complete at the time the application is deposited in the mail. Under 10 CFR 2.109, "Effect of timely renewal application," if at least 30 days before the expiration of an existing license, the licensee files an application for a renewal or for a new license for the same activity, then the existing license will not be deemed to have expired until the application has been finally determined.

4. If the license for a RO expires while he or she is participating in the facility licensee's SRO-upgrade training program, NRC Forms 396 and 398 should still be submitted for timely renewal of the RO license. However, if the RO is not current in the facility's

requalification training and testing program because he or she is attending SRO-upgrade training, NRC Form 398 must note the exception in the "Comments" section, and the operator must be administratively restricted from performing licensed duties until the individual is up to date in the requalification program.

5. The regulations at 10 CFR 55.5, "Communications," set forth requirements on where to submit any application for a license or license renewal and any related inquiry, communication, information, or report.

Upon receipt of a renewal application, the NRC regional office may take the following actions, as appropriate:

1. Under 10 CFR 55.31(b), the Commission may at any time after the application has been filed, and before the license has expired, require further information under oath or affirmation in order to enable it to determine whether to grant or deny the application or whether to revoke, modify, or suspend the license. After reviewing the renewal application, the NRC's regional office may ask the licensee or facility licensee to provide supplemental information. The Regional Administrator may deny an application if an applicant fails to respond to a request for additional information within 30 days from the date of the request or within such other period as may be specified. (Requirements concerning denials appear in 10 CFR 2.108, "Denial of application for failure to supply information," and 10 CFR 2.103(b).)

2. The NRC regional office will review the application and issue the license renewal if the staff finds that the applicant satisfies the requirements of 10 CFR 55.57(b). The operator does not have to operate the facility for any minimum number of hours to qualify for license renewal (i.e., inactive licenses are also renewable).

3. If the renewal applicant does not satisfy the requirements of 10 CFR 55.57, the NRC regional office shall inform the applicant and the facility licensee of the deficiencies and request any supplemental information that the staff might require to make a renewal decision. If, after evaluating the supplemental information, the NRC regional office still concludes that the applicant does not meet the requirements for license renewal, the staff will issue a notice of denial of the application and inform the applicant in writing of the right of the applicant to demand a hearing within 20 days from the date of the notice or such longer period as may be specified in the notice in accordance with 10 CFR 2.103(b).

The applicant may file a demand for a hearing following the denial of his or her license renewal application. A demand for a hearing shall be filed in accordance with 10 CFR Part 2, which is accessible electronically from the NRC Library on the NRC's Web site at https://www.nrc.gov/reading-rm/doc-collections/cfr/. Generally, a demand for a hearing should explain why the applicant believes that the NRC's denial of his or her application was in error and why the applicant believes that he or she has, in fact, satisfied the requirements for license renewal. Applicants must submit such requests electronically in accordance with the requirements of 10 CFR 2.302. The NRC has published detailed guidance on making electronic submissions on the agency's Web site at https://www.nrc.gov/site-help/e-submittals.html.

6.1 CONDUCTING NRC REQUALIFICATION EXAMINATIONS

Title 10 of the *Code of Federal Regulations* (10 CFR) 55.59(a) requires licensed operators and senior operators to complete a requalification program developed by the facility licensee and to pass a comprehensive requalification written examination and an annual operating test. In lieu of accepting the facility licensee's certification that the operator has passed the required examinations and tests administered within the facility licensee's Commission-approved program, the U.S. Nuclear Regulatory Commission (NRC) may administer a comprehensive requalification written examination and an annual operating test.

This standard provides guidance and instructions for conducting NRC requalification examinations. In addition, this standard offers guidance and instructions for evaluating the facility licensee's requalification training program for licensed operators to ensure that it is effectively maintaining the competency of the licensed operators. Examination Standard (ES)-6.2, "Requalification Written Examinations"; ES-6.3, "Requalification Walkthrough Examinations"; and ES-6.4, "Requalification Dynamic Simulator Examinations," provide specific guidance and instructions for conducting the comprehensive requalification written examinations and the annual operating tests (including both the plant walkthrough and dynamic simulator portions).

This standard also contains instructions to follow for an operator who fails one or more NRC-conducted requalification examinations, including licensed operators' requests for informal reviews.

A. Background

Section 306 of the Nuclear Waste Policy Act of 1982 authorized and directed the NRC to issue regulations, or other appropriate guidance, for training and qualifying nuclear power plant operators. Those regulations were to include requirements governing the administration of requalification examinations and operating tests at nuclear power plant simulators. The NRC's requalification evaluation program consists primarily of periodic, onsite requalification inspections. The oversight program requires the NRC to actively oversee each facility licensee's requalification training programs, and the Commission's regulations will continue to contain legally binding requirements that apply to the conduct of operator requalification examinations by facility licensees.

When determining the scope of a facility's requalification inspection and examination activities, regional managers will consider overall facility performance; the results of the NRC's inspection programs (e.g., requalification, emergency operating procedure, and resident); the results of routine initial and requalification examinations; and other factors. When necessary, the NRC can initiate augmented activities in accordance with program office guidance to ensure safe plant operation. Those activities could include a training program inspection in accordance with Inspection Procedure (IP) 41500, "Training and Qualification Effectiveness," operational evaluations of onshift crews, or NRC examinations conducted in accordance with this series of examination standards.

The NRC will conduct requalification examinations when it has lost confidence in the facility licensee's ability to do so or when the staff believes that the inspection process will not provide the needed insight. Regional management should consider conducting requalification examinations or operational evaluations when any of the following conditions exist:

- Requalification inspection results indicate an ineffective operator requalification program.
- Operator errors are a major contributor to operational problems.
- Allegations have been raised about significant training program deficiencies.

The decision to conduct NRC examinations should be implemented through the normal resource planning system because an inspection activity will be replaced with examinations that are more resource intensive. Using the existing inspection planning process ensures that the regional office and the NRC's Office of Nuclear Reactor Regulation (NRR) consider the need to conduct examinations, as well as the alternative expanded inspection tools, when allocating the required resources. Operational evaluations should be considered as a reactive effort based on immediate safety concerns.

B. Scope

The NRC-conducted requalification examinations measure the effectiveness of a facility licensee's requalification program by evaluating the licensee's ability to adequately prepare written examination questions, job performance measures (JPMs), and simulator scenarios, as well as its ability to properly evaluate its operators' performance. The examination procedures are based on a systems approach to training (SAT) program, as defined in 10 CFR 55.4, "Definitions." To the extent possible, these procedures rely on existing requalification program standards for developing and implementing the NRC's examinations. The SAT approach allows the NRC to conduct requalification examinations that are fundamentally consistent with existing facility licensee-developed programs. As such, this approach reduces the impact on the facilities and improves the reliability of the NRC's assessment of requalification training programs.

The NRC-conducted requalification examination normally consists of three parts, including a two-section open-reference written examination, a walkthrough evaluation, and a dynamic simulator evaluation. ES-6.2, ES-6.3, and ES-6.4 further describe the three examination parts. The NRC will consider preferentially using the facility licensee's requalification examination structure or methodology if it differs from that described here, and if it complies with 10 CFR 55.59, "Requalification," and is free of significant flaws. The regional office shall consult with the NRR operator licensing program office to determine the appropriate examination procedure.

To the extent practical, the examination will be based on the facility licensee's requalification program and learning objectives. The NRC expects the facility licensee to use the plant-specific job task analyses (JTAs) as the basis for developing the examination materials and substantiating the importance rating factors for each task. The facility licensee may also refer to the applicable knowledge and abilities (K/A) catalog for additional guidance on identifying job-specific importance rating factors. The use of a JTA will result in more technically sound and operationally oriented examinations.

An examination team composed of NRC examiners and facility licensee representatives will develop, review, and conduct each requalification examination. Parallel evaluation of operator performance by NRC examiners and facility licensee evaluators will enhance the NRC's ability to assess both individual and program performance.

C. Examination Preparations

Form 6.1-1, "Examination Timeline," outlines an example timeline for conducting an NRC requalification examination.

1. Communication

a. When the NRC determines that it is necessary to conduct a requalification examination, the regional office will notify the facility licensee to be evaluated at least 90 but preferably 120 days before the examination start date using the corporate notification letter shown in Letter 6.1-1, "Sample Corporate Notification Letter." If possible, the NRC will schedule the site visits to coincide with the facility's requalification training cycle. Depending on the number of operators and crews at the facility, it may be necessary to conduct the examinations over a period of 2 or more weeks to attain the required sample size. The requalification training cycle, referenced here and throughout NUREG-1021, is that continuous period (not to exceed 24 months) within which the facility licensee conducts its operator requalification training program.

   If the purpose of the examination is to retest operators who previously failed an NRC-conducted requalification examination, the regional office should modify the corporate notification letter, as appropriate.

b. The NRC expects the facility licensee to respond to the corporate notification letter at least 60 days before the evaluation by submitting the materials and information requested in the letter. The facility licensee may request that the NRC chief examiner or another NRC representative meet with appropriate facility licensee managers and the operators to be examined. Such a meeting should be scheduled during the examination preparation week as discussed in Section C.5.

c. At least 30 days before the examination, the NRC will confirm with the facility licensee which operators have been selected to participate in the evaluation.

2. Selection of Operators

a. The NRC expects facility licensees to train and examine their operators in the same crew configurations with which they normally operate the plant. Generally, the NRC expects the crew to include no more than five operators, but the agency will consider larger crews on a case-by-case basis.

   At times, to ensure an adequate sample size, the examination team may configure crews that do not routinely work together to perform shift duties. Mixed crews of shift and nonshift operators should not be configured unless the facility licensee routinely evaluates mixed crews in its requalification training program, or the facility licensee's normal crew size is so large that it is necessary to separate a normal crew for examination purposes.

b. All crew members for requalification dynamic simulator examinations must be currently licensed on the facility and up to date in the facility licensee's requalification program.

c. The selections will be made to minimize disruption of the facility licensee's schedules and plant operations. Operating crew(s) in training will be given priority during the

examination week(s). If the NRC is reevaluating the facility's program after an unsatisfactory evaluation, the selection process should favor operators who either failed their previous NRC-conducted examinations or were not previously examined.

d. During retake examinations, the dynamic simulator crew evaluation may include operators who have passed an NRC requalification examination. However, these operators will not be required to take the written or walkthrough portions of that examination. The operators' performance on the simulator examination will be evaluated in accordance with the guidance of ES-6.4.

e. A shift technical advisor (STA) may be added to the crew if the facility normally uses an STA during requalification training. In such instances, the NRC expects the STA's duties and responsibilities to be the same as those assigned during requalification training and plant operations.

f. The NRC will review the list of crews and operators submitted by the facility licensee and will recommend any necessary changes.

3. Reference Material

a. The NRC expects the facility licensee to supply the reference materials requested in the corporate notification letter (see Enclosure 1, "Reference Material Guidelines," to Letter 6.1-1). The NRC will evaluate the facility's reference materials for adequacy before the scheduled preparation week, using Form 6.1-4, "Evaluation Checklist for Facility Reference Material."

b. The NRC reserves the right to prepare the requalification examinations using the facility's background reference materials if the facility licensee's test items are inadequate for examination preparation. If the NRC prepares the examination, the staff may require reference materials comparable to those listed in Section F of ES-2.1, "Preparing for Operator Licensing Initial Examinations."

c. The NRC expects the facility licensee to provide a sample plan that meets the guidelines of Form 6.1-2, "Examination Sample Plan," for the NRC's use in developing the examination.

4. Examination Team Selection

a. The NRC will contribute no fewer than two examiners to the examination team. The regional office should consider assigning additional examiners if the operating crews for the dynamic simulator examinations contain five or more operators. To promote consistency in requalification program administration, regional office management should try to assign an examiner who participated in a prior requalification inspection or examination at the facility to be part of the NRC's examination team.

In most cases, the NRR operator licensing program office will send a representative to observe the examination process or an examiner to participate as an additional member of the examination team. The program office will work with the responsible regional supervisor to make the necessary arrangements.

b. The facility licensee is expected to provide an employee to work with the NRC as part of the requalification examination team. The employee should be drawn from the operations staff and must be an active senior reactor operator (SRO) as defined in 10 CFR 55.53(e) or (f). The NRC encourages the facility licensee to designate another employee from the training staff to be a member of the examination team. This employee should also be a licensed SRO but may be a certified instructor. If the facility licensee desires and the NRC chief examiner agrees, the facility licensee may also include additional employees from the operations or training staffs who have qualifications comparable to the facility licensee's other examination team members.

The function of these examination team members is to provide facility-specific technical assistance to the NRC in developing and reviewing the written examination items, plant walkthrough topics, and dynamic simulator scenarios. If necessary, the facility licensee representatives may participate as facility licensee evaluators in conducting the operating test or written examination. However, the facility licensee representatives should be used as evaluators only if they routinely perform that function during the administration of the facility licensee's requalification program.

5. Examination Development

a. The facility licensee may develop proposed written examinations and operating tests and forward them to the NRC as part of its reference material submittal. In accordance with 10 CFR 55.59(a)(2)(ii), the facility licensee must ensure that the operating tests require the operators to demonstrate an understanding of and ability to perform the actions necessary to accomplish a comprehensive sample of the items specified in 10 CFR 55.45(a)(2)–(13), inclusive, to the extent applicable to the facility.

b. Approximately 2 weeks before the scheduled examinations, the NRC examiners will visit the facility to make final preparations for the examination. The written, walkthrough, and dynamic simulator examinations will be developed in accordance with ES-6.2, ES-6.3, and ES-6.4, respectively. The examination should distinguish between reactor operator (RO) and SRO K/As to the extent that the facility training materials allow the examiners to make these distinctions. The NRC examiners will rely on the facility licensee's examination team members for site-specific technical assistance in developing, reviewing, and validating the written examination static scenarios and items, plant walkthrough topics (JPMs), and dynamic simulator scenarios.

c. The NRC chief examiner and the responsible regional supervisor will determine the required length of time on site and the required number of examiners. This determination will be based on the experience of the examiners, the quality of the facility licensee's testing material, and the level of effort required to develop new test items.

d. If requested by the facility licensee, the NRC chief examiner will brief the operators and managers about the requalification examination process. The NRC chief examiner will use this time to explain the examination and grading processes and to respond to any questions that the operators may ask about the NRC's examination procedures. If the schedule does not allow them to meet during the preparation week, they may meet at any mutually agreeable time.

6. Examination Security

a. To ensure examination security, each facility licensee representative who acquires knowledge of the content of the NRC's requalification examination before it is administered will be subject to the security restrictions described below from the time he or she first acquires the specific knowledge until the examination exit meeting.

b. To the maximum extent possible, only the examination team members and a simulator operator should be given specific knowledge about the content of the examination. The facility licensee evaluators should receive the package of simulator scenarios and JPMs the week before the examination to allow them to prepare for their evaluation, including coordinating the use of the simulator to perform JPMs and scenarios. If the facility licensee submits a proposed examination, those who participate in developing the examination become subject to the security restrictions when their involvement begins. Also, if facility licensee representatives other than the examination team members are used to time validate the written examination, they too become subject to the security restrictions as soon as they are exposed to the examination questions.

c. Facility licensee representatives who acquire specific knowledge of the NRC's examinations will sign Form 6.1-3, "Examination Security Agreement," before their examination involvement begins and again after the examination process is complete (i.e., following the exit meeting).

D. <u>Operator and Program Evaluation Procedures</u>

1. Examination Administration

a. Each selected operator will take a requalification examination using ES-6.2, ES-6.3, and ES-6.4 for the written, walkthrough, and simulator portions of the requalification examination, respectively. Operator performance will be documented on Form 6.1-6, "Individual Requalification Examination Report."

b. The number of persons present during an operating test should be limited to ensure the integrity of the test and to minimize distractions to the operators. Under no circumstances will another operator be allowed to witness an operating test. Examination security considerations preclude using operating tests as training vehicles for potential future applicants.

c. Other NRC examiners may observe an operating test as part of their training or to audit the performance of the examiner administering the operating test. The NRC chief examiner may permit others (such as resident inspectors, regional personnel, researchers, or NRC supervisors) to observe an operating test if the applicant does not object to the observers' presence. The NRR operator licensing program office must approve deviations from this policy in advance.

d. Other non-NRC personnel (e.g., representatives from the Institute of Nuclear Power Operations or the Nuclear Energy Institute) may observe the operating tests with prior approval from the NRR operator licensing program office. The NRC chief examiner will control the observers' activities in accordance with guidance provided by the program office.

2. Examination Grading

a. The NRC expects the facility licensee to grade the written examinations and operating tests in parallel with the NRC's examiners.

b. The agency expects the facility evaluators to provide preliminary pass/fail results for the simulator and walkthrough portions of the examination by the end of each day and the final results before the exit briefing or at the end of each examination week for multiweek examinations.

c. The NRC will notify the facility licensee immediately if any operator's performance on the examination is sufficiently poor to require immediate removal from licensed activity. The NRC will also notify the facility licensee of the results of the examination.

d. The facility licensee will provide the NRC with the final results of the written examinations and an overall summary of the examination results within 2 weeks after the exit meeting.

3. Evaluation of Requalification Programs

A requalification program evaluation requires a minimum sample size of 12 operators. The sample size is determined by counting the number of operators taking the dynamic simulator examination. This total includes those operators who participate in the simulator examination only for the purpose of meeting crew composition requirements but excludes those operators who are being reexamined after failing a previous NRC-conducted examination.

If less than one-half of the operators taking the dynamic simulator examination complete the entire examination, the NRC regional supervisor will determine whether a valid program evaluation can be made. In these instances, the regional supervisor will contact the NRR operator licensing program office.

A satisfactory requalification program meets each of the following criteria:

1. At least 75 percent of the operators must pass all portions of the examination in which they participate. The pass rate is determined by dividing the number of operators who pass all portions of the examination in which they participate by the total number of operators in the sample.

   In the event of a crew failure, only those operators who receive a satisfactory evaluation in the individual followup evaluation will be counted when calculating the operator pass rate.

   When calculating the pass rates, fractions should be rounded up to the next highest whole number. For example, if 15 operators are evaluated, 75 percent passing would be 11.25 operators; thus, 11 of 15 passing would not meet the 75-percent requirement, but 12 would.

2. At least two-thirds (66 percent) of the crews must pass the simulator examination.

For requalification examinations with more than three crews participating, three out of four, or four out of five crews, must pass to satisfy this requirement.

The NRC will consider the following areas in the overall program evaluation and may use the related findings to identify facility licensee weaknesses that will be documented in the examination report:

1. The facility licensee evaluators do not concur with the NRC examiners on all unsatisfactory crew evaluations.

2. More than one facility licensee evaluator is determined to be unsatisfactory. Section I, "Walkthrough Evaluation Techniques," of ES-3.5, "Administering Operating Tests," provides guidance that examiners should use to assess evaluator competence.

3. The facility licensee failed to train and evaluate an operator in all positions permitted by the individual's license. (For example, the facility licensee is required to train and evaluate an SRO in the RO position, as well as in directing operators.) An SRO will not be required to perform RO activities during the simulator portion of the operating test; however, his or her performance will be evaluated if the facility licensee normally places the SRO in a shift RO position during the simulator examination. Otherwise, RO skills will be evaluated during the performance of JPMs.

4. The facility licensee has insufficient administrative controls to preclude an RO or SRO with an inactive license from performing licensed duties. Operators must meet the requirements of 10 CFR 55.53, "Conditions of licenses," to restore an inactive license to active status.

5. The facility licensee has insufficient quality control of its examination bank. The NRC will evaluate the facility licensee's performance in this area if postexamination changes to facility licensee-developed test items result in significant modifications or deletions of more than 10 percent of the questions on the written examination.

6. The number of test items duplicated from any past examination or combination of examinations administered during the current requalification training cycle (as described in 10 CFR 55.59(a)(1)) or the number of operating test items repeated on successive days of an examination period is such that the discrimination validity and integrity of the examination could be affected. When test items are repeated, they should be selected in a distributed manner and approximately equally over all previous examinations to reduce predictability (if a large number of items were taken from the most recent examination).

7. The facility licensee's failure decisions are not as conservative as the NRC's. To ensure that the rationale for the evaluation is fully understood, the NRC will review with the facility licensee managers any case in which the facility licensee passed an operator whom the NRC failed. In addition, the NRC will assess whether the facility licensee's evaluations are conducted in accordance with documented facility guidance and whether facility licensee managers periodically assess their evaluation process.

The NRC also expects the facility licensee program to explicitly link an operator's examination failure with unsafe performance. In this way, all facility licensee failures and NRC failures will agree. In certain instances, the facility licensee's program may have operator performance standards that are not explicitly linked to unsafe performance and thus do not meet the threshold stated in these standards for the operator to fail the examination. In such instances, the facility licensee is expected to differentiate failures in which the operator performed at an unsafe level from those in which the operator failed for reasons other than safety (i.e., not meeting higher facility licensee established performance standards). In these instances, operators identified as failing for safety reasons would also be considered NRC failures.

4. Evaluation of Operator Performance

To pass the NRC-conducted requalification examination, the operator must pass a written examination and an operating test consisting of a walkthrough examination and a dynamic simulator examination. These examinations are developed and administered in accordance with ES-6.2, ES-6.3, and ES-6.4, respectively, unless the NRR operator licensing program office authorizes the regional office to use the facility licensee's alternative examination methodology. To pass the operating test, the operator must also be a member of a crew that passes the dynamic simulator examination.

E. Unsatisfactory Operator or Program Evaluation

1. Actions Following an Unsatisfactory Operator Evaluation

In all cases, a facility licensee's administrative procedures should ensure that an operator who fails a requalification examination is removed from licensed duties, given remedial training, and reexamined before being allowed to return to licensed duties. This also applies to an SRO who performs only RO-level duties at the facility when the failure is caused solely by activities involving SRO responsibility. Section H contains the instructions for notifying the operator about his or her performance on the NRC-conducted requalification examination, as well as guidance about the actions to be taken for an operator to return to licensed duty.

The NRC has deleted 10 CFR 55.57(b)(2)(iv)), which had required an operator to pass an agency-administered requalification examination as a prerequisite for license renewal. Nonetheless, it would be inappropriate to renew the license of any operator who failed to pass any NRC-conducted requalification examination without some level of agency involvement in the retesting process. The amount of NRC involvement may include conducting the retest in accordance with the appropriate examination standard(s); inspecting the facility licensee in accordance with IP 71111.11, "Licensed Operator Requalification Program and Licensed Operator Performance," as it retests the operator; or reviewing the reexamination prepared by the facility licensee. The regional office, in consultation with the NRR operator licensing program office, will determine the appropriate level of involvement on a case-by-case basis depending on the quality of the facility licensee's program. As long as the operator submits a timely renewal application, the term of the license will continue until the renewal requirements are satisfied or the operator fails three NRC-conducted examinations as discussed in Section H.

If an operator who failed a requalification examination is not prepared for a reexamination after 6 months of remedial training, the regional office will request the following information from the facility licensee:

- confirmation that the facility licensee still has a need for the individual's license
- the expected completion date of the operator's remedial training and when the facility licensee will be ready to administer its retake examination
- assurance that the operator will not return to licensed duties until he or she successfully retakes the examination (or portion thereof) administered by the facility licensee with a satisfactory requalification program or in accordance with the provisions of the confirmatory action letter (CAL) if the facility licensee has an unsatisfactory program and the NRC has not determined it to be "provisionally satisfactory"

The NRC will inform the facility licensee that a comprehensive requalification examination may be necessary if the operator is not ready to take a retest within 1 year after failing the examination.

2. Actions Following an Unsatisfactory Requalification Program Evaluation

The NRC will take the following actions for all requalification programs that the agency evaluates as unsatisfactory:

a. The NRC expects the facility licensee to identify program deficiencies and corrective actions to improve operator performance. The NRC will use a CAL to establish a formal dialogue and to document the facility licensee's corrective action commitments.

   An operator who fails the requalification examination, as determined by the NRC, will be subject to an NRC-administered reexamination before resuming licensed duties.

   The NRC expects the facility licensee to remediate and reevaluate an operator whose performance does not meet facility standards, as determined by the facility licensee, in accordance with the provisions of the facility licensee's requalification program. The NRC will review or monitor the reexamination, or both, to ensure the adequacy of the facility licensee's requalification program.

b. The NRC will schedule a meeting with senior facility licensee managers to review the examination results, as well as the identified deficiencies and their root causes, the proposed corrective actions and the schedule for their implementation, and the need for followup inspections and examinations. (Section E.3 contains additional guidance on conducting augmented inspections.)

   The Regional Administrator will evaluate the examination and inspection results and make a decision as to the continued operation of the facility and possible enforcement action against the facility licensee. At a minimum, the Regional Administrator should consider the following factors when making this determination:

- the results of previous program evaluations, including corrective actions
- the significance of generic performance deficiencies identified during the program evaluation
- recent facility events that relate to licensed operator performance
- recommendations by the NRC staff (including the results of any operational evaluations and inspections)

c. If operator performance deficiencies cause the unsatisfactory program evaluation, an operational evaluation is required. The operational evaluation is intended to help the Regional Administrator determine whether the facility licensee's remaining operating crews are suitably qualified to continue to operate the facility. In this case, the facility licensee identifies the individual operators and shift crews it proposes to use to continue plant operations. The regional office may choose not to evaluate those operators who passed their most recent NRC-conducted initial or requalification examination within the past 12 months. However, the regional office will evaluate all other operators in those areas noted as operational deficiencies during the requalification examination regardless of whether they have already passed or not yet taken the facility licensee-administered requalification examination. The regional office will conduct the operational evaluations in accordance with applicable guidance in ES-6.3 and ES-6.4.

If the facility licensee proposes to use a shift crew that is significantly different from its normal configuration, even though all the operators may have recently passed an NRC-conducted examination, the regional office may perform an operational evaluation of this crew.

The regional office should schedule the operational evaluation as soon as possible after determining that the facility licensee's requalification program is unsatisfactory. The evaluation should not be delayed to accommodate the facility's operating schedule, the completion of programmatic corrective actions, or the completion of remedial training for operators who failed the requalification examination. The operational evaluation may identify further program deficiencies that may need to be reflected in the CAL discussed in Section E.2(a) or may warrant additional inspection by the NRC. Additional operator weaknesses that require remediation may also be identified.

d. The NRC will review the corrective actions the facility licensee is to perform, the expected followup actions by the NRC, and the schedule for each.

As part of the followup activities, the NRC may conduct additional operational evaluations, requalification retake examinations, and augmented inspections (as necessary). Before these activities, the NRC will verify that the facility licensee has completed the applicable corrective actions and will obtain a certification of crew readiness from the facility licensee managers. Regional managers should consider using a new NRC chief examiner and having examiners from other regional offices participate in those operational evaluations and requalification retake examinations that have potential implications for restart approval.

e. The Regional Administrator will incorporate into the decision on followup activities any extraordinary circumstances surrounding the examination that may affect the validity of the examination results.

f. When the NRC determines that a requalification program is unsatisfactory, the program will remain unsatisfactory until the facility licensee completes all identified corrective actions agreed on by the NRC for restoring the program to satisfactory status and the NRC completes all related followup activities. For purposes of allowing facility licensee examiners to perform reexamination functions, however, a facility licensee may attain a status of "provisionally satisfactory" provided that the facility licensee has completed to the NRC's satisfaction all short- and intermediate-term corrective actions agreed on with the NRC.

   Once the NRC determines that the facility licensee has satisfactorily implemented these corrective actions, the Regional Administrator or designee will determine whether to permit the facility licensee to reexamine all operators who failed the NRC-conducted requalification examination for the purpose of returning the operators to licensed duties. Any operator who fails the NRC-conducted examination still needs to pass a future NRC-administered (i.e., conducted, inspected, or approved, as appropriate) requalification examination to renew the license. Long-term corrective actions are expected to be completed before the NRC's next requalification program evaluation (IP 71111.11).

   To attain a satisfactory rating following an unsatisfactory evaluation, the subsequent requalification program evaluation, with a sample size of at least 12 operators, must satisfy the passing criteria in Section D.3.

g. The Regional Administrator or designee may specify additional actions, as appropriate. The specific sequence of actions is not critical; however, this sequence of events corresponds to a typical regional response to an unsatisfactory program evaluation. The Regional Administrator or designee should defer determining whether a plant shutdown is required until he or she reviews all factors listed in Section E.2(b).

3. Augmented Inspection Guidelines

If the NRC determines that an augmented requalification program inspection is required, regional management should define its scope and depth based on the nature of the deficiencies.

The regional office should consider the following activities in addition to those specified in Section E.2:

a. The regional office may conduct augmented inspection coverage of all shifts. The inspection procedures for shift coverage should be used as appropriate. Inspection activities should devote attention to the following areas:

   - operator performance and attitude
   - operator overtime
   - management oversight
   - shift staffing

b. The regional office may develop a long-term training program inspection plan based on IP 41500. Such an inspection plan may include the following activities:

- ongoing status reviews of requalification training effectiveness, with an emphasis on known program deficiencies and implementation of short-term corrective actions

- an inspection to determine the root cause(s) for the unsatisfactory requalification program evaluation and to verify that the facility licensee's proposed corrective action plan should preclude or minimize the probability of recurrence

- an inspection to evaluate the adequacy of the facility licensee's corrective actions and to determine the effectiveness of the facility licensee's SAT-based requalification program

c. The regional office may convene an enforcement panel to determine whether action is warranted on the basis of the requirements of 10 CFR 50.54(i-1). Potentially, a requalification program rated unsatisfactory on two successive NRC evaluations does not meet the minimum requirements of 10 CFR 55.59(c) as required by 10 CFR 50.54(i-1). The basis for any proposed enforcement action will be the inadequate corrective action or requalification program element deficiencies (identified by the inspections related to Section E.3(b)) that led to the successive requalification examination failures.

F. Requalification Program Evaluation Report

After the Regional Administrator or designee approves the requalification examination results, the regional office will prepare a final requalification program evaluation report. The program evaluation report needs to include a copy of the written examination only if the report addresses written examination problems. The regional office will issue the report within 30 days following receipt of the facility licensee's final results or the examination exit meeting, whichever is later, and will place a complete copy of the report in the facility's requalification file.

The NRC chief examiner is responsible for completing Form 6.1-5, "Power Plant Requalification Results Summary Sheet." The examiner will enter each operator's scores in the appropriate columns and add a continuation sheet to document scores for all the operators. Under the "Simulator" column, the examiner will enter the results of the operator's individual followup evaluation. If the operator did not receive an individual followup evaluation, the examiner will enter a passing score. If an operator was a member of a crew that failed the dynamic simulator examination, but the operator passed or did not receive an individual followup evaluation, the examiner will enter a pass in the "Simulator" column for that operator. Crew failures will be summarized in the overall results at the top of Form 6.1-5.

The regional office will send a copy of the summary (and continuation) sheet(s) to the NRC Headquarters operator licensing assistant. The NRR operator licensing program office uses the results summary to verify the data in the Reactor Program System—Operator Licensing, so that statistics can be maintained on operator performance. The regional office will not include the results summary in the examination report as the summary contains information subject to the Privacy Act.

If a small number of operators are given retake examinations, the regional office may issue an addendum to the original requalification evaluation report instead of issuing a new report. If the reexaminations are conducted concurrently with initial examinations or inspected during a requalification program evaluation in accordance with IP 71111.11, the results may be reported as part of the initial examination or inspection report.

G. Individual Requalification Examination Report

After the regional office completes the requalification evaluation, it will keep a copy of each operator's NRC-conducted written, walkthrough, and simulator examination results and return the original documents to the facility licensee. The regulation in 10 CFR 55.59 requires the facility licensee to maintain records of these examination results, along with a copy of the written examination, until the operator's license is renewed or 2 years after the license expires.

The NRC chief examiner will ensure the completion of Form 6.1-6 for each operator who takes an NRC-conducted requalification examination. The report will include the following information for each individual:

- written examination grade
- the crew evaluation from the dynamic simulator examination
- the individual followup results (pass or fail) from the dynamic simulator examination
- the number (and percentage) of JPMs performed correctly, if JPMs were conducted

The regional office will send a copy of this report to the facility licensee's training manager and the operator with a letter notifying the operator of the examination results. The regional office will also file a copy in the operator's docket file.

H. NRC-Conducted Requalification Examination Results

1. Passing an NRC-Conducted Requalification Examination

a. An operator who passes all portions of the requalification examination, including being a member of a crew that passes the dynamic simulator examination, will receive written notification from the NRC regional office.

2. Failing an NRC-Conducted Requalification Examination

a. The NRC regional office will notify the operator in writing of a failure of the requalification examination. On receiving the failure notification, the operator can request an informal review of the failed portion(s) of the examination. The request must be made as described in the failure notification letter.

b. If an operator fails any part of an NRC-conducted requalification examination, the facility licensee is expected to remove the operator from licensed duty and take corrective action consistent with the provisions of its requalification program before returning the operator to licensed duty. If the facility licensee's requalification program is unsatisfactory, Section E.2 of this examination standard lists other recommended actions, including those actions the facility licensee is expected to complete before attaining a "provisionally satisfactory" requalification program status.

c. The NRC will normally administer a second (first retake) examination approximately 6 months after issuing the first failure. That examination will concentrate on the areas in which the operator exhibited deficiencies.

d. If the second (first retake) examination was failed, the NRC will normally administer a third (second retake) examination approximately 6 months after issuing the second failure. The third examination will be a *comprehensive* requalification examination.

Regardless of the status of the facility licensee's requalification program, if an operator fails a third requalification (second retake) examination, the NRC will thoroughly review the operator's examination performance and may conduct a complete review of the facility licensee's training program. The third failure may be grounds for suspending or revoking the operator's license. If an operator has an application pending for license renewal with the NRC at the time of a third requalification failure, that failure will provide the basis for denying the application. Notification of the operator will be handled on a case-by-case basis and coordinated through the NRR operator licensing program office.

I. Operator Licensing Renewal Policy

Operators are not required to take an NRC-conducted requalification examination to renew their licenses. However, if an operator takes, but fails to pass, an NRC-conducted examination, the NRC will not renew the license until the operator passes a retake examination conducted by the NRC, passes a retake examination administered by the facility licensee and inspected by the NRC in accordance with IP 71111.11, or passes an examination approved by the NRC. The regional office, in consultation with the NRR operator licensing program office, will determine the appropriate level of involvement on a case-by-case basis depending on the quality of the facility licensee's requalification program.

ES-5.3, "Maintaining, Changing, and Renewing Operator Licenses," contains the instructions for processing license renewal applications.

J. Records Retention

1. Facility Licensee Requalification Examination File

The NRC's regional office shall ensure that the original (whenever possible) or a copy of the following items is electronically available through the NRC's Agencywide Documents Access and Management System (ADAMS):

a. examination standard attachments and forms:

- Letter 6.1-1, "Sample Corporate Notification Letter"
- Form 6.1-3, "Examination Security Agreement"
- Form 6.1-5, "Power Plant Requalification Results Summary Sheet"
- Form 6.4-2, "Simulator Crew Evaluation Form"

b. a master list of all JPMs administered and the operators to whom they were administered

c. a master list of all scenarios conducted and operators to whom they were administered (facility licensee-generated forms or Form 3.3-1, "Scenario Outline," may be used to meet this requirement)

d. a copy of the written examination and answer key

e. a copy of the requalification examination report

The regional office may require that additional documents be retained in the facility licensee's requalification examination file.

2. Operator Docket Files

The regional office will retain the following records in each operator's docket file until the license is renewed or 2 years after the license expires or is terminated:

- Form 6.1-6, "Individual Requalification Examination Report"
- results notification letter
- a copy of all failed portions of the NRC-graded examination

3. Other Files

The regional office will retain reference materials used to develop each examination until the NRC has resolved with the facility licensee all failures associated with the examination and has sent a notification letter to each operator.

K. Feedback on Requalification Examination Stress

The level of stress perceived by operators and facility licensee personnel can affect their overall performance on the requalification examination. Therefore, the NRR operator licensing program office is interested in monitoring the stress of operators and facility licensee personnel participating in the requalification examination. Regional examiners and other personnel who participate in an NRC requalification examination should assume the following responsibilities:

- Monitor the level of stress in operators and facility licensee representatives and be alert for examination techniques that may be causing examination stress.

- Recommend to the program office any changes to NUREG-1021 that would further alleviate operator stress. Document recommendations and forward them to NRC Headquarters using report on interaction forms.

L. Forms and Letters

Form 6.1-1 Examination Timetable
Form 6.1-2 Examination Sample Plan
Form 6.1-3 Examination Security Agreement
Form 6.1-4 Evaluation Checklist for Facility Reference Material
Form 6.1-5 Power Plant Requalification Results Summary Sheet
Form 6.1-6 Individual Requalification Examination Report
Letter 6.1-1 Sample Corporate Notification Letter

Form 6.1-1 Examination Timetable

Date*	Activity
-120/90	The U.S. Nuclear Regulatory Commission (NRC) notifies the facility licensee.
-60	The facility licensee sends the NRC the materials requested for developing the examination (including written examination questions, simulator scenario banks, and job performance measures (JPMs)). The facility licensee proposes composition of the crews to be evaluated and identifies facility licensee examination team members. The facility licensee may ask the NRC chief examiner to review the examination process with operators and facility licensee managers.
-45	The facility licensee submits its proposed requalification written examination and operating test.
-30	The NRC concurs on the operating crews to be evaluated.
-14	The NRC examiners visit the facility to review the JPMs to be administered, observe the static and dynamic simulator examinations, and validate the test items (as needed). The chief examiner and the regional Branch Chief determine the length of time on site and the number of examiners required on the basis of the examiners' experience and the quality of the facility licensee's testing materials. The facility licensee designates a simulator operator. If requested, the chief examiner briefs the operators and facility licensee managers about the requalification examination process.
-7	The facility licensee examination team members finalize the examinations based on preparation week activities. Evaluators review reference material to prepare for the JPMs and simulator scenarios.
0	The NRC administers the examinations to selected crews and operators. The facility licensee notifies the NRC of its final results for crews and individuals at the end of each examination week.
+7	The NRC finalizes the examination results.
+14	The facility licensee transmits the written examination grades and a final summary to the NRC.
+30#	The NRC issues operator results and the final requalification examination report.

* Number of days before (-) or after (+) the examination, except as noted.
\# Number of days after receipt of facility results or examination exit meeting, whichever is later.

Form 6.1-2 Examination Sample Plan

A. Introduction

An examination sample plan provides a systematic approach to selecting and developing test items to determine whether a student has mastered the knowledge and abilities (K/As) and skills to be covered in a training program. The sample plan should provide an explicit, documented link between the learning objectives associated with the training program and the test items used to perform the evaluation and to verify the relevance to the job task analysis (JTA) associated with the operator's position.

Examination Standard (ES)-4.1, "Developing Written Examination Outlines," gives explicit guidance for developing a sample plan for initial examinations using the applicable K/A catalog. A similar methodology may be applied to any training program. With respect to a requalification program, the scope of topics is necessarily limited because less material is covered during a requalification program than in an initial licensing training program. However, the U.S. Nuclear Regulatory Commission (NRC) permits and encourages reserving 10 to 20 percent of test items for topics that have high importance ratings and contain K/As that operators should retain because of their safety significance but were not necessarily covered during the requalification cycle.

B. Requalification Test Outline

The facility licensee is expected to develop a test outline for all NRC-administered requalification examinations. At least 80 percent of the test outline must reflect the training curriculum of the most recent requalification cycle in a manner consistent with the distribution of emphasis in the curriculum.

The curriculum of the requalification training cycle for which the examination is being developed should identify the following:

- requalification lecture/classroom topics indicating the percentage of the cycle devoted to each
- concentration of training exercises using the simulation facility, including the types of scenarios trained for (e.g., accident, abnormal, normal) and the number of times each scenario was run
- special focus of the training, such as plant modifications, licensee event reports, and major changes to operating practices or policy
- practical training, such as operation of individual systems or components for requalification training purposes, using either the simulation facility, mockups, or actual systems and components

The format of the sample plan is a matter of facility licensee training department preference as long as the plan results in a thorough and accurate assessment of the training program and its intended objectives. The NRC expects the sample plan to contain the following information for use in developing or selecting the test items to be used in the requalification examination:

- identification of the subjects to be evaluated (system, component, procedure, or other training subject)
- the preferred testing medium for evaluating each subject (written, simulator, or walkthrough examination); more than one testing method may be used to evaluate a subject
- the learning objectives intended to be evaluated
- a list of references used to develop the test items
- the specific K/A topic or facility JTA K/As and skills that are closely linked to the learning objectives for each subject and the importance factors for each (the facility licensee may use a site-specific K/A if it exists)
- a K/A value of 3 or greater for all test items used in the examination; the facility licensee may propose the use of test items with NRC K/A values less than 3 with appropriate justification
- the percentage or number of points of the examination that should be devoted to the topic area (e.g., 3 points for technical specification interpretation or 5 percent on reactor coolant pumps)
- whether the subject is identified as safety related in the facility's JTA
- whether the subject was covered in the cycle for which the examination is being developed
- the identification code or number for previously developed test items that evaluate the subject
- recent safety-related issues and events (e.g., relevant licensee event reports)

Form 6.1-3 Examination Security Agreement

1. Pre-examination

I acknowledge that I have acquired specialized knowledge about the U.S. Nuclear Regulatory Commission (NRC) requalification examinations scheduled for the week(s) of _____as of the date of my signature. I agree that I will not knowingly divulge any information about these examinations to any persons who have not been authorized by the NRC chief examiner. I understand that I am not to instruct, evaluate, or provide performance feedback to those operators scheduled to be administered these examinations from this date until completion of examination administration, except as specifically noted below and authorized by the NRC (e.g., acting as a simulator booth operator or communicator is acceptable if I do not select the training content or provide direct or indirect feedback). Furthermore, I am aware of the physical security measures and requirements (as documented in the facility licensee's procedures) and understand that violation of the conditions of this agreement may result in cancellation of the examinations or an enforcement action by the NRC against me or the facility licensee, or both. I will immediately report to facility licensee management or the NRC chief examiner any indications or suggestions that examination security may have been compromised.

2. Post-examination

To the best of my knowledge, I did not divulge to any unauthorized persons any information concerning the NRC requalification examinations administered during the week(s) of _____. From the date that I entered into this examination security agreement until the completion of examination administration, I did not instruct, evaluate, or provide performance feedback to those operators who were administered these examinations, except as specifically noted below and authorized by the NRC.

	PRINTED NAME	JOB TITLE/RESPONSIBILITY	SIGNATURE (1)	DATE	SIGNATURE (2)	DATE
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						

NOTES:

Form 6.1-4 Evaluation Checklist for Facility Reference Material

This checklist represents the minimum content of facility licensee-generated reference material. Items marked "optional" should be checked if requested from the facility licensee by the chief examiner. The chief examiner or designee may use this checklist to make a quick, general evaluation of the completeness and adequacy of the facility licensee's references. The chief examiner may resolve any specific questions about the references with the facility licensee staff as necessary.

I. Quantity

	Reference Material	Required Minimum	Actual Submitted
A.	Open-reference written examination items	350 per section; bank is to be dynamic, with at least 150 revised, reviewed, or newly generated questions per year	
B.	Simulator scenarios	25; plus 5 per year following the initial requalification exam until at least 30 scenarios covering all aspects of the emergency operating procedures are developed	
C.	Job performance measures (JPMs)	95; plus 10 per year following the initial requalification exam until the job task analysis is fully covered	
D.	Technical specifications	1 copy	
E.	Applicable plant procedures	1 set (optional)	
F.	Emergency plan	1 copy	
G.	Applicable administrative procedures	1 copy (optional)	
H.	Sample plan	1 copy	
I.	Requalification cycle training reference material (e.g., lesson plans and handouts)	1 set (optional)	
J.	Appropriate sections of the job task analysis or facility-specific knowledge and ability (K/A) catalog	1 set (optional)	

Reviewed by: _____ Date: _____

II. Usability

		Circle one
A.	The reference material is legible.	Yes No
B.	The reference material is properly arranged and labeled for its function.	Yes No
C.	The reference material indicates a systems approach to training program.	Yes No
D.	Reference material is available to verify that test items are appropriate, job relevant, and technically accurate.	Yes No
E.	Reference material is available to adequately support the examination topics.	Yes No

Comments

Reviewed by: _____ Date: _____

III. Quality

Exam Section		Required Standards	Comments
A.	Sample Plan	Subjects covered in requalification cycle are identified. The test outline incorporates: • time spent on topic • relative importance • frequency of performance • job level (reactor operator (RO) or senior reactor operator (SRO)) The test outline identifies K/As (or facility equivalent) of sufficient importance. Plant-specific priorities are identified (license event reports (LERs), procedure changes, system modifications, risk-dominant accident scenarios, risk-important systems and operator actions[1] identified in, for example, the facility licensee's probabilistic risk assessment (PRA)/individual plant examination (IPE)). Appropriate testing methods are indicated for each K/A (i.e., JPM, written exam, and/or simulator). Applicable learning objectives are associated with K/As. A methodology exists to tie test items to a learning objective and a K/A. Sample plan includes important topics not covered in the requalification cycle. Test areas appropriate to ROs and SROs only are identified.	

Reviewed by: _____ Date: _____

[1] Chapter 13 of NUREG-1560, "Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance," issued December 1997, identifies important human actions that may be appropriate for evaluation.

III. Quality (continued)

Exam Section	Required Standards	Comments
B. Written	At least 10 percent of all test items shall be reviewed using Form 6.2-1, "NRC Checklist for Open-Reference Test Items."	
	Test items are important to safety.	
	Test items are clearly written.	
	Test items are appropriate to license level.	
	The criteria for open-reference examinations are met.	
	Test items are associated with K/As of 3 or greater and are adequate discriminators.	
	A learning objective and applicable reference are identified for each test item.	
	The facility has identified SRO-level questions for both sections of the exam.	

If the above criteria are not adequately met, the U.S. Nuclear Regulatory Commission (NRC) will conduct further review of the examination bank using the guidance in tES-6.2, "Requalification Written Examinations," and Form 6.2-1.

Reviewed by: _____ Date: _____

Exam Section		Required Standards	Comments
C.	Walkthrough	At least 10 percent of the JPM bank were reviewed using Form 3.2-4, "Job Performance Measure Development Job Aid" Test outline identifies applicable plant systems: • systems covered in requalification cycle • new or recently modified systems • systems in recent facility LERs or vendor notices • PRA-identified risk-dominant systems • systems in NRC generic communications Tasks/abilities for identified systems: • are applicable to the facility • are at the auxiliary operator (AO)/RO/SRO level • have a K/A value of 3 or greater • include JPMs pertinent only to SROs Some JPMs are performed under low-power or shutdown operating conditions. Some JPMs require the operator to implement alternative paths within the facility licensee's procedures. Facility licensee JPMs contain the information found on Form 3.2-4.	

Reviewed by: _____ Date: _____

III. Quality (continued)

Exam Section	Required Standards	Comments
D. Simulator	At least 10 percent of the scenarios are reviewed using Form 6.4-1, "Simulator Scenario Review Checklist." Scenarios are an appropriate measure of the material covered in the sample plan. Scenarios are based on the following: • lessons covered in the requalification cycle • recent industry events • LERs • emergency and abnormal procedures • design and procedural changes Scenarios exercise the crew's ability to use facility procedures in accident prevention and mitigation. Scenario events have a K/A of 3 or greater. Some scenarios are based on low-power[2] operations. Some scenarios are based on the dominant accident sequences for the facility as determined by a PRA/IPE. The scenario identifies critical tasks that meet the criteria of ES-3.3, "General Testing Guidelines for Dynamic Simulator Scenarios." Proposed examination scenarios that were used for training during the most recent training cycle have been reviewed by the NRC and replaced or modified, if appropriate, to ensure the validity of the examination and to minimize the potential for examination compromise.	

Reviewed by: _____ Date: _____

[2] NUREG-1449, "Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States," issued September 1993, defines "low power" to include the range from criticality to 5-percent power.

Form 6.1-5 Power Plant Requalification Results Summary Sheet

Privacy Information—For Official Use Only

Facility:	Overall Results	Total	Passed (P)	Failed (F)
Exam Date:		#	# / %	# / %
NRC Examiners:	Reactor Operator:			
	Senior Operator:			
	Total:			
	Crews:			

Operator	Docket 55-(____)	Grader	JPMs %	Written (A & B)	Results (P or F)			
					Written	Simulator		W/T
						Crew	Indiv.	
		NRC		%				
		FAC		%				
		NRC		%				
		FAC		%				
		NRC		%				
		FAC		%				
		NRC		%				
		FAC		%				
		NRC		%				
		FAC		%				
		NRC		%				
		FAC		%				
		NRC		%				
		FAC		%				

Privacy Information—For Official Use Only

Form 6.1-6 Individual Requalification Examination Report

Privacy Information—For Official Use Only

U.S. Nuclear Regulatory Commission Individual Requalification Examination Report		
Facility:	Operator's Name:	
Docket No: 55-	License No:	Expiration Date:
Exam Type: RO/SRO	Retake: 1st / 2nd / No	Date of Last Exam:
Written Examination Results		
Date(s) of Exam:	NRC Examiner (Print):	Facility Evaluator (Print):
	NRC Grading	**Facility Grading**
Section A (Points)	of	of
Section B (Points)	of	of
Overall Score (%)	%	%
Simulator Examination Results		
Date(s) of Exam:	NRC Examiner(s) (Print):	Facility Evaluator(s) (Print):
Crew Evaluation	Pass / Fail	Pass / Fail
Individual Followup	Pass / Fail / N/A	Pass / Fail / N/A
Walkthrough Examination Results		
Date(s) of Exam:	NRC Examiner(s) (Print):	Facility Evaluator(s) (Print):
No. of Successful JPMs	of 5	of 5
Exam Results (%)	%	%
NRC Examiner Recommendations		
Category	Results	Signature/Date
Written	Pass / Fail	
Simulator	Pass / Fail	
Walkthrough	Pass / Fail	
NRC Supervisor Review		
Date:	Pass / Fail	Signature:

Privacy Information—For Official Use Only

Letter 6.1-1 Sample Corporate Notification Letter

NRC Letterhead

(Date)

(Name, Title)
(Name of Facility)
(Street Address)
(City, State ZIP Code)

SUBJECT: REQUALIFICATION PROGRAM EVALUATION

Dear (Name):

In a telephone conversation on (date), (Name, title) and (Name, title) arranged to evaluate the requalification program and licensed personnel at the (facility name). The evaluation is scheduled for the week of (date). U.S. Nuclear Regulatory Commission (NRC) examiners and evaluators from your facility will conduct requalification examinations, and the NRC will evaluate your requalification program in accordance with NUREG-1021, "Operator Licensing Examination Standards for Power Reactors." You are encouraged to ensure that your training staff and proposed examinees are familiar with these standards.

For the NRC to adequately prepare for this evaluation, the facility licensee will need to furnish the NRC with the approved items listed in Enclosure 1, "Reference Material Guidelines." The agency also asks you to submit, at your option, a proposed examination for use during the examination week. However, if you do submit a proposed examination, the personnel participating in its development will become subject to the security restrictions described in this letter.

Please review the guidance in NUREG-1021 concerning the content and scope of simulator examination scenarios. The scenario examination bank should cover the entire spectrum of emergency operating procedures (EOPs), including alternative decision paths within the EOPs, and it should incorporate a range of failures with various degrees of severity for the same type of event. Each scenario should contain simultaneous events that require the senior reactor operators (SROs) to prioritize their actions and to assign particular tasks to other crew members. Each scenario should also require the SROs to decide when to make the transition between EOPs and which actions to take within EOPs.

You are requested to designate at least one employee to be a member of a joint NRC-facility licensee examination team. The NRC expects that employee to be an active SRO as defined by Title 10 of the *Code of Federal Regulations* (10 CFR) 55.53(e) or (f) from the (facility name) operations department. You are encouraged to designate a second employee from the training staff to be a member of the examination team. This employee should also be a licensed SRO but may be a certified instructor. If desired and agreed to by the NRC chief examiner, you may designate one additional employee from the training staff who has appropriate qualifications to be a member of the examination team. In addition to these individuals, you will need to designate a simulator operator for scenario preview and validation during the onsite examination preparation week. In some cases, you may also need to designate a simulator operator during the test item review period. All of these individuals will be subject to the examination security agreement.

The NRC restricts any facility licensee representatives under the examination security agreement from knowingly communicating (by any means) the content or scope of the examination to unauthorized persons or participating in any facility licensee programs (such as instruction, examination, or tutoring) in which an identified requalification examinee will be present. These restrictions apply from the day that the facility licensee representative signs the examination security agreement indicating that the representative understands that he or she has specialized knowledge of the examination. The NRC chief examiner will determine when a facility licensee representative has received specialized knowledge concerning the examination and will execute an examination security agreement. In most cases, the examination team members will not be required to enter into an examination security agreement more than 60 days before the examination week. The simulator operator will normally become subject to the security restrictions during the examination preparation and validation week; however, this may occur as many as 45 days before the examination week.

Sixty days before the examination administration date, please provide the NRC's regional office with a proposed list of operators, including crew composition, for the examination. The list should include at least 12 operators composing three or more crews and the current mailing address for each proposed operator, if different from that listed on the most recent Form 398, "Personal Qualification Statement—Licensee," submitted to the NRC. Your training staff should send this information directly to the NRC chief examiner, ensuring that each operator's address is sent in a manner to ensure privacy.

The facility licensee may request that the NRC chief examiner or another NRC representative meet with facility licensee managers and the operators to be examined during the examination preparation week, normally 2 weeks before the examination. However, if the schedule does not allow them to meet during the preparation week, they may meet at any mutually agreeable time. The NRC representative will explain the examination and grading processes and will respond to any questions that the operators may have about the NRC's examination procedures. If such a meeting is desired, your training staff should schedule it with the NRC chief examiner.

The facility licensee staff is responsible for providing adequate space and accommodations to properly develop and conduct the examinations. Enclosure 2, "Administration of Requalification Examinations," describes our requirements for developing and conducting the examinations. Also, a facility licensee operations management representative above a shift supervisor level should observe the simulator examination process at the site.

Paperwork Reduction Act Statement

This letter contains information collection requirements that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). The Office of Management and Budget (OMB) approved these information collections under approval number 3150-0018.

The burden to the public for these [voluntary][mandatory] information collections is estimated to average **25** hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this information collection to the FOIA, Library, and Information Collections Branch (T6-A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555 0001, or by e mail to Infocollects.Resource@nrc.gov, and to the OMB reviewer at: OMB Office of Information and Regulatory Affairs (3150-0018), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street, NW Washington, DC 20503; e mail: oira_submission@omb.eop.gov.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

In accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter and its enclosures will be available electronically for public inspection in the Publicly Available Records System component of the NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the Electronic Reading Room page of the NRC's public Web site at http://www.nrc.gov/reading-rm/adams.html.

Thank you for your cooperation in this matter. (Name) has been advised of the NRC guidelines and policies addressed in this letter. If you have any questions on the evaluation process, please contact (Name, regional section chief) at (telephone number).

Sincerely,

(Appropriate Regional Title)

Docket No.: 50-(Number) or
52-(Number)

Enclosures:
1. Reference Material Guidelines
2. Administration of Requalification Examinations

DISTRIBUTION:
Public
NRC Document Control System
Regional Office Distribution

Enclosure 1

Reference Material Guidelines

1. Sixty days before the examination date, the facility licensee should provide test items to the U.S. Nuclear Regulatory Commission (NRC) to support all aspects of the requalification examination.

2. The facility licensee is expected to submit the following reference materials for all NRC-conducted requalification examinations:

   - an examination sample plan that meets the guidelines of Form 6.1-2, "Examination Sample Plan," of Examination Standard (ES)-6.1, "Conducting NRC Requalification Examinations," of NUREG-1021, "Operator Licensing Examination Standards for Power Reactors"

   - the facility licensee's examination banks (written, simulator, and job performance measures (JPMs)) and associated reference materials (including, at a minimum, technical specifications, abnormal and emergency operating procedures, and emergency plan procedures used in requalification training)

   - additional reference materials requested by the NRC chief examiner

3. The NRC expects the facility licensee's examination banks to contain the following information:

   - a minimum of 700 test items equally divided for use in the two sections of the written examination and covering all safety-related elements of the facility's job task analysis

     The NRC expects the facility licensee to maintain a dynamic bank by reviewing, revising, or generating at least 150 questions a year. New questions should cover equipment and system modifications, as well as recent industry and licensee events and procedural changes.

   - JPMs that meet the criteria in ES-6.3, "Requalification Walkthrough Examinations," for evaluating each reactor operator's and senior reactor operator's safety-related tasks identified in the facility's job task analysis

     The JPM bank should expand at a rate of at least 10 JPMs per year until this goal is reached. An estimated 125 to 150 JPMs will be the final result.

   - a bank of at least 30 simulator scenarios reflecting all abnormal and emergency situations to which an operator is expected to respond or control

     The facility licensee should generate at least 5 scenarios per year until all aspects of the emergency operating procedures are covered with sufficient variation in the type and scope of initiating events and level of degradation. Scenarios that include applicable industry events should be emphasized.

Enclosure 2

Administration of Requalification Examinations

1. The U.S. Nuclear Regulatory Commission (NRC) must evaluate at least 12 operators to perform a facility licensee requalification program evaluation. Section C.2 of Examination Standard (ES)-6.1, "Conducting NRC Requalification Examinations," and ES-6.4, "Requalification Dynamic Simulator Examinations," of NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," describe the guidelines on crew composition in the simulator.

2. The simulator and simulator operators need to be available for examination development. The NRC chief examiner and the facility licensee representatives will agree on the dates and amount of time needed to develop the examinations.

3. The NRC chief examiner will review the reference materials used in the simulator. The NRC will not authorize for use during the simulator test any reference material that is not normally used for plant operation in the control room.

4. The facility licensee will provide a single room for completing Section B of the written examination. The facility licensee will select the locations of the examination room and supporting restroom facilities to prevent the examinees from having contact with any other facility licensee or contractor personnel during the examination.

5. The NRC chief examiner will inspect the examination room to see that it meets the minimum standard that will ensure examination integrity. The minimum spacing standard consists of one examinee per table and a 1-meter (3-foot) space between tables. No wall charts, models, or other training materials are allowed in the examination room.

6. The NRC expects the facility licensee to provide a copy of each reference document for each examinee for Section B of the written examination. The materials should include documents that are normally available to the operators in the control room (such as the technical specifications, operating and abnormal procedures, administrative procedures, and emergency plans). The NRC chief examiner will review the reference materials before the examination begins.

7. The NRC requalification examination will attempt to distinguish between reactor operator and senior reactor operator knowledge and abilities to the extent that the facility licensee training materials allow the developers to make these distinctions.

8. Prudent scheduling of examination week activities is important to help alleviate undue stress on the operators. The facility licensee training staff and the NRC chief examiner should attempt to formulate a schedule that will minimize delays while conducting the examination. The following suggestions will help to structure the examination activities to achieve this objective:

   - Consider allowing operators to stay at home until their scheduled examination times.

   - Segregate the group of operators who are completing their examination, instead of the group of operators who are scheduled to start their examination.

- Following simulator scenarios, the facility licensee evaluators and NRC examiners should quickly determine whether followup questioning is required so that the crew members may be released to talk among themselves about the scenario.

- Ensure that time validation of job performance measures, particularly those performed in the simulator, is accurate. Establish a reasonable schedule to prevent operators from waiting for simulator availability to complete their job performance measures.

6.2 REQUALIFICATION WRITTEN EXAMINATIONS

The NRC staff uses this examination standard to conduct written requalification examinations in accordance with 10 CFR 55.59(a)(2)(iii). NRC examiners are to follow this examination standard in conjunction with Examination Standard (ES)-6.1, "Conducting NRC Requalification Examinations," to prepare and administer all NRC-conducted written requalification examinations.

A. Scope

The written examination is useful for evaluating the K/As and skills of licensed operators that are difficult to infer from behavior alone but can be tested readily through written responses to questions that value interpretation and allow the examinee to use references. Additionally, an individual's knowledge of factual information and his or her ability to perform "paper and pencil" tasks are best evaluated through a written examination.

The written examination consists of two sections for which the examinee may refer to references (i.e., "open-reference examinations"). Section A, "Plant and Control Systems," is administered using a static simulator. Section B, "Administrative Controls/Procedural Limits," may be administered in a classroom. Each section should be designed to last a minimum of 1 hour, including time for the operator to review his or her work. Combined, the two sections of the written examination should be designed to last 3 hours. The facility licensee will determine the exact number of questions and time allowed to complete each section, on the basis of the requalification sample plan and the license level of the operators taking the examination (RO or SRO).

Although the examination is designed so that examinees may use references, an examinee should not expect to have time to complete the examination by consulting references to determine each answer. A good mix of test items will contain some questions that evaluate the operator's abilities to determine a correct response without delving into reference material and others that require the use of reference material to select the correct response. By combining test items that require references with those that do not, the written examination can test a broader sample of operator knowledge within a given period.

On both sections of the written examination, certain questions will test the K/As of an RO, while others will test those of an SRO. In developing the examination, the examiner should consult the facility's job task analysis (JTA) and the applicable K/A catalog to help identify the most suitable topics for an RO or SRO. Additionally, 10 CFR 55.41, "Written examination: Operators," and 10 CFR 55.43, "Written examination: Senior operators," provide further guidance on item selection for RO and SRO written examinations, respectively.

1. Section A, "Plant and Control Systems" (Static Simulator)

This section of the written examination is designed for using the simulator as a reference tool to visually provide realistic information and to give the operators an environment that is as close as possible to their normal control room. During this section, the simulator will be "frozen" in the middle of an evolution, transient, or accident. Test items in this section should allow the use of references that can be related to plant systems and components, control room indications, instrumentation and controls, and technical specification (TS) limiting conditions for operation. Section A is designed to evaluate the operators' knowledge of plant systems, integrated plant operations, and instrumentation and controls. In addition, it evaluates the operators' abilities to

recognize TS limiting conditions for operation and to determine the effects of postulated events. The NRC encourages facility licensees to include questions that test the operators' abilities to use their facility curves and charts.

While administering Section A, the examination team will use one "frozen" simulator condition or setup. The condition places the simulator in a "snapshot" of the plant following a major transient that resulted in an engineered safety feature initiation or a steady-state situation at power. Some equipment should be frozen in an abnormal or failed condition to provide adequate material for test items.

2. Section B, "Administrative Controls/Procedural Limits"

Section B of the written examination is designed to evaluate the operators' abilities to analyze a given set of conditions and determine the proper procedural and administrative guidance to use. This section may include theory-related questions that are appropriate to sample the topics listed in 10 CFR 55.41 and 10 CFR 55.43 as long as the questions are operational in nature or test unique facility characteristics.

Section B is designed to test the operators' knowledge and use of plant procedures and administrative controls while allowing the use of references. As sources of test items for this section of the examination, the NRC uses administrative, operating, normal, abnormal, and emergency procedures; the TS; and the emergency plan. The test items focus on how direction, guidance, and information found in these procedures are used or interpreted, rather than focusing on finding the procedure containing the necessary information. Additionally, the test items for Section B of the SRO examination assess the operators' understanding of the reasons and bases for procedural requirements. The use of graphs, charts, tables, and drawings is appropriate. The simulator may be made available to the examinees to make the examination more operationally oriented.

B. Examination Development Responsibilities

1. Facility Licensee Examination Team Members' Responsibilities

The facility licensee examination team is responsible for the following activities:

a. The NRC expects the facility licensee to provide a bank of test items that are developed using the guidance in Section C of this examination standard; ES-4.2, "Developing Written Examinations"; and Appendix B, "Examples of Written Examination Questions," as applicable. The number of test items should meet the submittal guidelines of Enclosure 1, "Reference Material Guidelines," of Letter 6.1-1, "Sample Corporate Notification Letter." Form 6.1-4, "Evaluation Checklist for Facility Reference Material," provides information that facility licensee personnel may use to evaluate reference material sets before submitting them to the NRC.

   The facility licensee should keep its examination question bank up to date by reviewing, modifying, or creating at least 150 questions each year to expand the bank and reflect procedure or system changes, new lesson plans, and recent licensee and industry events.

If the facility question bank contains at least 700 items that meet the format guidance of Form 6.2-4, “Example Formats for Open-Reference Questions,” in this examination standard, the facility licensee may release the bank to its operators for review.

b. The following items should be provided for each test question:

- applicable K/A reference and values (RO/SRO)
- reference JTA (if applicable)
- estimated time to answer
- appropriate learning objectives
- applicable references (e.g., lesson plan and emergency operating procedures)

c. The facility licensee is expected to provide a sample plan that meets the guidelines of Form 6.1-2, “Examination Sample Plan,” and may submit a proposed examination that conforms to the facility licensee’s sample plan. The proposed examination should contain a total of 30 to 40 test items, depending on the time validation (maximum of 3 hours) of the individual questions selected. Sections A and B should each contain 15 to 20 questions, and each section must be designed to last a minimum of 1 hour, with the total examination designed to last 3 hours.

The facility licensee will determine the number of questions in each section based on the requalification sample plan and the license level of the operators taking the examination (RO or SRO) and subject to the quantitative constraints of the previous paragraph. Plant systems questions that do not directly relate to the static scenario can be included in Section A to meet the facility licensee’s sample plan and the requirements of 10 CFR Part 55, “Operators’ licenses.” In addition, up to 20 percent of the test items may be from topics outside the sample plan as long as the information stated in Section B.1.b. of this examination standard is provided.

If the facility licensee submits a proposed examination, those individuals involved in its development become subject to the examination security restrictions of ES-6.1 once examination development starts. These restrictions remain in effect until the NRC examination is given. If, after developing a proposed examination, the facility licensee decides not to submit it for use in the NRC-conducted examination, the developers are released from the examination security restrictions of ES-6.1.

d. After the NRC has reviewed the facility’s examination bank and commented on the test items selected for the examination, the facility licensee team members are expected to prepare the examination for final NRC review and approval. The examination may be finalized before or during the preparation week.

e. The facility licensee examination team representative will evaluate each test item that the NRC revised to assess the following criteria:

- appropriateness
- time required to answer, given the operational context
- technical accuracy
- clarity
- K/A and objective references

Following this evaluation, the facility licensee examination team representatives and the NRC chief examiner need to agree on the final form of the examination. They also need to complete a time validation of the proposed examination. A variety of methods have proven effective in accomplishing this task.

Any individual involved in time validating the examination is required to sign Form 6.1-3, "Examination Security Agreement." The examination team may add or delete items from the examination based on the results of this time validation and the experiences. If any test items are added, it is not necessary to time validate the entire examination again as long as a subject matter expert has reviewed the added questions, indicating the approximate time that an operator should take to answer each question.

f. The NRC expects the facility licensee to provide sufficient copies of each reference so that each examinee can use the references during the examination and, immediately upon completion of the examination, to compile the examinations and reproduce sufficient copies for its own use and that of the NRC.

g. To help relieve the burden of providing a complete set of references to each operator, the examination may be assembled so that a different sequence of questions appears on each operator's examination. Alternatively, handouts of relevant information (e.g., plant curves, blank forms) may be provided with the test.

2. NRC Examination Team Members' Responsibilities

The NRC examination team is responsible for the following activities:

a. The NRC will begin its evaluation of the sample plan, the bank of test items, and the proposed examination as soon as possible after receiving the facility licensee's materials. The NRC will promptly evaluate the materials to allow sufficient time for the agency or the facility licensee to develop the test items and for the facility licensee to revise them to meet NRC standards, if required. The NRC examiners should review the proposed test items using Form 6.2-1, "NRC Checklist for Open-Reference Test Items," to ensure appropriateness, clarity, and importance to safety as described in Section C of this examination standard.

If the facility licensee intends to administer both sections of the examination during a single 3-hour period as noted in Section B.1.c, the NRC examination team members must review the examination as a whole to ensure that the items in either section do not compromise those in the other.

b. A minimum of 80 percent of the test items will be chosen in accordance with the sample plan. The NRC examination team may substitute the remaining 20 percent by using facility examination bank questions or new questions that the team develops. Should it be necessary to develop additional items to satisfy the sample plan, the NRC staff will ask the facility licensee to do so.

c. If, after reviewing at least 75 percent of the bank, the NRC examination team finds that test items are insufficient to develop an NRC examination that meets the sample plan, the NRC staff will declare the bank of test items inadequate. In that event, the NRC regional managers may either cancel the scheduled examination or administer an

examination using NRC-developed test items without consideration of the 20-percent substitution constraints.

d. If the sample plan does not include topics from outside the requalification cycle, the NRC examination team should consider incorporating 10 to 20 percent test items specific to the nonrequalification cycle.

e. If a test item does not have a clear tie to the JTA, the NRC examination team will discuss the applicability of the test item with the facility licensee representatives.

C. Guidelines for Developing and Reviewing Open-Reference Examinations

Those who are involved in developing or reviewing test items for the written portion of the NRC's requalification examination should use the following guidelines. As described above, the written examination consists of two sections. Section A uses a static simulator to provide the context for questions on plant and control systems, while Section B focuses on plant procedures and administrative controls. Examinees may use references, including simulator displays, for both sections. Open-reference written examinations are used for two reasons:

1. examination validity

   By permitting the use of references that are available to the control room operators, the conditions and requirements of the written examination more closely approximate those of the actual job. The information provided to the operators in the test items should closely parallel the information typically available to them, while the responses elicited by the questions should be related to the decisions, solutions, and actions required for effective job performance. In other words, consulting references more closely correlates *job demands* and *test demands*—a cornerstone of examination validity.

2. level of knowledge

   Use of references enhances examination validity by elevating the level of knowledge of the test items. As described later in these guidelines, operator access to references precludes the use of questions that test for the mere recall of facts and specifics. Instead, open-reference test items require test takers to demonstrate that they can find, apply, analyze, evaluate, or otherwise *use* knowledge to handle the problems and issues they may encounter on the job.

Most principles for effective test item construction apply equally to all types of written questions, regardless of format. Therefore, those who develop and review open-reference test items should consult Appendix A, "Overview of Generic Examination Topics," to this NUREG, in addition to the guidelines in this section.

1. Selection of Test Topics

Use the following criteria to select test item topics for the NRC's requalification examination:

a. requalification training program curriculum

   Base the test topics on the curriculum of the most recent operator requalification program training cycle. However, the NRC may substitute up to 20 percent of the

examination topics selected by the facility licensee with subjects not emphasized during the requalification cycle. These test items should emphasize knowledge that is of high importance to safety.

b. performance basis

Like the requalification program itself, draw the test topics from a JTA for an RO and an SRO. The facility licensee should validate each test item by demonstrating a link between each item and the following JTA products:

- important operator tasks, as identified by the JTA
- important K/As (rated 3.0 or higher), as identified in NUREG-1122, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors"; NUREG-2103, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Westinghouse AP1000 Pressurized-Water Reactors"; NUREG-1123, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Boiling Water Reactors"; NUREG-2104, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Advanced Boiling-Water Reactors"; or a facility-specific K/A catalog
- facility learning objectives identified as important to safety

c. adequacy of test coverage

Check the facility licensee's proposed sample plan (or test outline) to ensure that it provides balanced, comprehensive coverage of the requalification training cycle topics. Revise the distribution of proposed test items on the examination if the topics underrepresent or overrepresent the material covered in the requalification program. In the sample plan, address recent safety-related issues and events (e.g., those in relevant LERs). Form 6.1-2 provides further information on sample plan development.

2. General Guidelines for Sections A and B

Use the guidelines in this section to construct and review test items for both parts of the written examination. The NRC intends these guidelines to supplement, rather than replace, the good practices stated in Appendices A and B to this NUREG.

a. Operational Orientation

As previously discussed, examination validity is enhanced to the extent that the demands of the test match the demands of the job. Therefore, in addition to being derived from important K/As and testing objectives, the context and stipulations of test items should mirror the situations encountered in the work setting. The following example illustrates effective and ineffective ways to design test items from K/As and learning objectives:

K/A:	*Knowledge of the design attributes of the turbine-driven auxiliary feedwater pump (TDAFWP) differential pressure controller*.
Task:	*Operate the TDAFWP controls during all modes of plant operation.*

Learning Objective:	*The student will be able to operate the TDAFWP differential pressure controller without error during a loss-of-feedwater event.*
Enabling Objective:	*After completing this lesson, the student will be able to explain the operation of the TDAFWP differential pressure controller*.
Poor Test Item:	*State the parameters used by the TDAFWP differential pressure controller.*
Better Test Item:	*Before isolating the "C" steam generator (in accordance with EPP11), an operator noted that the transducer-fed auxiliary feed flow indicators for the "C" steam generator were reading greater than the flow indicators to the "A" and "B" steam generators. What is the reason for this flow deviation?*

Notice that the "better" test item requires the operator to demonstrate mastery of the knowledge by applying it to an actual job situation. In developing items, ask "Why is the K/A important to satisfactory job performance?" and "In what situation will the operator need this K/A?" The answers to these questions can provide a basis and context for a test item.

b. Level of Knowledge

The operational orientation required of test items on the open-reference examination, as well as the operators' access to controlled documents, *precludes* the use of questions that test for mere recall or memorization. Rather than requiring operators to simply recognize or recall facts and specifics, open-reference test items have the operators *demonstrate* understanding by *using* the knowledge to address real-life situations and problems. A test item at the higher level of knowledge requires operators to determine or identify the appropriate fact, rule, or principle and then correctly apply it to a novel situation. Appendix B describes each level of knowledge. Together with Form 6.2-3, "Examples of Different Types of Questions," Appendix B also provides sample questions that illustrate the various levels of knowledge.

c. Realistic Context

For additional assurance of examination validity, make the situation or problem posed in the open-reference test item as similar as possible to the actual situations that operators encounter on the job. Situations described in the questions should be realistic and should also be free of common "context" problems, including "backward logic" and "window dressing."

Backward-logic questions give operators information they normally must produce while asking them for information they normally receive, as illustrated by the following example:

K/A:	*Ability to calculate shutdown margins*
Backward-Logic Item:	*If the shutdown margin is 5.5 percent, how long has the unit been shut down?*
Better Item:	*The unit has been shut down for x hours. Which of the following is the shutdown margin?*

Questions with window dressing have additional, unnecessary information, typically in an attempt to make a memory-level item more operationally oriented, as in the following example:

Window Dressing Item:	*The plant has tripped from the effects of a tornado crossing the site boundary. You, as shift supervisor, direct the phone talker to complete the 15-minute notification. He informs you that the normal notification network is inoperable. Which of the following do you direct him to use for completing the 15-minute notification?*
Better Item:	*If the normal notification network is inoperable, which of the following methods do you use to complete the 15-minute notification after the plant has tripped?*

Another common problem when constructing a question with a realistic context is that "real-world" situations often have more than one correct solution or response. Carefully check the question and references to ensure that each test item has only one correct answer.

d. Question Novelty

One of the most effective ways to ensure that an operator has a high level of knowledge is to present novel situations and require the operator to realize both what information is relevant and how to apply it. If a test question does *not* contain unique or varied circumstances different from those presented in training, the item will merely elicit simple recall.

When candidates are able to memorize test items and answers (in their static state) to respond to test items, the test cannot really determine whether they can truly solve the problems or whether they have merely memorized the answers. Once a test item and its answer have been seen and rehearsed, the item ceases to be a viable discriminator of safe operator performance. It is no longer challenging or testing problem-solving ability; rather, it is simply testing recall. Therefore, test items must be dynamic, replacing or substituting items of like kind and difficulty to preserve integrity in the test discrimination process.

Because an infinite number of combinations of plant or equipment parameters and malfunctions may exist at any given time, a true test will compensate for this variation and will become dynamic so that the test can adapt to the infinite number of combinations and still test the same kinds of responses but to different situations.

Review the training material to ensure that questions do not include overly familiar conditions. Keep in mind, however, that all conditions and situations should be reasonable, realistic, and safety related.

e. Relationship of Open-Reference Examinations and Direct Lookup Questions

Direct lookup questions are associated with open-reference examinations. The key phrase here, "direct lookup," conveys the meaning that little mental activity is involved other than simply copying an answer that is readily available in a reference (i.e., simple recall of where to find the information). Merely omitting from the item stem any mention of where to find the answer does not make it an acceptable open-reference question.

Do not use direct lookup questions for two reasons. First, these items only test memory, in that the information is readily available; this is an inefficient and less valid means of testing candidate knowledge. Second, other than demonstrating that a candidate knows *where* to find information, this type of question does *not* test the understanding or analysis of the information that can be applied on the job. Consequently, this type of question will not discriminate the safe operator from the unsafe operator.

The other option is an "open-reference" question. Use an open-reference examination to test candidate knowledge for the following purposes:

- Does the candidate know which reference to use and where to find it?
- Does the candidate know how to apply the information in the reference to the problem?

For an open-reference question, the kind and amount of information required to solve the problem would exceed that which could normally be committed to memory. In other words, the NRC does not expect candidates to remember the information needed to solve the problem.

In regular closed-reference questions, the candidate is expected to know and understand how systems operate so that they can answer a question with the information provided in the stem of the question. For a closed-reference question, the candidate would not need to consult a reference. In other words, the NRC expects the candidate to solve the problem by knowing and understanding how the systems work, given various conditions set in the problem.

Whether an examination is open- or closed-reference, the test should, to the extent possible, assess problem-solving or decisionmaking because, at this more complex level of thought, the test can more closely approximate the job and achieve a valid assessment.

Memory types: Understanding how memory operates relates to understanding why an open-reference question is preferable. Obviously, all that one knows or does involves memory. Operationally, however, memory falls into two categories: simple memory and complex memory.

Simple memory can be viewed as recall or recognition of simple bits and chunks of information. Simple memory may still be involved when the volume of information increases (i.e., the amount of information is large, but the process is basically simple memorization of *more* bits of information). Visualize the type of memory required to memorize 5 letters of the alphabet versus 26 letters or the recitation of a short poem (or procedure) versus a long one, and so forth. This memorization process does not involve analysis, integration of facts, or problem-solving.

Rather, the process requires repetition, practice, and rehearsal. The difference lies in the amount of information to be recalled, not the level of mental processing.

By contrast, complex memory, as the term suggests, involves a higher level of cognitive processing. The bits and chunks of information must now be combined or integrated to create something new, solve a problem, predict a response, or make a decision. Therefore, both the amount of information and what is to be done with it make the cognitive mental processes complex. Naturally, some questions will involve greater complexity than others, but the mental processes will be the same—integrating bits of information, combining and sorting them, and

distinguishing the relevant from the irrelevant to arrive at an answer to the question. This is the essence of an analysis or synthesis process.

As previously stated, the NRC should evaluate candidates at this complex level, because this level of thought processing most closely approximates that needed on the job. The complex, problem-solving level subsumes knowledge of the bits and chunks of information frequently tested at the simple memory level. Therefore, by testing at the complex level, the examination also implicitly tests at the simple memory level. As a prerequisite to solving the problem, the candidate recalls and integrates these bits and chunks of information. Therefore, testing at the analysis level is more efficient than testing at the simple memory level.

A Final Note: Undue emphasis is placed on the term "immediately" in the definition of a direct lookup. Speed of knowing where to locate a reference is irrelevant to direct lookup. The NRC expects candidates, who have been trained, to quickly locate the appropriate reference. The speed issue is relevant to whether the stem of the question contains unnecessary cues to the candidate about where to find the reference. If the open-reference question is intended to assess whether the candidate knows where to find the information, the stem should not contain a cue about the location of the information. Part of the value of an open-reference examination is to test the candidate's evaluative knowledge of *where* to look. If the stem provides unnecessary cues to the reference, a candidate can immediately go to the reference and some value of the open-reference test is lost.

Speed in answering the question properly is a function of the level of difficulty and the thought processes or steps required to answer the question. Obviously, if the question is a direct lookup, by definition, it assesses only simple memory and will be quickly and easily answered. This type of question should never be asked.

References should be considered "tools" that operators use to solve problems. The open-reference examination should test the correct use of these "tools," not just the recall of facts and specifics. As previously stated, "direct lookup" questions should generally be avoided and should not be included in the examination; rather, questions should be structured to determine whether operators can identify, locate, or select correct reference information to produce organized responses and satisfactory solutions to job-related problems and issues. The following is an example of a lookup question, which should generally be avoided:

> *Based on the "Alarm Response Procedure" 1ZZ-040-3, what is the setpoint of the high-high containment pressure alarm (PK25) on VB3?*
>
> *a. 10 psig*
> *b. 15 psig*
> *c. 20 psig*
> *d. 25 psig*

This question should be rejected because a candidate can easily find the setpoint in the alarm response procedure. Some may argue that knowing how to look up this data in the procedure makes the item valid; however, no higher order cognitive skills requiring analysis or synthesis of information were required to determine the correct response. Avoid similar questions on precautions or prerequisites that are listed in procedures. The following is a better question using reference material:

Using the current plant conditions (assume emergency core cooling system (ECCS) and containment spray flow rates REMAIN CONSTANT), how much time is available before switchover to containment recirculation?

a. 3.6 hours
b. 4.2 hours
c. 4.8 hours
d. 5.2 hours

This is a "lookup" question in a sense, but it certainly requires gathering data from the control boards (e.g., ECCS flow, Containment Spray flow, and refueling water storage tank level) and then identifying the correct emergency procedure and locating and selecting the correct graph to determine how much time is left before the tank reaches a specific level. It requires use of both the simulator and the plant procedures as references.

The following is another appropriate question using facility references:

Following a loss-of-coolant accident, automatic actions have occurred as follows:

- *The reactor has tripped and is shut down.*
- *Auxiliary feedwater has actuated, and steam generator pressure is being controlled at 1,005 psig, using steam dumps to the condenser.*
- *Containment pressure has risen to 15 psig, and no additional automatic actions have occurred.*

Which of the following functional recovery procedures should be implemented IMMEDIATELY?

a. FR-C1
b. FR-Z1
c. FR-P1
d. FR-I1

This question requires identifying which systems should have actuated based on the engineered safety feature actuation signal setpoints and which critical safety functions are compromised. The operator should refer to the functional recovery procedures to verify which critical safety functions have been compromised. Knowing where to look and what to look for are factors required to answer this question in a reasonable time.

The item could also be used in the simulator section by requiring the operator to look at the control board in the "frozen" simulator to determine the plant conditions and deduce what critical safety functions were not met. Naturally, the more integration and evaluation required, the more time must be given to answer the question.

Another question that makes effective use of reference material is as follows:

While operating at 100-percent power, volume control tank and pressurizer alarms and indications show decreasing pressurizer level with two charging pumps operating. Also, the blowdown and main steam radiation monitors have alarmed. While following the

appropriate abnormal and emergency procedures, you, as the shift supervisor, must evaluate the existing conditions. Which emergency classification would you declare on the basis of this information?

a. Notification of Unusual Event
b. Alert
c. Site Area Emergency
d. General Emergency

This question requires the operator to consult references to classify an event. It also requires analyzing the situation, finding the correct part of the emergency plan implementing procedures, and selecting the appropriate classification.

f. Difficulty Level versus Discriminatory Value

Test developers sometimes believe, erroneously, that open-reference questions should be more difficult to compensate for the operators' access to reference material. Frequently, this increased difficulty is in the form of requiring knowledge of more obscure or otherwise unnecessary information. Both open- and closed-reference questions should have the same standard of difficulty; that is, difficulty should be based on the job demands and responsibilities of operators. A question should be constructed so that it effectively discriminates a competent operator from one who is not. A high K/A value should not be confused with the difficulty or discriminating ability of a question.

g. Time Limits

Operators take considerably longer to answer open-reference questions than closed-reference questions. (Weaker operators especially have been found to spend an inordinate amount of time consulting references rather than writing responses.) Provide the operators ample time to complete the examination, although not so much time that less-than-competent operators have the opportunity to locate answers without prior familiarization with the topic. Use the following four guidelines to determine the appropriate length of the examination:

1. A competent operator should complete the combination of Sections A and B in 3 hours. Give the operators an appropriate amount of time to review Sections A and B based on the number of questions assigned to each section. For example, if Section A has 15 questions and is validated for 45 minutes, allow operators 15 minutes for review. Likewise, if Section B has 20 questions and is validated for 90 minutes, allow 30 minutes for review. The 3-hour time limit must include the time allocated to review Sections A and B.

2. Develop questions so that Sections A and B each have approximately 15 to 20 points for a total test value of 30 to 40 points. Use the examination sample plan to determine the exact number of questions to be asked in each section. As noted in Appendix B, multiple-choice questions are preferred, but other formats are acceptable. No question will be worth more than 2 points.

3. In an open-reference examination, every answer need not require the operator to use a reference. When developing the questions, make a reasonable estimate of the time required to answer each question and identify any references needed to respond.

Whether and to what extent references are needed affect what constitutes a reasonable amount of time to respond. For example, if the static scenario is set up for an abnormal plant transient that requires relatively rapid operator analysis or response, the time allowed to respond to the question should be similar to that required to react to the transient. The NRC does not expect an operator to answer a question as quickly as he or she would react in the plant but does expect that the operator would consult few references.

Conversely, questions involving scenarios for which an operator would have time to consult many references would allow similar time to respond to the question.

4. The NRC expects each proposed examination to be time validated. In the best method, a representative cross section of plant operators would take the examination in near-test conditions. Then, by taking the average of the time it took each individual to answer each question, a reasonable time may be established for the test. However, if a large deviation occurs among test takers on particular questions, ask them why they took either an excessive or relatively short amount of time to answer the question (compared to that anticipated). Responses may lead to eliminating certain operators' times from the averaging process and, thereby, eliminating anomalies associated with individuals (rather than eliminating the test items themselves). However, logistics dictate that sometimes only one or a few individuals can participate in validating the time to complete the test. In any case, the results need to be carefully evaluated for any unanticipated deviations from the amount of time anticipated to complete each item.

   The NRC expects facility managers responsible for validating the examination to validate the time for each question similarly. When performing time validation of the examination, make these expectations clear to the facility representatives validating the examination so that a reasonable estimate can be obtained.

h. Correct Mode of Measurement

No matter how high their importance ratings or operational relevance, certain operator K/As and skills are not amenable to written testing, as in the following example:

Arrange the major steps in the proper sequence to start, parallel, and load diesel generator DG-2:

_____ *Use governor control to increase kilowatt power to DG-2.*
_____ *Raise DG speed to 900 revolutions per minute.*
_____ *Match voltage with bus 1A2 voltage.*
_____ *Close breaker 1AD2.*

Despite its operational orientation, the underlying skill addressed in this test item would be better assessed by having the operator simulate or perform the steps during either the simulator or walkthrough portions of the operating examination.

3. Specific Guidelines for Section A

The guidelines in the section are specific to Section A of the written examination as performed on a static simulator.

a. Question Development

To ensure that the operator's knowledge of systems and integrated plant response is adequately evaluated, Section A of the written examination should incorporate the behavior of systems and controls in normal, abnormal, and emergency plant conditions. To the extent possible, questions should require the operators to refer to control room indications in formulating their responses, as in the following example:

Which one of the following describes the location of the steam break?

a. inside containment, upstream of the steamline flow transmitters

b. inside containment, downstream of the steamline flow transmitters

c. outside containment, between "C" main steam isolation valve (MSIV) and "C" main steamline check valve

d. outside containment, between "C" MSIV and "C" main steamline containment penetration

The scenario used should put the plant at some point in a major plant transient (e.g., loss-of-coolant accident, steam generator tube rupture, loss of all alternating current power) with several passive or active failures incorporated. However, the number of malfunctions or failures included in the scenario should be limited. No more than four minor failures should be used (e.g., failure of a safety-related pump to start, failed pressurizer pressure indication, nuclear instrumentation failure). Four failures will provide sufficient effects to test a wide range of objectives. Such a scenario would provide sufficient visual cues to develop a good percentage (at least 50 percent) of questions directly related to the existing plant conditions.

Questions may be used that do not relate to the transient but use the simulator as a frame of reference only provided that the operators are aware of this lack of relationship to the transient.

Examination authors should carefully ensure that multiple questions stemming from one event do not give each other away. The operator should be able to understand and correctly answer each question, based only on the information given in the question rather than on the answer to a previous question.

Use of plant diagnostic questions for which the examinee attempts to identify the transient that has occurred is generally not suitable given the purpose of this section of the examination. Having the operator attempt to identify what took place may limit the number of questions the test may ask about the transient. The author should indicate which symptoms or events have occurred, which procedure has been implemented, and which point in the procedure was reached at the time the simulator was "frozen."

The operator's response should either determine the root cause of the actual system or component failure or (by using "what if" questions) propose a future event and ask for the expected response.

b. Simulator Setup

Before the test, the simulator recorders should be advanced to provide clean readings and the recorders checked for proper operation. All indications (e.g., bulbs, meters, manual loader indications) should be checked to ensure they are in proper working order.

When the simulator has been frozen, the chart recorder drive power should be secured, if necessary.

Before administering the test, the test team should verify that the simulator indications are as expected in order for operators to arrive at the correct answer.

Any "first-out" annunciators that would normally blink to announce first-out conditions should be frozen and their readings provided to the operators.

If plant procedures are used to stabilize a transient, the step at which the simulator is frozen should be noted and recorded on the simulator operations summary sheet. As necessary, the examinees should receive the progress of the procedure step in effect.

4. Ideas for Open-Reference Formats

Form 6.2-4, "Example Formats for Open-Reference Questions," provides sample formats to assist individuals who are developing performance-based, open-reference questions.

Form 6.2-5, "Developing Open-Reference Test Items," provides additional guidance on the process of developing open-reference questions.

D. Examination Administration and Evaluations

1. Written Examination Conduct

a. An NRC examiner or knowledgeable facility licensee representative who has signed the examination security agreement will proctor each section of the examination. At a minimum, an NRC examiner will observe the examination briefing as the operators begin the examination to ensure that all administrative aspects of the examination are followed. If an NRC examiner does not continuously proctor the examination, an examiner will periodically visit the examination room to ensure that the proctor appropriately addresses questions on the content or administration of the examination that may have arisen.

b. Section A is administered on the facility's simulator or an approved simulation facility.

c. Section B may be administered in the simulator or in a classroom setting as the facility licensee staff and the NRC chief examiner deem appropriate. If both sections of the examination are administered in the simulator during a single 3-hour period, operators may return to a section of the examination that they have already completed or retain both sections of the examination until the time has expired.

d. For Section A of the examination, the facility licensee is responsible for giving the group of examinees at least one copy of all controlled reference materials available in the control room. Examination reference materials will *not* include material that is intended for training use only. The facility licensee controls all reference materials in accordance with its procedure revision control program under Appendix B, "Quality Assurance

Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic licensing of production and utilization facilities." The materials should be authorized for use in operating the power plant, agreed on by the facility licensee and the NRC chief examiner, and in effect at the time of the examination validation (i.e., the preparation week).

e. During the administration of Section B, each examinee will have available for use the following materials (complete, current issue):

- TS
- plant procedures (emergency operating procedures, abnormal operating procedures, and normal operating procedures)
- emergency plan (as available in the control room)
- administrative procedures applicable to operations
- other controlled plant reference materials that are normally available in the control room (e.g., curves and data book, forms, plant drawings, flow charts) and authorized for use in operating the plant

Note that "noncontrolled" reference materials, such as the emergency operating procedure owner's group basis documents, will *not* be provided unless they are authorized to be used by the control room operators during plant operations.

2. Examination Administration Procedures

The written examinations will begin only after the NRC chief examiner has verified the adequacy of the examination facilities and arranged for continuous proctoring of the examination as discussed in Section D.1.a of this examination standard. An NRC examiner may act as proctor during this examination. However, the NRC chief examiner is responsible for ensuring that the actions described in paragraphs D.2.b through D.2.i (below) are complete.

Each section of the written examination will be administered as follows:

a. An NRC examiner will verify each examinee's identity and examination level against the list provided by the facility licensee. If possible, the ROs and SROs should sit at alternating tables. Any errors or no shows will be resolved with the facility licensee staff, and the list will be updated as required.

b. The proctor will remind the operators that they may use calculators to complete the examination and that no reference material other than that provided is allowed in the examination area. The proctor will define the examination area for the examinees.

c. The proctor will pass out the examinations and answer sheets and instruct the examinees not to turn over the examination until told to do so. The examinees will be informed that pads of scrap paper are available from the proctor upon request.

d. The proctor will brief the examinees about the rules and guidelines in effect during the written examination using ES-1.2, "Guidelines for Taking NRC Examinations." The

proctor should inform the examinees that they may refer to the instructions directly beneath their examination cover sheet. The proctor will read the indicated policies verbatim.

e. The proctor will ask the examinees to verify the completeness of their copies by checking each page of the examination. The proctor should also have the examinees check to ensure that their examinations include an examination sheet, if required.

f. After answering any questions that the examinees may have about the examination policies, the proctor will start the examination and record the time.

g. The proctor will periodically advise the examinees of the time that remains to complete the examination. Normally, a chalk board or white board is available for this purpose.

h. As the examinees complete the examination, the proctor will ensure that they sign the examination cover sheet and staple it on top of their answer sheets. The proctor will collect the examination packages, including the questions and answer sheets, any references used with the examination, and all scrap and unused paper. The NRC examiner will keep the cover and answer sheets, dispose of the scrap paper, and give the packages of questions to the facility licensee for subsequent use.

i. The proctor will remind the examinees to leave the examination area, as defined by the examination team.

3. Written Examination Evaluations

Using the examination and answer key, the facility licensee and the NRC will independently grade each section of the written examination and will complete the grading of all written examinations within 10 working days of the examination administration date. NRC examiners will record the grades on the written examination cover sheet (Form 6.2-2, “Written Requalification Examination Cover Sheet”).

An individual’s grade will be obtained by summing the points credited to the examinee on both sections of the examination and dividing by the total points available (i.e., compensatory grading methodology).

To pass the written portion of the examination, operators must achieve an overall score of 80 percent on the written examination.

4. Test Item Evaluation

If a number of test items require significant modification during the grading of the examination (e.g., more than 10 percent of the items are deleted or the answer is changed from the original key), the NRC will determine the root cause and reflect it in the examination report. As discussed in ES-6.1, if significant deficiencies exist in the facility licensee’s quality control of its examination bank, the NRC will consider them as part of the program evaluation.

If technical flaws that have some safety significance are found in procedures while analyzing the answers to the written examination, the facility licensee may institute an immediate procedural change and inform all operators of the change.

E. Forms

Form 6.2-1	NRC Checklist for Open-Reference Test Items
Form 6.2-2	Written Requalification Examination Cover Sheet
Form 6.2-3	Examples of Different Types of Questions
Form 6.2-4	Example Formats for Open-Reference Questions
Form 6.2-5	Developing Open-Reference Test Items

Form 6.2-1 NRC Checklist for Open-Reference Test Items

<u>Test Item Level</u>

____ 1. Does each test item have a documented link to important operator tasks, knowledge and abilities (K/As), and/or facility learning objectives?

____ 2. Is each question operationally oriented (i.e., is there a correlation between job demands and test demands)?

____ 3. Is the question at least at the comprehension level of knowledge?

____ 4. Is the context of the questions realistic and free of window dressing and backward logic?

____ 5. Does the item require an appropriate use of references (i.e., use of analysis skills or synthesis of information either to discern what procedures are applicable or to consult the procedures to obtain the answer)?

____ 6. Is the question a “direct lookup” question, or does one question on the examination compromise another? A “direct lookup” question is defined as a question that only requires the examinee to recall where to find the answer.

____ 7. Does the question possess a high K/A importance factor (3.0 or greater) for the job position?

____ 8. Does the question discriminate a competent operator from one who is not?

____ 9. Is the question appropriate for the written examination and the selected format (e.g., short answer or multiple choice)?

____ 10. Do questions in Section A take advantage of the simulator control room setting?

____ 11. Is the question clear, precise, and easy to read and understand?

____ 12. Is there only one correct answer to each question?

____ 13. Does the question pose situations and problems other than those presented during training?

____ 14. Does the question have a reasonable estimated response time?

Form 6.2-2 Written Requalification Examination Cover Sheet

U.S. Nuclear Regulatory Commission Written Requalification Examination	
Operator Information	
Name:	
Date:	Region: I / II / III / IV
Facility/Unit:	Reactor Type: W / CE / BW / GE AP1000 / ABWR
Start Time:	Stop Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade is 80 percent. You have a total of 3 hours to complete both sections of the examination.

Operator Certification

All work done on this examination is my own. I have neither given nor received aid.

_____
Operator's Signature

Results

Test Value (Points)	Section A: _____ Section B: _____ TOTAL: _____
Operator's Score (Points)	Section A: _____ Section B: _____ TOTAL: _____
Operator's Grade (Combined)	_____ Percent

Form 6.2-3 Examples of Different Types of Questions

1. Memory-level questions are not to be used on open-reference examinations.

2. Comprehension-level questions require the operator to demonstrate an understanding of a concept without necessarily relating it to other material or fully comprehending it in depth:

   A spurious safety injection signal resulted in high head safety injection flow to the loop cold legs when the plant was in Mode 4. After completing corrective actions for the inadvertent safety injection initiation, you must do the following:

   a. Stroke test the cold-leg motor-operated stop valves within 24 hours.

   b. Test the cold-leg injection check valves for leakage within 48 hours.

   c. Stroke test the cold-leg motor-operated stop valves before entering Mode 3.

   d. Test the cold-leg injection valves for leakage before entering Mode 2.

3. Questions at the analysis, synthesis, and application levels require higher order cognitive thought processes.

   a. Application-level questions may require the operator to apply his or her knowledge to various concrete situations:

      Given the following conditions—

      - *Both main feed pump turbines tripped.*
      - *Auxiliary feedwater (AFW) automatically started.*
      - *AFW valves reset to control steam generator water level.*
      - *AFW suction pressure decreases to 7 psig.*

      Which ONE of the following describes AFW pump response for the given conditions?

      A. The pump suction will automatically shift to nuclear service water.
      B. The pump suction will automatically shift to upper surge tank.
      C. The pump will trip when suction pressure decreases to 5 psig.
      D. The pump will trip after a 6-second delay.

   b. Analysis questions require the operator to mentally integrate a number of conditions, analyze their interrelationships, sort through and discriminate among distractors, and finally choose the correct answer:

      Which answer below correctly indicates the posting required for a room using the results of the following radiological survey?

      SURVEY RESULTS:
      AIRBORNE ACTIVITY: 6.44 E-9 uci/cc (Co-60)
      FLOOR SMEAR: Beta-610 dpm/cm^2; Alpha-4 dpm/cm^2

EQUIPMENT SMEAR: Beta-1,800 dpm/cm^2; Alpha-16 dpm/cm^2
GENERAL RADIATION LEVEL: 110 mr/hr

A. Radiation Area, Airborne Area, and Full Anti-Cs
B. High Radiation Area, Airborne Area, and Full Anti-Cs
C. High Radiation Area, Full Anti-Cs
D. Locked High Radiation Area, Airborne Area, Double Anti-Cs

c. Problem-solving questions require putting together elements to demonstrate an understanding of the underlying knowledge:

The plant is operating at 100-percent power when a loss-of-coolant accident occurs. The reactor trips automatically, but fast transfer fails, and buses 1A1 and 1A2 become deenergized. Pressurizer pressure low signal and containment pressure high signal initiate, and all equipment operates as designed.

Which ONE of the following is the expected system response?

a. Offsite power low signal (OPLS) initiates load shed and starts both emergency diesel generators.

b. OPLS does NOT actuate; the emergency diesel generators start and reenergize buses 1A1 and 1A2.

c. OPLS does NOT actuate; the emergency diesel generators do NOT start, and the sequencers start safeguards motors.

d. OPLS does NOT actuate; the emergency diesel generators run at idle speed, and the sequencers start safeguards motors.

Form 6.2-4 Example Formats for Open-Reference Questions

1. Given plant, system, or component condition or problem—

    - Diagnose the cause of the problem.
    - Identify the location of the problem.
    - Predict the effect on the plant/system/component.
    - Identify the precipitating events/actions.
    - Classify and indicate whether the conditions meet the specified criteria.
    - Indicate and use the proper procedures/references.
    - Identify the appropriate recuperative actions.

2. Given plant conditions and operator actions or procedural steps implemented—

    - Indicate the purpose/reason behind taking these actions.
    - Determine whether the correct actions were taken, given available cues.
    - Indicate what further actions are required to achieve a desired effect.

3. Given a proposed or hypothetical course of action or recommendation—

    - Determine its appropriateness or acceptability.
    - Predict the expected plant/system/component response.
    - Predict the effect on other systems/components.

4. Given data on plant conditions or parameters—

    - Compute or determine the status or change in other parameters.
    - Use, for example, charts, curves, and graphs to perform calculations or estimations.

Form 6.2-5 Developing Open-Reference Test Items

Analysis-level open-reference questions should be developed according to the following decision steps and mental model:

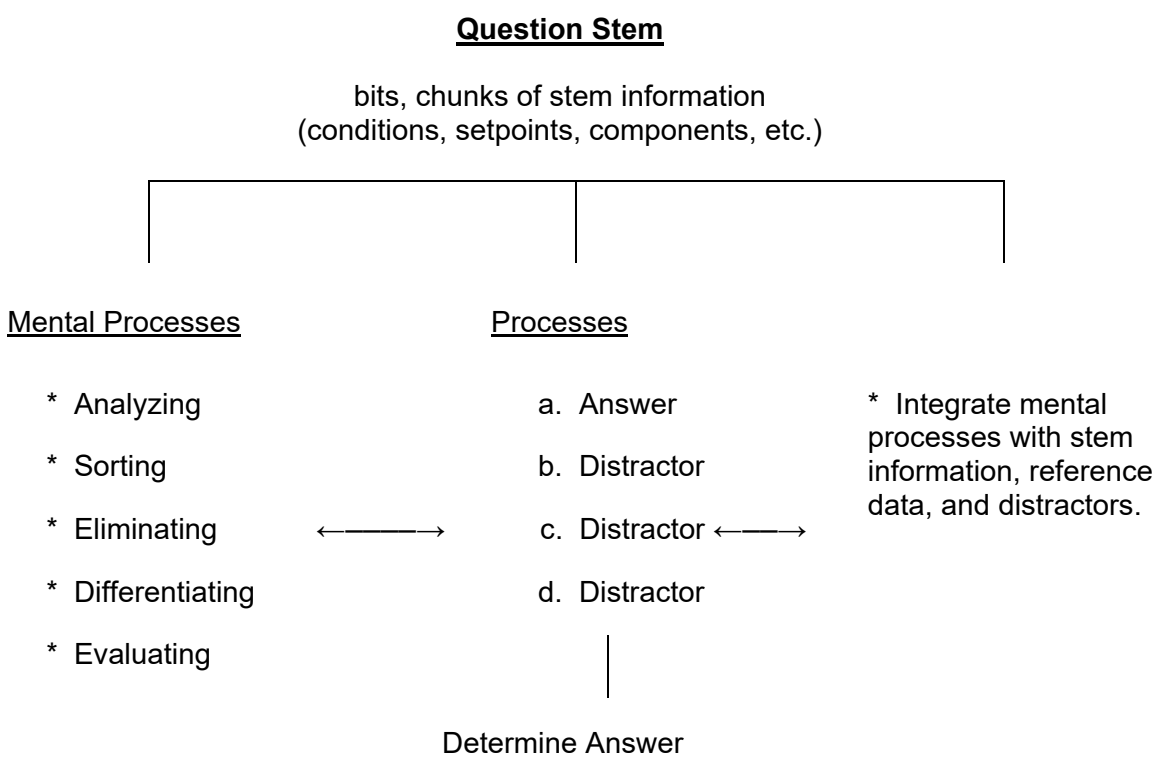
1. Determine the purpose of the test. Do you want to test *knowledge where* and *knowledge what/how*?

2. Determine the information needed to respond to the question. Is the volume and kind of information such that you would *not* normally expect candidates to recall the information from memory to answer the question?

3. If the answer is *yes* to both Questions 1 and 2, develop an open-reference question.

4. Construct the question as two tiers:

Tier Purpose	Process	Criteria	Outcome
1. Knowledge where	Evaluate reference sources	Avoid clues in stem	Locate reference sources
2. Knowledge what/how	Integrate multiple variables/events	Information volume and detail high (not in memory)	Identify correct answer



6.3 REQUALIFICATION WALKTHROUGH EXAMINATIONS

NRC examiners, working with facility licensee evaluators, follow this examination standard (ES) to administer walkthrough requalification examinations as authorized by Title 10 of the *Code of Federal Regulations* (10 CFR) 55.59(a)(2)(iii). The walkthrough examination is an effective tool for evaluating the ability of a licensed operator to manipulate system components and controls, interpret references, use administrative procedures, and demonstrate knowledge of component locations.

A. Scope

This examination standard provides specific guidance and requirements for NRC examiners to use in preparing, reviewing, and administering walkthrough requalification examinations in which each operator performs five job performance measures (JPMs). Each operator's walkthrough examination is designed to test the operator on plant systems that are important to the safe operation of the reactor. NRC examiners and facility licensee evaluators jointly approve the JPMs for each examination. Each JPM consists of several steps, one or more of which is designated as "critical." An operator must properly complete each critical step to pass the JPM.

The examination team will agree on five JPMs so that at least two are conducted in the simulator (or the control room) and at least two are conducted in the plant. To the maximum extent practical, control room JPMs will be conducted using the simulator. When operators perform JPMs in the control room or the plant, they will be cautioned not to manipulate the reactor controls. To successfully complete these JPMs, operators will demonstrate to the examiners the steps or actions they would take to complete the task.

B. Development of Job Performance Measures

The following are the activities conducted by the facility licensee and the NRC examination team for an NRC-conducted requalification walkthrough examination.

1. Facility Licensee Examination Team Members' Responsibilities

a. The NRC staff expects the facility licensee to identify the plant systems that are critical to protecting public health and safety. The systems that are selected for the examination should meet the following criteria:

- systems covered during the current requalification cycle (the facility's sample plan should identify the systems and appropriate learning objectives; see Form 6.1-2, "Examination Sample Plan")
- new or recently modified systems
- systems that are the subject of recent facility license event reports or vendor notices

- risk-important systems, components, and operator actions[1] for plant or vendor generic systems as identified through probabilistic risk assessment (PRA)

- systems that are the subject of NRC information notices

- systems that are important to safety during low-power or shutdown operations

b. For those systems that are identified as being important to safety, the facility licensee representatives are expected to review the job task analysis (JTA), learning objectives, and applicable K/A catalog. The facility license representatives should highlight for use as JPMs the tasks, abilities, and learning objectives that fulfill the following criteria:

- apply to the facility

- are at the appropriate level for the operator being examined (i.e., the RO is responsible for AO/RO tasks, and the SRO is responsible for AO/RO/SRO tasks)

- have a K/A rating of 3.0 or higher (tasks and abilities selected for use may have ratings below 3.0 if proper justification exists for such ratings)

c. Some tasks important to safety are unique to a specific plant and are not referenced in the applicable K/A catalog. The NRC staff expects each facility licensee to maintain a list of these plant-specific tasks and develop JPMs that test the operator's K/A in these areas. Before submitting the JPMs to the NRC for review, the facility licensee is responsible for ensuring that the tasks are appropriate to the applicable license level and have a safety importance rating of at least 3.0.

If a facility-specific K/A is used in lieu of those specified in the applicable K/A catalog, the importance ratings must be based on protecting public health and safety.

d. JPMs should meet the development instructions in Examination Standard (ES)-3.2, "Developing Job Performance Measures," and Form 3.2-4, "Job Performance Measure Development Job Aid." The JPMs should indicate which steps are "critical" to successful completion of the task. Critical steps are those steps that when not performed correctly, in the proper sequence, or at the proper time, will prevent the system from functioning properly or preclude successful completion of the task. Form 3.2-3, "Job Performance Measure Template," or an equivalent facility licensee form should be used to construct and format the JPMs.

In accordance with 10 CFR 55.59(a)(2)(ii), requalification operating tests require operators and senior operators to demonstrate an understanding of, and ability to, perform necessary actions. Therefore, JPMs selected for the walkthrough examination shall not test solely for simple recall or memorization. Although it addresses written examinations, ES-6.2, Section C, "Guidelines for Developing and Reviewing Open-Reference Examinations," should be used when preparing JPMs. Although an operating

[1] Chapter 13 of NUREG-1560, "Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance," issued December 1977, identifies important human actions that might be appropriate for the operating test. In determining important operator actions, do not overlook actions that are relied on or result in specific events being driven to lower risk contribution. This will help identify those human actions, assumed to be very reliable, that might otherwise not show up on a list of risk-dominant actions.

test does not require every JPM to be an alternate path or demonstrate detailed system understanding, simple one-step JPMs or JPMs that require only direct look up of the correct answer are not appropriate. JPMs that incorporate the testing of immediate action steps from memory are acceptable. However, JPMs should not solely test immediate action steps and should include testing additional steps or items that are not from memory.

The majority of the JPMs selected for the walkthrough examination will cover topics from the most recent requalification training cycle. In addition, the facility licensee is expected to create at least 10 new JPMs each year until it has a JPM bank that is representative of Sections B.1.a and B.1.b of this examination standard. The NRC anticipates that a facility's bank will comprise approximately 125–150 JPMs; however, the exact number will depend on the facility's JTA. New JPMs should generally be based on recent requalification training, industry events, facility changes, and tasks for safety-significant systems.

e. The NRC staff expects each facility licensee to develop "time-critical" JPMs to evaluate time-critical tasks identified in the facility's JTA for each licensed position. To facilitate the selection of time-critical JPMs for the requalification examination, the facility licensee is expected to uniquely identify these JPMs. To successfully complete a time-critical JPM, the operator must perform the "time-critical" steps within a prespecified time period, in addition to successfully performing all of the critical steps that are not time critical. The time period identified in the time-critical JPM should be based on a regulatory requirement or a facility licensee commitment to the NRC.

f. The NRC staff also expects each facility licensee to develop "alternate-path JPMs" and include them in the JPM bank. To facilitate the selection of alternate-path JPMs for the requalification examination, the NRC staff expects the facility licensee to uniquely identify these JPMs. ES-3.2 provides guidance for use in developing these JPMs.

2. NRC Examination Team Members' Responsibilities

a. The NRC examination team will review and approve the JPMs selected by the facility licensee. The majority of the selected JPMs should be based on the systems covered during the most recent requalification cycle. However, the facility licensee should also select JPMs in systems that are important to safety, regardless of when they were reviewed in requalification training. NRC examiners will review the JPMs submitted by the facility licensee to ensure that the most recent training cycle did not cover 20 percent of the selected JPMs, because this examination is intended to sample skills and abilities that operators should always be able to display. In general, examiners should select systems in Groups I and II of the appropriate written examination outline form in ES-4.1, with Group I comprising at least 50 percent of the selected systems.

b. The NRC staff will discuss with the facility licensee representatives the selected JPMs that are not identified in the applicable K/A catalog to ensure that the system or task meets the site-specific importance criteria. The NRC staff will also discuss any modifications to the selection of JPMs with the facility licensee representatives. The NRC may substitute up to 20 percent of the facility licensee-proposed JPMs with NRC-developed JPMs. The NRC will give facility licensee representatives sufficient time to review any substituted JPMs.

c. The NRC chief examiner has the authority to decide the content of each examination set. NRC examiners should review the proposed JPMs using the criteria in ES-3.2 for developing JPMs.

d. The NRC chief examiner will ensure that enough different JPMs are scheduled during the examination week to avoid compromising the examination.

e. The NRC chief examiner will ensure that the time validation of each JPM is reasonable and will verify that each JPM is identified as “time critical” or “not time critical.”

C. Examination Administration

1. Conducting Job Performance Measure Walkthrough Examinations

a. The facility licensee evaluator is responsible for conducting the walkthrough examination while the NRC examiner observes. The NRC examiner and the facility licensee evaluator may ask the operator questions to clarify his or her performance of the JPM after the measure is completed. In most instances, the NRC examiner will ask the facility licensee evaluator to question the operator about the appropriateness of an action or a response that does not follow the actions specified in the JPM.

b. The facility licensee evaluator will brief the operator using ES-1.2. If desired, the evaluator may brief the operators as a group before starting the walkthrough examination.

c. Operators should not be informed of the expected completion time before commencing the JPM. Informing operators of the expected completion time may increase tension as operators approach the time limit. However, the evaluator will inform operators that a JPM is time critical.

d. Time should be allotted during the operating test for evaluating each operator’s performance of five JPMs.

Each walkthrough examination should last approximately 2 hours. This time includes the validated times associated with each planned JPM plus any administrative tasks required to conduct the examination.

Administrative tasks include the following examples:

- transit time to and from the plant site
- time spent complying with facility security and radiological administrative requirements (unless this is part of the JPM being performed)
- transit time within the plant after a JPM is completed to arrive at the location where the initiating cue for the next JPM is to be given

Note: The JPM sample size will be constrained to the requirements of this examination standard for NRC-conducted examinations. The facility licensee may perform an

additional evaluation of its operators outside the timeframe designated for the NRC examination.

However, the final requalification evaluation of the operator by the NRC will not factor in any additional evaluation by the facility licensee. The criteria for determining requalification program status remain the same.

e. JPMs that directly relate to the operator's job functions are preferable, particularly for SROs. For example, if an SRO will not perform an emergency action level classification during the dynamic simulator or written examinations, the examination team may choose to have the operator perform one JPM that involves classifying an emergency.

f. The NRC examiner will ensure that the facility licensee evaluator conducts an appropriate examination. ES-3.5, "Administering Operating Tests," provides examples of good evaluation techniques to use during the walkthrough examination. If the NRC examiner observes improper evaluation techniques that may render the examination invalid, the NRC examiner will stop the walkthrough and counsel the facility licensee evaluator. If the facility licensee evaluator continues to display poor evaluation techniques, the NRC examiner will stop the examination and request that another facility licensee evaluator continue the examination. If necessary, the NRC examiner may conduct the walkthrough with the original facility licensee evaluator observing and co-evaluating.

g. If a facility licensee evaluator believes that followup questioning is required and is not sure how to phrase the question, he or she should consult the NRC examiner. This will avoid inadvertent prompting of the operator and enhance communication between the facility licensee evaluator and the NRC examiner.

h. The examiner will document the operator's performance using the applicable portions of Form 3.2-3 or the facility licensee equivalent for each JPM. The examiner will document any questions asked to clarify the operator's performance and also fill out Form 6.3-1, "Job Performance Measure Summary Matrix," to maintain operators' scores during the examination; document which JPM each operator performed; and fulfill the record retention requirements of ES-6.1.

i. After completing an operator's JPM set, the NRC and facility licensee evaluators shall discuss and resolve any outstanding issues that may result in the operator failing the walkthrough examination or any individual JPM. A discussion of their observations will often correct a difference of opinion. Unresolved differences should be brought to the attention of the NRC chief examiner.

2. Grading the Examination

a. To pass the walkthrough examination, each operator must successfully complete at least four of the five JPMs. To successfully complete a JPM, the operator must complete all critical steps and satisfy the completion criteria specified in the given JPM.

b. The NRC expects an operator to complete each JPM within the validated time period. For a JPM that is not time critical, an operator may exceed the validated time if the facility licensee evaluator and the NRC examiner agree that the operator is making acceptable progress toward completing the JPM.

For time-critical JPMs, the facility licensee representatives should identify a period that they consider to be the absolute maximum time in which they would expect an operator to perform the given task (e.g., locally opening reactor trip breakers on an anticipated transient without scram or locally starting an auxiliary feedwater pump on a loss of all feedwater). An operator who fails to meet the time criteria will receive an unsatisfactory evaluation for the given JPM.

D. Forms

Form 6.3-1 Job Performance Measure Summary Matrix

Form 6.3-1 Job Performance Measure Summary Matrix

Operators' Names >>>															
Job Performance Measure Number/Brief Description															
1.															
2.															
3.															
4.															
5.															
6.															
7.															
8.															
9.															
10.															
11.															
12.															
13.															
14.															
15.															

6.4 REQUALIFICATION DYNAMIC SIMULATOR EXAMINATIONS

NRC examiners use this examination standard (ES) in preparing and administering dynamic simulator requalification operating tests in accordance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) 55.59(a)(2)(iii).

By simulating actual plant operation, the dynamic simulator test provides a comprehensive evaluation of the integrated plant knowledge and skills required of operating crews. It is effective in evaluating a crew's communication skills and team behavior and in identifying any areas in which the licensed operators should be retrained to improve their K/As in accordance with the requalification program developed by the facility licensee.

A. Scope

The dynamic simulator test consists of two scenarios. Each scenario is constructed to last approximately 45 to 60 minutes. The actual time needed to complete the scenarios will depend on the specific events within the scenarios but should allow the crew the time necessary to perform the actions required to respond to each event. To successfully complete this portion of the operating test, the crew must demonstrate the ability to operate effectively as a team while completing a series of critical tasks (CTs) that measure the crew's ability to safely operate the plant during normal, abnormal, and emergency situations.

The NRC examiners evaluate the performance of each crew, using standard competency rating scales. Each competency is rated according to the crew's ability to satisfactorily complete the tasks that have been designated as "critical" within that crew's scenario set. Each CT must meet the methodology specified in Examination Standard (ES)-3.3, "General Testing Guidelines for Dynamic Simulator Scenarios." If the crew fails to correctly perform a CT, that failure would indicate a critical performance deficiency (CPD) in the knowledge, skill, or ability of that crew to demonstrate team behavior and will be evaluated using the behavioral anchors on Form 6.4-2, "Simulator Crew Evaluation Form."

Facility licensee evaluators will assess the performance of the operators during the dynamic simulator test. Because the primary purpose of the dynamic simulator test is to evaluate crews, each individual is not required to perform a specific number of CTs and may not necessarily receive an individual evaluation by an NRC examiner. However, NRC examiners will follow up on individual CPDs and significant performance deficiencies (SPDs) observed during the simulator test in a manner and setting compatible with the deficiency. This followup evaluation will be graded as a component of the individual's operating test. To meet the requirements of 10 CFR 55.59(a)(2), it is the facility licensee's responsibility to conduct its annual operator performance evaluations on the dynamic simulator in accordance with the requirements of its requalification program. The facility licensee may use the NRC-conducted operating test to meet this requirement if the conditions of 10 CFR 55.59(a)(2)(ii) are satisfied (the operating test will require the operator or senior operator to demonstrate an understanding of and the ability to perform the actions necessary to accomplish a comprehensive sample of items specified in 10 CFR 55.45(a)(2) through (13) inclusive, to the extent applicable to the facility).

If an operator demonstrates SPDs or CPDs during the dynamic simulator portion of the operating test, the facility licensee and NRC examination team members should discuss those deficiencies at the end of the dynamic simulator test.

If the operating crew performs satisfactorily and NRC examiners observe no individual CPDs or SPDs, the individual would pass the dynamic simulator test. In the case of operators who demonstrate SPDs or CPDs, the facility licensee evaluators and NRC examiners will decide whether the operator would pass or fail by asking the operator followup questions about his or her performance to determine the extent of the knowledge or ability deficiency demonstrated. The NRC examiners and facility licensee evaluators will agree to the number and scope of followup questions to be asked, which will be based on the individual's demonstrated K/A performance deficiencies. The followup questions and the individual's answers will be documented and used along with the individual's performance as the basis for a pass or fail decision. Section D.2 of this standard describes the method for evaluating and documenting individual performance.

In the rare event that the only way to evaluate the scope and depth of the individual's performance deficiency is by conducting another scenario to gain additional information, the examination team (the NRC and facility licensee) will determine the content, CTs, operator actions, and crew position rotation necessary to complete the evaluation of the individual's performance. Conducting another scenario is time consuming and may adversely affect the examination process. If an individual operator exhibits only minor deficiencies in performance and satisfactorily completes the testing requirements of 10 CFR 55.59(a), then remedial retraining and reevaluation will be conducted in accordance with the facility licensee's requalification program.

B. Examination Development

Developing the NRC's dynamic simulator requalification examination is a combined effort between the facility licensee representatives and the NRC examiners on the examination team. The responsibilities of the examination team members are outlined below.

1. Facility Licensee Team Member's Responsibilities

The facility licensee examination team is responsible for the following activities:

a. The facility licensee develops the dynamic simulator scenarios with identified CTs that meet the methodology specified in ES-3.3 and Form 6.4-1, "Simulator Scenario Review Checklist." The facility licensee will submit each proposed dynamic simulator test to the NRC chief examiner 45 days before the scheduled examination.

b. The NRC expects the facility licensee to provide a qualified simulator operator to assist in developing and administering the simulator examinations. The simulator operator must be available to support the examination team during the examination preparation week, normally 2 weeks before the examination.

   The simulator operator needs to sign an examination security agreement at the time that the NRC chief examiner determines that he or she has access to specialized knowledge of any part of the examination.

c. The scenarios should be based on the training conducted during the requalification cycle, recent industry events, license event reports, emergency and abnormal procedures, and design and procedural changes. The scenarios should demonstrate the crew's ability to use facility procedures to prevent and mitigate accidents. Some scenarios should be based on the dominant accident sequences for the facility or actual

events that have occurred at that or a similar facility. Dominant accident sequences are those that contribute significantly to the frequency of core damage as determined by the facility licensee's probabilistic risk assessment (PRA) or individual plant examination (IPE). The PRA/IPE should also be used to identify risk-important operator actions.[1] In identifying those actions, actions that are relied on or result in specific events being driven to lower risk contribution should not be overlooked. This will help identify those human actions that are assumed to be very reliable and might not otherwise show up in a list of risk-dominant actions.

d. The facility licensee representatives on the examination team will have the opportunity to review any modifications that the NRC makes to the scenarios. The representatives may recommend changes to events that are critical to plant safety, but they must substantiate the reasons for those changes. The examination team has to agree on the validity and content of each scenario before the examination.

e. The NRC encourages each facility licensee to have its management discuss with the agency any problems with examination complexity. Facility licensee managers engaged in the examination review will be required to sign an examination security agreement. Responsibility rests with the facility licensee to resolve any issues before administering the examination. This review is to ensure that the final scenarios are (1) consistent with the facility licensee's requalification requirements for operators licensed at the facility, (2) within the capability of the simulation facility, and (3) within the scope of the facility's procedures.

   This facility licensee's senior manager or representative should communicate any significant concerns about scenario validity to the NRC chief examiner. If adequate resolution is not reached, the concerns should be brought to the attention of the NRC's regional managers and then, if necessary, to managers in the NRR operator licensing program office.

2. NRC Team Member's Responsibilities

The NRC examination team is responsible for the following activities:

a. At least 2 weeks before the preparation week, the NRC chief examiner or a designee will complete a draft of Form 6.4-1 for each scenario that the facility licensee proposes to use during the examination, along with any proposed changes to be validated during the preparation week. During the review of each scenario that the facility licensee selected for the examination, the NRC chief examiner or designee will consider the quantitative and qualitative factors described in ES-3.3, as summarized on Form 6.4-1.

b. If the proposed scenarios require major changes to follow the guidance in Form 6.4-1, the NRC chief examiner will inform the NRC regional managers and determine the appropriate actions. The NRC may revise the scenarios, as appropriate, or develop new scenarios to add to the facility licensee's existing scenarios, if required. The NRC will communicate all scenario changes to the appropriate facility licensee representative

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[1] Chapter 13 of NUREG-1560,"Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance," issued December 1977, identifies important human actions that might be appropriate for evaluation on the dynamic simulator operating test.

early enough to allow for scenario validation before the preparation week. During the preparation week, the examiners may make minor changes to ensure that the scenario objectives are properly accomplished. The NRC staff will review the final scenarios with the facility licensee's examination team representatives before the examination is administered. The NRC has the final authority to determine the content of the scenarios and decide whether a task is critical for evaluating the competency of the crew.

c. A key element of the examination team's resolution of concerns about the scope, depth, and complexity of simulator scenarios involves a senior facility licensee manager observing the proposed examination scenarios (subject to signing an examination security agreement) during examination preparation. If necessary, this manager would raise specific concerns to appropriate NRC regional management for resolution before the examination is administered.

C. Examination Administration

1. Administrative Requirements

a. A facility licensee manager or representative with responsibilities for conducting plant operations (at a minimum, a manager at the first level above shift supervisor) should be present while the simulator examinations are administered. The NRC chief examiner or a designee will also be present during the administration of each dynamic simulator examination. The NRC chief examiner is the principal point of contact between the facility licensee manager and the NRC.

b. The examination team briefs the operating crews before the start of the simulator scenarios, using the information in ES-1.2.

c. Crews should have adequate time to respond to all planned and unplanned events. A scenario's contact time should be approximately 45 to 60 minutes. Contact time means the actual time the operators spend in the scenario; it does not include time spent on briefings, simulator setup, or investigating simulator performance problems.

d. Under no circumstance will any member of the examination team modify the sequence of events and transients during the scenario. If the scenario is not properly administered as a result of a simulator operator error or an unexpected simulator response, the examination team will confer immediately after the scenario set to determine whether the crew has performed enough transients and events to justify an evaluation of the required competencies. If necessary, the examination team can run an additional scenario to ensure that the required competencies are addressed.

e. Crew rotation practices shall be discussed and agreed to during the preparation week, and any problems shall be resolved before the administration of the operating test.

f. The members of the operating crew should maintain the same operating positions as during facility licensee requalification evaluations. The crew members should rotate between positions in the manner identical to the rotation practices for evaluations specified in the facility licensee's requalification program.

g. SROs must be evaluated in at least one scenario in an SRO licensed crew position. More than two simulator scenarios may be required to examine crews that consist of more than four SROs.

2. Postscenario Activities

a. If the NRC examiners and facility licensee evaluators observe actions that are unexpected during the simulator scenario, they should question the crew members as necessary to completely document the crew's performance during the scenario. Questions should be factual and should clarify performance related to observations.

b. If an examiner observes an individual who demonstrates performance deficiencies in performing a CT, the NRC examiner and the facility licensee evaluator will discuss those performance deficiencies at the completion of the scenario. If they determine that the operator's performance deficiencies cannot be assessed because of a lack of information, the examination team has the option to conduct an additional scenario or a JPM to obtain the necessary information.

During the postscenario discussion, the NRC expects the facility licensee evaluator to describe the operator's deficiencies to the NRC examiner and suggest a series of followup questions designed to identify the cause of the deficiency. The NRC examiner will assess the facility licensee evaluator's ability to diagnose the operator's deficiency and document it in the examination report, if applicable. The NRC examiner has the option to augment the followup questions proposed by the facility licensee evaluator, if necessary.

The examination team should minimize the time needed to conduct this review of crew and individual performance to minimize the impact on the operators. However, the examination team's responsibility is to ensure that the review is thorough and complete.

The facility licensee evaluator will conduct an individual evaluation of the operator in accordance with Section D.2 of this examination standard. The NRC examiner has the option to ask additional followup questions.

c. Upon completing any followup questioning, the NRC examiners and facility licensee evaluators will dismiss the crew to await the next scenario and inform the crew members that they may discuss the completed scenario among themselves.

d. The NRC examiners and facility licensee evaluators will meet separately to compare observations and determine whether the crew omitted or incorrectly performed any CTs (CPDs) or had any SPDs.

e. The facility licensee evaluators will discuss the crew's performance with the NRC examiners after each scenario to clarify any performance deficiencies noted. The examination team will determine whether the as-run scenario has invalidated any predesignated CTs or whether any new CTs should be designated to evaluate unpredicted events or actions taken by the crew during the scenario. The examination team will then revalidate the CTs in each scenario, using the methodology presented in ES-3.3.

f. After the crew completes the last scenario, the NRC examiners and facility licensee evaluators will independently complete Form 6.4-2 as discussed in Section D. The facility licensee evaluators will also evaluate individual operator performance in accordance with their requalification program requirements and Section D.2. In addition, the NRC examiners will review the facility licensee's evaluations of individual operator performance after completing each crew evaluation.

D. Performance Evaluations

Two separate evaluations will be conducted based on the information obtained during the dynamic simulator examination. The first is a crew simulator evaluation. For the second, the examination team uses individual simulator performance to determine whether followup questioning of the operator is necessary. After observing the operator's performance in the dynamic simulator and evaluating the responses to followup questions, the examination team may conclude that additional performance information about the operator must be obtained to make an individual evaluation. In this case, an additional scenario or JPM would be conducted. The individual followup would then be documented along with the individual's crew evaluation on Form 6.1-6.

Each operator will be subject to failure based on a competency evaluation of his or her performance on the dynamic simulator and the required followup evaluation if he or she exhibited deficient performance in executing a crew CT.

1. Crew Simulator Evaluations

After administering the dynamic simulator scenario set discussed in Section C, the NRC examiners and facility licensee evaluators will independently evaluate the crew's performance by completing Form 6.4-2. The facility licensee is expected to provide its final crew evaluations to the NRC examiners before the crew members return to licensed duties or the end of the examination week, whichever is sooner. Specific guidance for completing Form 6.4-2 appears on the first page of the form.

Each individual's examination results and the facility requalification program evaluation will factor in the results of the crew evaluations. Members of a crew that receives an unsatisfactory crew evaluation are expected to receive remedial training from the facility licensee and to be reevaluated in accordance with the facility licensee's NRC-approved requalification program before returning to licensed duties. Although operators are not required to take an NRC-conducted requalification examination for purposes of license renewal, those who fail to pass (individually or as a member of a crew) an examination conducted by the NRC must be reevaluated by the agency before their license will be renewed. The level of NRC involvement during the reevaluation will be determined on a case-by-case basis (see Section E.1 of ES-6.1).

NRC examiners will document the results of each operator's crew performance in the "Simulator Examination Results" section of Form 6.1-6.

2. Individual Operating Evaluations

The facility licensee is primarily responsible for individual operating evaluations on the dynamic simulator examination and the resulting remedial training. Unsatisfactory operator performance of a crew CT will be followed up after the simulator scenario and documented on Form 6.1-6.

The NRC expects facility licensee evaluators to document and grade individual operator performance during the dynamic simulator examination in accordance with the requirements of the facility licensee's requalification program. The NRC also expects the facility licensee's grading methodology to identify operator deficiencies, and for the facility licensee evaluators to discuss those deficiencies with the NRC examiners during the meetings after the scenarios as described in Section C. The facility licensee evaluators should document the deficiencies and remediate and retest the operators for the identified deficiencies in accordance with the facility licensee's requalification training program. At a minimum, the NRC expects the facility licensee evaluators to identify any operator on the crew who was directly responsible for the omission or incorrect performance of validated CTs.

Individual followup is conducted if an operator has SPDs or CPDs. As described in Section C.2.b of this examination standard, the NRC examiner will assist in developing and administering followup questions specific to the performance deficiencies that the operator displayed. The examination team will determine the number and scope of the followup questions that will be asked based on a review of the operator's performance deficiencies at the completion of the scenario. The examination team has the option to gather additional information about an operator who displays SPDs or CPDs by either running an additional scenario or using JPMs if the dynamic simulator examination and followup questioning are inconclusive.

Upon completion of the individual followup questions, the NRC examiner will complete an individual competency evaluation using the appropriate sections of Form 6.4-2 or the facility licensee's equivalent form. Only those competencies that deal with the operator's individual performance deficiencies should be filled out. If the NRC examiner gives the operator a rating factor score of "1" in either of the following cases, the individual fails this portion of the examination:

- any two rating factors in any one competency
- any one rating factor in any one competency if, in the judgment of the examination team, the operator's performance deficiency jeopardizes the safety of the plant or has a significant safety impact on the public

NRC management will make the final decision concerning all operator failures resulting from a single rating factor evaluation of "1."

When conducting the evaluation described here, NRC examiners will not assign rating factor scores of "1" based solely on performance in the dynamic simulator. The examiners will ask followup questions and record the operator's responses to evaluate and document CPDs and SPDs.

The NRC examiner will then apply the individual's responses to the questions asked to evaluate and justify individual performance deficiencies that warrant a rating factor score of "1." The examiner will document and include the followup questions asked and the responses given by the operator. The results of the operator's simulator examination will include written comments describing the operator's performance and the as-run simulator scenario set.

The NRC examiner will document the pass or fail determination for each operator's individual followup under "Individual Followup" in the "Simulator Examination Results" section of Form 6.1-6.

If an operator demonstrates no performance deficiencies and, therefore, does not require any additional followup questioning, regardless of whether the crew passes or fails the dynamic simulator examination, the NRC examiner will record an “N/A” for “Individual Followup” in the “Simulator Examination Results” section of Form 6.1-6.

E. Forms

Form 6.4-1 Simulator Scenario Review Checklist
Form 6.4-2 Simulator Crew Evaluation Form

Form 6.4-1 Simulator Scenario Review Checklist

Note: Attach a separate copy of this form to each scenario reviewed. The examination team uses this form as guidance in reviewing the proposed scenarios.

SCENARIO IDENTIFIER: **REVIEWER:**

Qualitative Attributes

__ 1. The scenario summary clearly states the objectives of the scenario.

__ 2. The initial conditions are realistic in that some equipment or instrumentation, or both, may be out of service, but the conditions do not cue the crew to expected events.

__ 3. The scenario consists mostly of related events.

__ 4. Each event description consists of the following:

- the point in the scenario when it is to be initiated
- the malfunction(s) that is entered to initiate the event
- the symptoms and cues that will be visible to the crew
- the expected operator actions (by shift position)
- the event termination point

__ 5. No more than one nonmechanistic failure (e.g., pipe break) is incorporated into the scenario without a credible preceding incident, such as a seismic event.

__ 6. The events are valid with regard to physics and thermodynamics.

__ 7. Sequencing and timing of events are reasonable and allow the examination team to obtain complete evaluation results commensurate with the scenario objectives.

__ 8. The scenario summary clearly indicates whether time compression techniques are used. Operators have sufficient time to carry out expected activities without undue time constraints. Cues are given.

__ 9. The simulator modeling is not altered.

__ 10. All crew competencies can be evaluated.

__ 11. The scenario has been validated.

Form 6.4-1 Simulator Scenario Review Checklist (Continued)

Note: The "Quantitative Attributes" criteria address scenario traits that are numerical in nature. A second set of numbers indicates a range to be met for a set of two scenarios. Therefore, to complete this part of the review, the set of scenarios must be available. This page should be completed once per scenario set.

Scenario Set Consists of Scenario: and Scenario:

<u>Quantitative Attributes</u>

__ 12. If the sampling plan indicates that the scenario was used for training during the requalification cycle, the need to modify or replace the scenario has been evaluated.

__ 13. Total malfunctions inserted: 5 to 8 / 10 to 14

__ 14. Malfunctions that occur after emergency operating procedure (EOP) entry: 1 to 4 / 3 to 6

__ 15. Abnormal events: 2 to 3 / 4 to 5

__ 16. Major transients: 1 to 2 / 2 to 3

__ 17. EOPs used beyond the primary scram response EOP: 1 to 3 / 3 to 5

__ 18. EOP contingency procedures used: 0 to 3 / 1 to 3

__ 19. Approximate scenario run time: 45 to 60 minutes (One scenario may approach 90 minutes.)

__ 20. EOP run time: 40 to 70 percent of scenario run time

__ 21. Crew critical tasks: 2 to 5 / 4 to 8

__ 22. Technical specifications are exercised during the test.

COMMENTS:

Form 6.4-2 Simulator Crew Evaluation Form

The examination team should use this evaluation form during the dynamic simulator component of the requalification examination. The rating scales on this form are for evaluating the crew as a whole, rather than the individual operators. Use the following instructions when rating team performance on the simulator examination:

1. Review the rating scales before the simulator examination so that you are familiar with each competency to be evaluated.

2. Use Form 3.3-2, "Required Operator Actions," or an equivalent facility licensee form to make notes during the examination, as described in ES-3.5, "Administering Operating Tests."

3. Complete this form immediately after the simulator examination. Evaluate the crew's performance on each applicable rating factor by comparing the actions of the crew against the associated behavioral anchors and selecting the appropriate grade. The tasks planned and performed during the crew's scenario set may not permit you to evaluate every rating factor for every crew. Annotate those rating factors that are not used in the evaluation.

   The examination team should pay particular attention to the completion of tasks that they identified as critical to plant safety. The crew may compensate for actions that individual operators performed incorrectly as long as the critical task was completed satisfactorily. The rating factor evaluations should also account for other less significant deficiencies to provide information for crew remedial training during subsequent requalification training.

4. Justify all rating factor grades of "1" and document each justification in the space for "Comments" on the form. Rating factor grades of "1" must be linked to the performance of at least one critical task.

5. Complete the simulator examination summary sheet, recording for each scenario the scenario name (or identifier) and the critical tasks performed by the crew. Annotate whether the critical task was performed satisfactorily or unsatisfactorily. Complete the crew's overall evaluation using the criteria listed in the next paragraph. Space is provided for additional comments about the crew's performance.

6. The threshold for failing the simulator portion of the examination is to receive a (behavioral anchor) score of "1" in either of the following:

   a. any two rating factors in any one competency

   b. any one rating factor in any one competency if, in the judgment of the examination team, the crew's performance deficiency jeopardizes the safety of the plant or has a significant safety impact on the public (U.S. Nuclear Regulatory Commission management will make the final decision concerning all crew failures resulting from a single rating factor evaluation of "1")

Form 6.4-2 Simulator Crew Evaluation Form (page 2)

Simulator Examination Summary Sheet

Facility: _____ Examination Date: _____

Overall Dynamic Simulator Crew Evaluation: **SAT or UNSAT**

Crew Members	Docket No.	Scenario #1 Position	Scenario #2 Position
1. _____	55-_____	_____	_____
2. _____	55-_____	_____	_____
3. _____	55-_____	_____	_____
4_____	55-_____	_____	_____
5. _____	55-_____	_____	_____
6. _____	55-_____	_____	_____

Scenario #1: [Enter scenario descriptor]

Crew Critical Tasks	**SAT**	**UNSAT**
1. [Enter critical task descriptor]		
2.		
3.		
4.		
5.		

Scenario #2:

Crew Critical Tasks	**SAT**	**UNSAT**
1.		
2.		
3.		
4.		
5.		

Comments:

Form 6.4-2 Simulator Crew Evaluation Form (page 3)

Diagnosis of Events and Conditions Based on Signals or Readings

Did the crew—

(a) Recognize off-normal trends and status?

3	2	1
Recognized status and trends quickly and accurately.	Recognized status and trends at the time of, but not before, exceeding established limits.	Did not recognize adverse status and trends, even after alarms and annunciators sounded.

(b) Use information and reference material (e.g., prints, books, charts, emergency plan implementation procedures) to aid in diagnosing and classifying events and conditions?

3	2	1
Made accurate diagnosis by using information and reference material correctly and in a timely manner.	Committed minor errors in using or interpreting information and reference material.	Failed to use, misused, or misinterpreted information or reference material that resulted in improper diagnosis.

(c) Correctly diagnose plant conditions based on control room indications?

3	2	1
Performed timely and accurate diagnosis.	Committed minor errors or had minor difficulties in making diagnosis.	Made incorrect diagnosis, which resulted in incorrect manipulation of any safety control.

Grade for diagnosis of events and conditions based on signals and readings: SAT or UNSAT

Comments:

Form 6.4-2 Simulator Crew Evaluation Form (page 4)

Understanding of Plant and System Responses

Did the crew—

(a) Locate and interpret control room indications correctly and efficiently to ascertain and verify the status and operation of plant systems?

3	2	1
Each crew member located and interpreted instruments or displays accurately and efficiently.	Some crew members committed minor errors in locating or interpreting instruments or displays. Some crew members required assistance.	The crew members made serious omissions, delays, or errors in interpreting safety-related parameters.

(b) Demonstrate an understanding of the manner in which the plant, systems, and components operate, including setpoints, interlocks, and automatic actions?

3	2	1
Crew members demonstrated thorough understanding of how systems and components operate.	The crew committed minor errors because of incomplete knowledge of the operation of the system or component. Some crew members required assistance.	Inadequate knowledge of safety system or component operation resulted in serious mistakes or plant degradation.

(c) Demonstrate an understanding of how the crew's actions (or inaction) affected systems and plant conditions?

3	2	1
All members understood the effect that actions or directives had on the plant and systems.	Actions or directives indicated minor inaccuracies in individuals' understanding, but the crew corrected the actions.	The crew appeared to act without knowledge of, or with disregard for, the effects on plant safety.

Grade on understanding of the response of plant and systems: SAT or UNSAT

Comments:

Form 6.4-2 Simulator Crew Evaluation Form (page 5)

Adherence to and Use of Procedures

Did the crew—

(a) Refer to and/or verify the appropriate procedures in a timely manner?

3	2	1
The crew used procedures as required and knew what conditions were covered by procedures and where to find them.	The crew committed minor failures to refer to and/or verify procedures without prompting, which affected the plant's status.	The crew failed to correctly refer to and/or verify procedure(s) when required, resulting in faulty safety system operation.

(b) Correctly implement procedures, including following procedural steps in correct sequence, abiding by cautions and limitations, selecting correct paths on decision blocks, and transitioning between procedures when required?

3	2	1
The crew followed the procedural steps accurately and in a timely manner, demonstrating a thorough understanding of the procedural purposes and bases.	The crew misapplied procedures in minor instances but made corrections in sufficient time to avoid adverse effects.	The crew failed to follow procedures correctly, which impeded recovery from events or caused unnecessary degradation in the safety of the plant.

(c) Recognize abnormal operating procedure (AOP) and emergency operating procedure (EOP) entry conditions and perform appropriate actions without the aid of references or other forms of assistance?

3	2	1
The crew recognized plant conditions and implemented AOPs and EOPs consistently, accurately, and in a timely manner.	The crew had minor lapses or errors. Individual crew members needed assistance from others to implement procedures.	The crew failed to accurately recognize a degraded plant condition(s) or execute an efficient mitigating action(s), even with the use of aids.

Grade on adherence to and use of procedures: SAT or UNSAT

Comments:

Form 6.4-2 Simulator Crew Evaluation Form (page 6)

Operate Plant Component Controls

Did the crew—

(a) Locate controls efficiently and accurately?

3	2	1
Individual operators located controls and indications without hesitation.	One or more operators hesitated or had difficulty in locating controls.	The crew failed to locate a control(s), which jeopardized a system(s) important to safety.

(b) Manipulate controls in an accurate and timely manner?

3	2	1
The crew manipulated plant controls smoothly and maintained parameters within specified bounds.	The crew demonstrated minor shortcomings in manipulating controls, but recovered from errors without causing problems.	The crew made mistakes manipulating a control(s) that caused safety system transients and related problems.

(c) Take manual control of automatic functions, when appropriate?

3	2	1
All operators took control and smoothly operated automatic systems manually without assistance, thereby averting adverse events.	Some operators delayed or required prompting before overriding or operating automatic functions but avoided plant transients where possible.	The crew failed to manually control automatic systems important to safety, even when ample time and indications existed.

Grade on operation of plant component controls: SAT or UNSAT

Comments:

Form 6.4-2 Simulator Crew Evaluation Form (page 7)

Crew Operations

Did the crew members—

(a) Maintain a command role?

3	2	1
The crew took early remedial action when necessary.	In minor instances, the crew failed to take action within a reasonable period of time.	The crew failed to take timely action, which resulted in the deterioration of plant conditions.

(b) Provide timely, well planned directions to each other that facilitated their performance and demonstrated appropriate concern for the safety of the plant, staff, and public?

3	2	1
The supervisor's directives allowed for safe and integrated performance by all crew members.	In minor instances, the supervisors gave orders that were incorrect, trivial, or difficult to implement.	The supervisor's directive(s) inhibited safe crew performance. Crew members had to explain why an order(s) could not or should not be followed.

(c) Maintain control during the scenario with an appropriate amount of direction and guidance from the crew's supervisors?

3	2	1
Crew members stayed involved without creating a distraction, the crew members anticipated each other's needs, and the supervisors provided guidance when necessary.	Crew members had to solicit assistance from supervisors or each other, interfering with their ability to carry out critical action(s).	Crew members had to repeatedly request guidance. The crew failed to verify successful accomplishment of orders.

Crew Operations Continued on Next Page

Crew Operations (Continued)

Did the crew members—

(d) Use a team approach to problem-solving and decisionmaking by soliciting and incorporating relevant information from all crew members?

3	2	1
Crew members were involved in the problem-solving and decisionmaking processes for effective team decisionmaking.	At times, crew members failed to get involved in the decisionmaking process when they should have, detracting from the team-oriented approach.	The crew was not involved in making a decision(s). The crew was divided over the scenario's progress, and this behavior was counterproductive.

Grade on crew operations: SAT or UNSAT

Comments:

Form 6.4-2 Simulator Crew Evaluation Form (page 9)

Communications

Did the crew—

(a) Exchange complete and relevant information in a clear, accurate, and attentive manner?

3	2	1
Crew members provided relevant and accurate information to each other.	Crew communications were generally complete and accurate, but the crew sometimes needed prompting or failed to acknowledge the completion of evolutions or to respond to information from others.	Crew members did not inform each other of an abnormal indication(s) or action(s). Crew members were inattentive when important information was requested.

(b) Keep key personnel outside the control room informed of plant status?

3	2	1
Crew members provided key personnel outside the control room with accurate, relevant information throughout the scenarios.	In minor instances, the crew needed to be prompted for information and/or provided some incomplete or inaccurate information.	The crew failed to provide needed information.

(c) Ensure receipt of clear, easily understood communications from the crew and others?

3	2	1
The crew requested information or clarification when necessary and understood communications from others.	In minor instances, the crew failed to request or acknowledge information from others.	The crew failed to request needed information or was inattentive when information was provided; serious misunderstandings occurred among crew members.

Grade on communications: SAT or UNSAT

Comments:

7.1 ADMINISTRATION OF INITIAL EXAMINATIONS FOR SENIOR OPERATORS LIMITED TO FUEL HANDLING

This standard provides specific instructions for use in preparing, administering, grading, and documenting initial examinations for senior operators limited to fuel handling (i.e., limited senior reactor operators (SROs) or LSROs).

A. Background

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 55.41, "Written examination: Operators," and 10 CFR 55.43, "Written examination: Senior operators," the U.S. Nuclear Regulatory Commission's (NRC's) written LSRO examinations must contain a representative selection of questions concerning the specific knowledge and abilities (K/As) and skills needed to perform licensed fuel handling duties. Similarly, to the extent applicable, the operating tests must require the applicant to demonstrate an understanding of and the ability to perform the actions necessary to accomplish a representative sample of the items in 10 CFR 55.45, "Operating tests." The regulations also stipulate that the content of the examinations and tests will be identified, in part, from learning objectives derived from a systematic analysis of the operators' duties performed by the facility licensee. Therefore, the facility licensee's job task analysis (JTA) for fuel handlers would provide an excellent source of information for developing the written examination and operating test.

Except as noted herein, the applicable instructions and guidance in the following examination standards for administering unrestricted initial licensing examinations at power reactors also applies to the LSRO examination:

- Examination Standard (ES)-2.1, "Preparing for Operator Licensing Initial Examinations"
- ES-2.2, "Applications, Medical Requirements, and Waiver and Excusal of Examination and Test Requirements"
- ES-2.3, "Reviewing and Approving Operator Licensing Initial Examinations"
- ES-3.1, "Overview of the Operating Test for Operator Licensing Initial Examinations"
- ES-3.2, "Developing Job Performance Measures"
- ES-3.5, "Administering Operating Tests"
- ES-3.6, "Grading and Documenting Operating Tests"
- ES-4.1, "Developing Written Examination Outlines"
- ES-4.2, "Developing Written Examinations"
- ES-4.3, "Administering Written Examinations"
- ES-4.4, "Grading and Documenting Written Examinations"
- ES-5.1, "Issuing Operator Licenses and Postexamination Activities"
- ES-5.2, "Application Denials and Requests for Informal NRC Staff Review"

B. Responsibilities

1. Facility Licensee

The facility licensee is responsible for the same activities specified in the examination standards for unrestricted licenses, with the following exceptions and modifications:

a. As an exception to ES-2.2, the facility licensee may request LSRO licenses that are valid for more than one site. To do so, the facility licensee shall document the differences in the design, procedures, technical data, and administrative controls of the separate facilities for which the license is being sought.

b. The scope, content, administration, and grading of the written examination and operating test shall be as described in Sections C and D below.

c. In accordance with 10 CFR 55.46(b), the facility licensee shall request the Commission's approval to use the plant or a simulation facility, other than a plant-referenced simulator, in administering the operating test under 10 CFR 55.45(b)(1) or (3).

2. NRC Regional Office

The NRC regional office is responsible for the same activities specified in the unrestricted examination standards, with the following exceptions and modifications:

a. The NRC regional office should generally conduct the LSRO examinations during a time when the fuel handling equipment will be available for the operating tests.

b. With the concurrence of the Office of Nuclear Reactor Regulation (NRR) operator licensing program office, the NRC regional office may issue LSRO licenses that are valid for units at more than one site if the units are manufactured by the same vendor and are of similar design. The applicant must pass an examination that addresses the differences in the design, procedures, technical data, and administrative controls of the separate facilities for which the license is being sought.

c. The scope, content, administration, and grading of the written examination and operating test shall be as described in Sections C and D below.

d. The NRC regional office shall coordinate with the NRR operator licensing program office to approve to use the plant or a simulation facility, other than a plant-referenced simulator, in administering the operating test under 10 CFR 55.45(b)(1) or (3).

C. Written Examination Instructions

1. Preparation

The NRC's written LSRO examination should meet all the guidelines and requirements for question construction, quality, and facility reviews specified in ES-4.2, except as noted below:

a. Develop the examination outline as described in Section B of ES-4.1, with the following exceptions and clarifications:

- Use the applicable LSRO outline form (i.e., Form 7.1-BWR, "Written Examination Outline for Senior Operators Limited to Fuel Handling for Boiling-Water

Reactors"; Form 7.1-PWR, "Written Examination Outline for Senior Operators Limited to Fuel Handling for Pressurized-Water Reactors"; Form 7.1-ABWR, "Written Examination Outline for Senior Operators Limited to Fuel Handling for Advanced Boiling-Water Reactors"; or Form 7.1-AP, "Written Examination Outline for Senior Operators Limited to Fuel Handling for the AP1000") and Form 7.1-GEN, "Generic Knowledge and Abilities Outline (Tier 3) for Senior Operators Limited to Fuel Handling," to develop the examination outline. As with the unrestricted examinations, eliminate topics that are not applicable to LSROs at the subject facility in accordance with Section B.3 of ES-4.2. Given the large number of K/A statements that will not apply to LSROs, it may be advantageous to prescreen the K/As, as discussed in ES-4.1. When reviewing K/As for elimination, do not focus only on the fuel handling equipment; rather, focus more broadly on the K/As that an LSRO would need to support safe operation during fuel handling. If the facility licensee's JTA identified other LSRO-relevant components, systems, and evolutions that are not included on the applicable LSRO outline form, add those items to the appropriate tier of the outline before beginning the random selection process. Additional instructions are noted on the forms.

- The applicable LSRO outline forms do not have a separate category for sampling SRO-only questions.

- Use Form 7.1-3, "Examination Outline Quality Checklist for Senior Operators Limited to Fuel Handling," instead of Form 2.3-1, "Examination Outline Quality Checklist," when reviewing the examination outline.

b. Select and develop questions as described in ES-4.2, with the following exceptions:

- Construct the LSRO written examination so that a competent applicant can complete the examination in 2.5 hours. (The applicants will be allowed 4 hours to complete and review the examination.)

- Write between 50 and 60 percent of the LSRO examination questions (20 to 24 questions) at the comprehension/analysis level.

- Reactor theory, component, and thermodynamic questions that directly relate to the LSRO JTA may be selected from prior generic fundamentals examinations.

- ES 4.2, Section E, is not applicable to the LSRO examination.

- Limit the use of bank questions to no more than 30 and include at least 4 new questions on every examination; the remaining 6 examination questions may be new or significantly modified from the facility licensee's or *any* other bank. All questions developed must be relevant to the LSRO function. To be considered a significantly modified question, at least one pertinent condition in the stem and at least one distractor must be changed from the original bank question. Changing the conditions in the stem such that one of the three distractors in the original question becomes the correct answer would also be considered a significant modification.

- If the examination will be used to license the applicants at more than one facility, ensure that it adequately covers all of the applicable units. An examination developed for the purpose of cross-qualifying a licensed LSRO at another similar facility may focus exclusively on the differences between the facilities.

c. Review and assemble the examination as described in Form 7.1-4, "Written Examination Quality Checklist for Senior Operators Limited to Fuel Handling," and Form 7.1-6, "Written Examination Cover Sheet for Senior Operators Limited to Fuel Handling," instead of the equivalent forms in ES-2.3 and ES-4.2.

2. Administration and Grading

The NRC's written LSRO examination shall be administered and graded in accordance with applicable instructions in ES-4.3 and ES-4.4. The examination may be administered concurrently and in the same room with full-scope, initial license examinations. However, in such instances, the proctor should minimize any disturbance to those applicants taking the longer examination.

D. Operating Test Instructions

The LSRO operating test shall generally be prepared, administered, and documented in accordance with the applicable instructions in ES-3.1, ES-3.2, ES-3.5, and ES-3.6, except as noted below and in the specific criteria at the bottom of Form 7.1-2, "Operating Test Outline for Senior Operators Limited to Fuel Handling."

The operating test shall be performance based to the maximum extent possible; however, given the nature of an LSRO's duties, it is neither practical nor appropriate to administer the test on the plant-referenced simulator. Therefore, pursuant to 10 CFR 55.45(b), the test shall be administered in a plant walkthrough and in either the plant or a simulation facility, as approved by the Commission under 10 CFR 55.46(b). The facility licensee is encouraged to permit the actual use of equipment to handle dummy fuel elements, assemblies, or modules during the operating test whenever feasible. This may require careful coordination with the facility licensee to establish a schedule and to ensure that a licensed SRO is available, if needed. When actual equipment is not available or accessible (e.g., because of high radiation), the test should be administered using walkthrough methods near the actual equipment or by using mockup equipment. If the facility licensee has a refueling machine simulator, it should be used to the extent possible during the administration of the operating test.

The operating test shall assess the applicant's ability to execute normal, abnormal, and emergency procedures associated with fuel handling. Each applicant will be required to simulate or perform tasks related to fuel handling and, if necessary based on his or her performance, to answer questions associated with the refueling equipment and associated systems. The applicant shall not be held accountable for duties that are performed exclusively by the control room staff or shift supervisor.

1. Preparation

The operating test shall consist entirely of job performance measures (JPMs) covering those administrative topics, systems, and emergency/abnormal plant evolutions (E/APEs) related to refueling. No distinction between control room and facility systems/evolutions is required because most (if not all) of the test will be conducted outside the control room. The dynamic simulator operating test requirements, instructions, and guidelines in ES-3.1, ES-3.3, "Testing

Guidelines for Dynamic Simulator Scenarios," and ES-3.4, "Developing Scenarios," do not apply to the LSRO license examination.

Part of the operating test may be conducted in the control room so that those controls, instruments, and other materials or equipment related to fuel handling (e.g., procedures and diagrams) are available for reference. Although LSROs will not operate any systems from the control room, they must be aware of the effects (e.g., alarms) that fuel handling operations will have in the control room. They must also be familiar with the methods and requirements for communicating with the control room staff and shift supervisor. At least two of the JPMs must require the applicant to use the facility's technical specifications.

The following additional guidelines clarify the expectations for each part of the LSRO operating test:

a. Develop the administrative portion of the operating test in accordance with the instructions for administrative topic JPMs in ES-3.2; however, given the reduced scope of the LSRO's responsibilities, the required number of tasks is reduced from five to three, distributed among the four administrative topics. Note that some "Conduct of Operations" subjects (e.g., reactor plant startup requirements) may not apply; however, most can be adapted for use during the LSRO operating test. The "Equipment Control" subjects all lend themselves to evaluating the required refueling maintenance and surveillance actions that the LSRO should be able to supervise or perform. All of the "Radiation Control" subjects apply to refueling operations and should be evaluated on a sampling basis. The "Emergency Plan" topic shall be evaluated to the extent that the applicant is required to respond to a declared event and the knowledge required of a radiation worker.

b. Develop the systems portion of the operating test as follows:

- Develop two JPMs that require the applicant to manipulate the facility's fuel handling equipment.

- Develop two JPMs related to systems other than fuel handling equipment (i.e., systems other than System No. 234000 (boiling-water reactor (BWR)) or System No. 034 (pressurized-water reactor (PWR))) listed in Tier 2 of the appropriate LSRO written examination outline (i.e., Form 7.1-BWR/PWR/ABWR/AP).

- Include two JPMs that require the applicant to execute alternative paths within the facility's operating procedures.

- Follow the instructions in ES-3.2, Sections D and E, for developing JPMs. (Note that the specific instructions for selecting safety functions and systems on Form 3.2-2, "Control Room/In-Plant Systems Outline," in ES-3.2 do not apply.)

c. Develop the E/APE portion of the operating test as follows:

- Develop three JPMs based on the evolutions listed in Tier 1 of the appropriate LSRO written examination outline (i.e., Form 7.1-BWR/PWR/ABWR/AP as modified in Section C.1.a above); one of the JPMs must involve a refueling accident.

- Include one JPM that requires the applicant to execute alternative paths within the facility's operating procedures.

d. The operating test should normally take between 4 and 6 hours, depending on whether the LSRO actually operates refueling equipment.

e. Use Form 7.1-2 to document the selection of administrative, system, and E/APE JPMs to be performed; insert the applicable type codes and adhere to the specific criteria noted at the bottom of the form. Review the outline using Form 7.1-3, "Examination Outline Quality Checklist for Senior Operators Limited to Fuel Handling."

f. Review the final operating test using Form 7.1-5, "Operating Test Quality Checklist for Senior Operators Limited to Fuel Handling."

2. Administration

The operating test should be administered in accordance with the applicable sections in ES-3.5.

3. Grading

The applicant's performance on the operating test should be graded and documented in accordance with ES-3.6, "Grading and Documenting Operating Tests for Operator Licensing Initial Examinations," as applicable, with the following clarifications:

a. Use Form 7.1-3 to document a grade for each JPM. On Form 5.1-2, "Individual Examination Report," write "N/A" for "Simulator Operating Test" under "Operating Test Summary."

b. The applicant must achieve a satisfactory grade on at least 80 percent of the JPMs (8 out of 10) overall and at least 60 percent (2 out of 3) of the administrative topic JPMs.

E. Forms

Form 7.1-BWR	Written Examination Outline for Senior Operators Limited to Fuel Handling for Boiling-Water Reactors
Form 7.1-PWR	Written Examination Outline for Senior Operators Limited to Fuel Handling for Pressurized-Water Reactors
Form 7.1-ABWR	Written Examination Outline for Senior Operators Limited to Fuel Handling for Advanced Boiling-Water Reactors
Form 7.1-AP	Written Examination Outline for Senior Operators Limited to Fuel Handling for the AP1000
Form 7.1-GEN	Generic Knowledge and Abilities Outline (Tier 3) for Senior Operators Limited to Fuel Handling
Form 7.1-2	Operating Test Outline for Senior Operators Limited to Fuel Handling
Form 7.1-3	Examination Outline Quality Checklist for Senior Operators Limited to Fuel Handling
Form 7.1-4	Written Examination Quality Checklist for Senior Operators Limited to Fuel Handling
Form 7.1-5	Operating Test Quality Checklist for Senior Operators Limited to Fuel Handling
Form 7.1-6	Written Examination Cover Sheet for Senior Operators Limited to Fuel Handling

Form 7.1-BWR Written Examination Outline for Senior Operators Limited to Fuel Handling for Boiling-Water Reactors

Facility:												Date of Exam:
Tier	K/A Category Points											
	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total
1. Emergency and Abnormal Plant Evolutions												10
2. Plant Systems												20
3. Generic Knowledge and Abilities Categories	1		2		3		4		Fundamentals			10

Notes:

1. Ensure that at least one topic from every knowledge and ability (K/A) category is sampled within each tier.
2. The point total for each tier in the proposed outline must match that specified in the table. The final point total for each tier may deviate by ±1 from that specified in the table. The final exam must total 40 points.
3. Select topics from many systems and evolutions; avoid selecting more than two K/A topics from a given system (except fuel handling equipment) or evolution (except refueling accident).
4. The shaded areas are not applicable to the category/tier.
5. The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the applicable K/A catalog, but the topics must be relevant to the applicable evolution/system.
6. Systems/evolutions within each tier are identified on the associated outline. Enter the K/A numbers, a brief description of each topic, importance ratings (IRs) for the senior reactor operator license level, and the point totals (#) for each system and category. Enter the tier totals for each category in the table above.
7. For Tier 3, select topics from Sections 2, 5, and 6 of the applicable K/A catalog. A minimum of four Tier 3 questions shall include basic reactor theory, component, and thermodynamic topics from Sections 5 and 6 of the applicable K/A catalog that apply to fuel handling operations (place these items in the "Fundamental" category). Enter the K/A numbers, descriptions, IRs, and point totals (#) on Form 7.1-GEN.
8. Inapplicable or inappropriate K/A statements can be eliminated by (1) discarding randomly selected K/As during the outline development process or (2) prescreening the entire K/A catalog to eliminate inappropriate K/As before beginning the random selection process. Use the facility licensee's job task analysis for fuel handlers as the basis for eliminating or adding testable topics.
9. * These systems/evolutions must be included as part of the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan. They are not required to be included when using earlier revisions of the K/A catalog.

   ** These systems/evolutions may be eliminated from the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan.

Written Examination Outline for Senior Operators Limited to Fuel Handling for Boiling-Water Reactors
Emergency and Abnormal Plant Evolutions—Tier 1

E/APE #/Name/Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295003 Partial or Complete Loss of AC									
295004 Partial or Total Loss of DC									
295014 Inadvertent Reactivity Addition									
295018 Partial or Total Loss of CCW									
295021 Loss of Shutdown Cooling									
295023 Refueling Accidents									
295033 High Secondary Containment Area Radiation Levels									
295034 Secondary Containment Ventilation High Radiation									
295006 Scram									
295008 High Reactor Water Level									
295009/295031 Reactor Low Water Level									
295017/295038 High Offsite Release Rate									
295019 Partial or Total Loss of Instrument Air									
295020 Inadvertent Containment Isolation									
295030 Low Suppression Pool Water Level									
295035 Secondary Containment High Differential Pressure									
600000 Plant Fire On Site									
K/A Category Totals:							Tier Point Total:		10

Written Examination Outline for Senior Operators Limited to Fuel Handling for Boiling Water Reactors
Plant Systems—Tier 2

System #/Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
205000 Shutdown Cooling														
215004 Source Range Monitor														
233000 Fuel Pool Cooling/Cleanup														
234000 Fuel Handling Equipment														
262001 AC Electrical Distribution														
263000 DC Electrical Distribution														
290002 Reactor Vessel Internals														
201002 RMCS														
201003 Control Rod and Drive Mechanism														
203000 RHR/LPCI: Injection Mode														
204000 RWCU														
211000 SLC														
212000 RPS														
214000 RPIS														
215001 Traversing In-Core Probe														
215003 IRM														
215005 APRM/LPRM														
223001 Primary CTMT and Aux.														
223002 PCIS/Nuclear Steam Supply Shutoff														
261000 SGTS														
264000 EDGs														
272000 Radiation Monitoring														
286000 Fire Protection														
288000 Plant Ventilation														
290001 Secondary CTMT														
300000 Instrument Air														
400000 Component Cooling Water														
510000* Service Water														
K/A Category Totals:												Tier Point Total:		20

Form 7.1-PWR Written Examination Outline for Senior Operators Limited to Fuel Handling for Pressurized-Water Reactors

Facility:												Date of Exam:
Tier	K/A Category Points											
	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total
1. Emergency and Abnormal Plant Evolutions												10
2. Plant Systems												20
3. Generic Knowledge and Abilities Categories	1		2		3		4		Fundamentals			10

Notes:

1. Ensure that at least one topic from every knowledge and ability (K/A) category is sampled within each tier.
2. The point total for each tier in the proposed outline must match that specified in the table. The final point total for each tier may deviate by ±1 from that specified in the table. The final exam must total 40 points.
3. Select topics from many systems and evolutions; avoid selecting more than two K/A topics from a given system (except fuel handling equipment) or evolution (except refueling accident).
4. The shaded areas are not applicable to the category/tier.
5. Select the generic (G*) K/As in Tiers 1 and 2 from Section 2 of the applicable K/A catalog, but the topics must be relevant to the applicable evolution/system.
6. Systems/evolutions within each tier are identified on the associated outline. Enter the K/A numbers, a brief description of each topic, importance ratings (IRs) for the senior reactor operator license level, and the point totals (#) for each system and category. Enter the tier totals for each category in the table above.
7. For Tier 3, select topics from Sections 2, 5, and 6 of the applicable K/A catalog. A minimum of four Tier 3 questions shall include basic reactor theory, component, and thermodynamic topics from Sections 5 and 6 of the applicable K/A catalog that apply to fuel handling operations (place these items in the "Fundamental" category). Enter the K/A numbers, descriptions, IRs, and point totals (#) on Form 7.1-GEN.
8. Eliminate inapplicable or inappropriate K/A statements by (1) discarding randomly selected K/As during the outline development process or (2) prescreening the entire K/A catalog to eliminate inappropriate K/As before beginning the random selection process. Use the facility licensee's job task analysis for fuel handlers as the basis for eliminating or adding testable topics.
9. * These systems/evolutions must be included as part of the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan. They are not required to be included when using earlier revisions of the K/A catalog.

   ** These systems/evolutions may be eliminated from the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan.

Written Examination Outline for Senior Operators Limited to Fuel Handling for Pressurized-Water Reactors
Emergency and Abnormal Plant Evolutions—Tier 1

E/APE #/Name/Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
025 Loss of RHR System									
026 Loss of Component Cooling Water									
032 Loss of Source-Range Nuclear Instrumentation									
036 (BW/A08) Fuel Handling Accident									
061 ARM System Alarms									
033 Loss of Intermediate-Range Nuclear Instrumentation									
055 Station Blackout									
056 Loss of Offsite Power									
057 Loss of Vital AC Instrument Bus									
058 Loss of DC Power									
062 Loss of Nuclear Service Water									
065 Loss of Instrument Air									
067 Plant Fire on Site									
069 (W/E14) Loss of CTMT Integrity									
078* RCS Leak									
W/E16 High Containment Radiation									
K/A Category Totals:							Tier Point Total:		10

Written Examination Outline for Senior Operators Limited to Fuel Handling for Pressurized-Water Reactors
Plant Systems—Tier 2

System #/Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
005 Residual Heat Removal														
015 Nuclear Instrumentation														
033 Spent Fuel Pool Cooling														
034 Fuel Handling Equipment														
103 Containment														
062 AC Electrical Distribution														
063 DC Electrical Distribution														
002 Reactor Coolant														
004 Chemical and Volume Control														
008 Component Cooling Water														
013 Engineered Safety Features Actuation														
064 Emergency Diesel Generator														
072 Area Radiation Monitoring														
076 Service Water														
078 Instrument Air														
079** Station Air														
086 Fire Protection														
K/A Category Totals:												Tier Point Total:		20

Form 7.1-ABWR Written Examination Outline for Senior Operators Limited to Fuel Handling for Advanced Boiling-Water Reactors

Facility:												Date of Exam:
Tier	K/A Category Points											
	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total
1. Emergency and Abnormal Plant Evolutions												10
2. Plant Systems												20
3. Generic Knowledge and Abilities Categories	1		2		3		4		Fundamentals			10

Notes:

1. Ensure that at least one topic from every knowledge and ability (K/A) category is sampled within each tier.
2. The point total for each tier in the proposed outline must match that specified in the table. The final point total for each tier may deviate by ±1 from that specified in the table. The final exam must total 40 points.
3. Select topics from many systems and evolutions; avoid selecting more than two K/A topics from a given system (except fuel handling equipment) or evolution (except refueling accident).
4. The shaded areas are not applicable to the category/tier.
5. Select the generic (G) K/As in Tiers 1 and 2 from Section 2 of the applicable K/A catalog, but the topics must be relevant to the applicable evolution/system.
6. Systems/evolutions within each tier are identified on the associated outline. Enter the K/A numbers, a brief description of each topic, importance ratings (IRs) for the senior reactor operator license level, and the point totals (#) for each system and category. Enter the tier totals for each category in the table above.
7. For Tier 3, select topics from Sections 2, 5, and 6 of the applicable K/A catalog. A minimum of four Tier 3 questions shall include basic reactor theory, component, and thermodynamic topics from Sections 5 and 6 of the applicable K/A catalog that apply to fuel handling operations (place these items in the “Fundamental” category). Enter the K/A numbers, descriptions, IRs, and point totals (#) on Form 7.1-GEN.
8. Eliminate inapplicable or inappropriate K/A statements by (1) discarding randomly selected K/As during the outline development process or (2) prescreening the entire K/A catalog to eliminate inappropriate K/As before beginning the random selection process. Use the facility licensee’s job task analysis for fuel handlers as the basis for eliminating or adding testable topics.

E/APE #/Name/Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
APE2003 Partial or Complete Loss of AC / 6									
APE2004 Partial or Total Loss of DC Power / 6									
APE2006 Reactor Scram									
APE2008 High Reactor Water Level									
APE2013 Inadvertent Reactivity Addition / 1									
APE2009 Low Reactor Water Level / 2									
APE2016High Offsite Release Rate / 9									
APE2017 Partial or Total Loss of CCW Reactor Building Cooling Water / 8									
APE2018 Partial or Total Loss of Instrument Air / 8									
APE2019 Inadvertent Containment Isolation / 5 & 7									
APE2020 Loss of Shutdown Cooling / 4									
APE2022 Refueling Accidents / 8									
APE2023 Plant Fire On Site / 8									
EPE1006 Low Suppression Pool Water Level / 5									
EPE1009 High Secondary Containment Area Radiation Levels / 9									
EPE1010 Reactor Building HVAC Exhaust High Radiation / 9									
EPE1011 Secondary Containment High Differential Pressure / 5									
K/A Category Totals:							Tier Point Total:		10

System #/Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
SF2RHRLPFL RHR: Low-Pressure Flooder Mode														
SF4RHRSDC RHR: Shutdown Cooling Mode														
SF5LDIS Leak Detection and Isolation System														
SF6EPDS AC Electrical Distribution														
SF6VAC Vital AC Power Supply														
SF6DC Direct Current Power Supply														
SF6DGCTG Emergency Generators (Diesel/CTG)														
SF7SRNM Startup Range Neutron Monitor														
SF7ELCS ESF Logic and Control System														
SF7APRM Average Power Range Monitor/Local Power Range Monitor														
SF9SGTS Standby Gas Treatment System														
SF8IAS Instrument Air														
SF8RBCW Reactor Building Cooling Water														
SF8RSW Reactor Service Water														
SF2RWCU Reactor Water Cleanup														
SF5SEC Secondary Containment														
SF5PCS Primary Containment and Auxiliary														
SF5RPV & SF9RPV Reactor Vessel Internals														
SF6I&C Instrumentation and Control Power Supply														
SF9HVAC Plant Ventilation Systems														
SF7RMS & SF9RMS Radiation Monitoring														
SF8FPS Fire Protection														
SF8FH Fuel Handling														

Written Examination Outline for Senior Operators Limited to Fuel Handling for Advanced Boiling-Water Reactors
Plant Systems—Tier 2

System#/Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
SF9FPC Fuel Pool Cooling/Cleanup														
SF9RD Radwaste														
SF1 Standby Liquid Control														
SF1 Control Rod Drive														
SF1 Fine Motion Control Rod Drive Mechanism														
SF1 Rod Control and Information System														
SF7 Automated Traversing In-Core Probe														
K/A Category Totals:												Tier Point Total:		20

Form 7.1-AP Written Examination Outline for Senior Operators Limited to Fuel Handling for the AP1000

Facility:												Date of Exam:
Tier	K/A Category Points											
	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	Total
1. Emergency and Abnormal Plant Evolutions												10
2. Plant Systems												20
3. Generic Knowledge and Abilities Categories	1		2		3		4		Fundamentals			10

Notes:

1. Ensure that at least one topic from every knowledge and ability (K/A) category is sampled within each tier.
2. The point total for each tier in the proposed outline must match that specified in the table. The final point total for each tier may deviate by ±1 from that specified in the table. The final exam must total 40 points.
3. Select topics from many systems and evolutions; avoid selecting more than two K/A topics from a given system (except fuel handling equipment) or evolution (except refueling accident).
4. The shaded areas are not applicable to the category/tier.
5. Select the generic (G*) K/As in Tiers 1 and 2 from Section 2 of the applicable K/A catalog, but the topics must be relevant to the applicable evolution/system.
6. Systems/evolutions within each tier are identified on the associated outline. Enter the K/A numbers, a brief description of each topic, importance ratings (IRs) for the senior reactor operator license level, and the point totals (#) for each system and category. Enter the tier totals for each category in the table above.
7. For Tier 3, select topics from Sections 2, 5, and 6 of the applicable K/A catalog. A minimum of four Tier 3 questions shall include basic reactor theory, component, and thermodynamic topics from Sections 5 and 6 of the applicable K/A catalog that apply to fuel handling operations (place these items in the “Fundamental” category). Enter the K/A numbers, descriptions, IRs, and point totals (#) on Form 7.1-GEN.
8. Eliminate inapplicable or inappropriate K/A statements by (1) discarding randomly selected K/As during the outline development process or (2) prescreening the entire K/A catalog to eliminate inappropriate K/As before beginning the random selection process. Use the facility licensee’s job task analysis for fuel handlers as the basis for eliminating or adding testable topics.

Written Examination Outline for Senior Operators Limited to Fuel Handling for the AP1000
Emergency and Abnormal Plant Evolutions—Tier 1

E/APE #/Name/Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
A-337, Passive RHR Heat Exchanger Leak / 4									
A-343, Loss of Normal Residual Heat Removal / 4									
A-317, Loss of Component Cooling Water / 8									
FR-S.1, Response to Nuclear Power Generation / 1									
A-323, Loss of 6.9-kV, 4,160-V, or 480-V Bus Power / 6									
A-345, Loss of Nuclear Service Water / 4									
A-329, Loss of Instrument Air / 8									
ECA-1.1, Loss-of-Coolant Accident Outside Containment / 3									
FR-H.1, Response to Loss of Heat Sink / 4									
SDP-1, Response to Loss of RCS Inventory during Shutdown / 2									
SDP-2, Response to Loss of RNS during Shutdown / 4									
A-308, Loss of Control Room AC / 8									
A-320, Loss of Circulating Water / 8									
A-302, Emergency Boration / 1									
A-314, Fuel Handling Incident / 8									
SDP-4, Response to Rising Nuclear Flux during Shutdown / 1									
SDP-5, Response to RCS Cold Overpressure during Shutdown / 3									
SDP-6, Response to Unexpected RCS Temperature Changes during Shutdown / 4									
A-306, Evacuation of Control Room / 8									
FR-Z.2, Response to Containment Flooding / 5									
FR-Z-3, Response to High Containment Radiation / 9									
A-321, Loss of Data Display and Processing System / 7									
A-340, Reactor Coolant Leak / 2									
K/A Category Totals:							Tier Point Total:		10

Written Examination Outline for Senior Operators Limited to Fuel Handling for the AP1000 Plant Systems—Tier 2

System Name/Safety Function	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
Reactor Coolant / 2, 4														
Normal Residual Heat Removal / 4														
Passive Residual Heat Removal /4														
Passive Core Cooling / 2														
Component Cooling Water / 8														
Engineered Safeguards Actuation / 2														
Passive Containment Cooling / 5														
AC Electrical Distribution / 6														
Class 1E and Non-Class 1E DC and UPS / 6														
Onsite Standby Power System / 6														
Service Water / 4														
Compressed Air / 8														
Containment System / 5														
Containment Air Filtration / 8														
Containment Hydrogen Control / 5														
Main Control Room HVAC / 8														
Spent Fuel Pool Cooling / 8														
Fuel Handling / 8														
Gaseous Radwaste / 9														
Radiation Monitoring / 7														
Circulating Water / 8														
Fire Protection / 8														
K/A Category Point Totals:												Tier Point Total:		20

Form 7.1-GEN Generic Knowledge and Abilities Outline (Tier 3) for Senior Operators Limited to Fuel Handling

ES-7.1				**Form 7.1-GEN**
Generic Knowledge and Abilities Outline (Tier 3) for Senior Operators Limited to Fuel Handling				
Facility:		Date of Exam:		
Category	K/A #	Topic	IR	#
1. Conduct of Operations	2.1.			
	2.1.			
	2.1.			
	2.1.			
	Subtotal			
2. Equipment Control	2.2.			
	2.2.			
	2.2.			
	2.2.			
	Subtotal			
3. Radiation Control	2.3.			
	2.3.			
	2.3.			
	2.3.			
	Subtotal			
4. Emergency Procedures/ Emergency Plan	2.4.			
	2.4			
	2.4.			
	2.4.			
	Subtotal			
5. Fundamentals				
	Subtotal			4
Tier 3 Point Total				10

Form 7.1-2 Operating Test Outline for Senior Operators Limited to Fuel Handling

Applicant Docket Number: 55-

Facility: Date of Examination:

Title/Description of Tasks (Job Performance Measures)	Type Codes*	Evaluation (S or U)	Comment Page Number
Administrative			
1.			
2.			
3.			
Systems			
1.			
2.			
3.			
4.			
Emergency/Abnormal Plant Evolutions			
1.			
2.			
3.			

Type Codes & Criteria:

(A)lternative path (2 systems; 1 emergency/abnormal plant evolution))
(C)ontrol room
(D)irect from bank (≤ 7)
(I)n-plant
(N)ew or (M)odified from bank, including 1(A) (≥ 1/section)
(L)ast NRC exam (≤ 1/section)
(R)efueling accident (1)
(T)echnical specification (≥ 2)
(S)atisfactory or (U)nsatisfactory

Form 7.1-3 Examination Outline Quality Checklist for Senior Operators Limited to Fuel Handling

Facility: Date of Examination:

Item		Task Description	(Y)es / (N)o		
			a	b*	c#
1. WRITTEN	a.	Verify that the outline fits the model in accordance with ES-7.1.			
	b.	Assess whether the outline was systematically and randomly prepared in accordance with Section B of ES-4.1 and whether all knowledge and ability (K/A) categories are sampled at least once.			
	c.	Assess whether the outline overemphasizes any systems, evolutions, or generic topics.			
	d.	Assess whether the justifications for deselected or rejected K/A statements are appropriate.			
2. OPERATING	a.	Verify that the overall operating test— (1) includes at least two tasks that require the use of technical specifications and (2) does not duplicate any tasks from the applicants' audit test(s).			
	b.	Verify that the administrative tasks— (1) are distributed among the four administrative topics described in ES-3.2, (2) include no more than one repeat from the last NRC licensing examination, and (3) include at least one task that is new or significantly modified.			
	c.	Verify that the systems walkthrough includes— (1) two tasks requiring the manipulation of fuel handling equipment, (2) two additional tasks related to Tier 2 systems other than fuel handling equipment, (3) two tasks requiring implementation of alternative-path procedures, (4) no more than one repeat from the last NRC licensing examination, and (5) at least one task that is new or significantly modified.			
	d.	Verify that the emergency/abnormal plant evolution walkthrough includes— (1) three job performance measures based on the Tier 1 evolutions, including a refueling accident; (2) one task requiring implementation of an alternative-path procedure; (3) no more than one repeat from the last NRC licensing examination; and (4) at least one task that is new or significantly modified.			
	e.	Determine whether there are enough different outlines to test the projected number of applicants and ensure that no items are duplicated on subsequent days.			
3. GENERAL	a.	Assess whether plant-specific priorities (including probabilistic risk assessment and individual plant examination insights) are covered in the appropriate exam section.			
	b.	Assess whether the 10 CFR 55.41, 10 CFR 55.43, and 10 CFR 55.45 sampling is appropriate.			
	c.	Assess whether the sampling process adequately considered plant-specific refueling components, systems, and procedures that are not included in the generic models.			
	d.	Ensure that K/A importance ratings (except for plant-specific priorities) are at least 2.5.			
	e.	Check for duplication and overlap among exam sections.			
	f.	Check the entire exam for balance of coverage.			
	g.	Assess whether the proposed sample is consistent with the job responsibilities for a senior operator limited to fuel handling.			

	Printed Name/Signature	Date
a. Author	_____	_____
b. Facility Reviewer (*)	_____	_____
c. NRC Chief Examiner (#)	_____	_____
d. NRC Supervisor	_____	_____

* The facility licensee signature is not applicable for NRC-developed tests.
\# An independent NRC reviewer performs the steps in column c. This may be the NRC chief examiner if he/she did not develop the outline under review.

Form 7.1-4 Written Examination Quality Checklist for Senior Operators Limited to Fuel Handling

Facility: Date of Exam:

Item Description	(Y)es / (N)o a	b*	c#
1. Questions and answers are technically accurate and applicable to the facility.			
2. NRC knowledge and ability (K/A) statements are referenced for all questions (as applicable). Facility learning objectives are referenced as available.			
3. Questions are appropriate for applicants for senior operators limited to fuel handling.			
4. The sampling process was random and systematic. (If more than three questions were repeated from the last two NRC licensing exams, consult the NRC Office of Nuclear Reactor Regulation operator licensing program office.)			
5. Question duplication from the license screening/audit exam was controlled as indicated below (check the item that applies) and appears appropriate: __ the audit exam was systematically and randomly developed, or __ the audit exam was completed before the license exam was started, or __ the examinations were developed independently, or __ the licensee certifies that there is no duplication, or __ other (explain).			
6. Bank use meets limits (no more than 30 questions from the bank, at least 4 new, and the rest modified); enter the actual question distribution at right. — Bank: ___ Modified: ___ New: ___			
7. Between 50 and 60 percent (20 and 24) of the questions on the exam are written at the comprehension/analysis (C/A) level; enter the actual question distribution at right. — Memory: ___ C/A: ___			
8. References/handouts provided do not give away answers or aid in eliminating distractors.			
9. Question content conforms to specific K/A statements in the previously approved examination outline and is appropriate for the tier to which the questions are assigned; deviations are justified.			
10. Question psychometric quality and format meet the guidelines in Appendix B to NUREG-1021.			
11. The exam contains 40 one-point, multiple-choice items; the total is correct and agrees with the value on the cover sheet.			

	Printed Name/Signature	Date
a. Author	_____	_____
b. Facility Reviewer (*)	_____	_____
c. NRC Chief Examiner (#)	_____	_____
d. NRC Supervisor	_____	_____

* The facility licensee signature is not applicable for NRC-developed tests.
\# An independent NRC reviewer performs the steps in column c. This may be the NRC chief examiner if he/she did not develop the outline under review.

Form 7.1-5 Operating Test Quality Checklist for Senior Operators Limited to Fuel Handling

Facility:	Date of Examination:	Operating Test Number:

Item Description	(Y)es / (N)o		
	a	b*	c#
1. The operating test conforms to the job responsibilities of a senior operator limited to fuel handling and the previously approved outline.			
2. Any changes from the previously approved outline have not caused the test to deviate from any of the acceptance criteria (e.g., item distribution, bank use, repetition from the last two NRC examinations) specified on the outline.			
3. There is no day-to-day repetition between this and other operating tests to be administered during this examination.			
4. The operating test does not duplicate items from the applicants' audit test(s).			
5. Overlap between the written examination and the operating test is within acceptable limits.			
6. It appears that the operating test will differentiate between competent and less-than-competent applicants.			
7. Each job performance measure includes the following, as applicable: • task standard • initial conditions • initiating cues • references and tools, including associated procedures • reasonable and validated time limits (average time allowed for completion) and specific designation if deemed to be time critical by the facility licensee • specific designation if meets criteria of alternate path • operationally important specific performance criteria that include the following: – detailed expected actions with exact criteria and nomenclature – system response and other examiner cues – statements describing important observations to be made by the applicant – criteria for successful completion of the job performance measure task standard – identification of critical steps and their associated performance standards – restrictions on the sequence of steps, if applicable			

	Printed Name/Signature	Date
a. Author	_____	_____
b. Facility Reviewer (*)	_____	_____
c. NRC Chief Examiner (#)	_____	_____
d. NRC Supervisor	_____	_____

* The facility licensee signature is not applicable for NRC-developed tests.
\# An independent NRC reviewer performs the steps in column c. This may be the NRC chief examiner if he/she did not develop the outline under review.

Form 7.1-6 Written Examination Cover Sheet for Senior Operators Limited to Fuel Handling

U.S. Nuclear Regulatory Commission

Written Examination for Senior Operators Limited to Fuel Handling

Applicant Information	
Name:	
Date:	Region: I ☐ II ☐ III ☐ IV ☐
Facility/Unit:	Reactor Type: W ☐ CE ☐ BW ☐ GE ☐ AP1000 ☐ ABWR ☐
Start Time:	Stop Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. Passing the examination requires a final grade of at least 80 percent. Examination papers will be picked up 4 hours after the examination begins.

Applicant Certification

All work done on this examination is my own. I have neither given nor received aid.

_____
Operator's Signature

Results		
Test Value	_____	Points
Applicant's Score	_____	Points
Applicant's Grade	_____	Percent

7.2 ADMINISTRATION OF NRC REQUALIFICATION EXAMINATIONS FOR SENIOR OPERATORS LIMITED TO FUEL HANDLING

This examination standard (ES) provides general guidance for facility licensees and instructions for NRC examiners to use in preparing, administering, grading, and documenting NRC-conducted requalification examinations for senior operators limited to fuel handling (i.e., limited senior reactor operators (SROs) or LSROs). It is designed to be used in conjunction with ES-6.1, "Conducting NRC Requalification Examinations," ES-6.2, "Requalification Written Examinations," and ES-6.3, Requalification Walkthrough Examinations."

A. Background

The NRC's requalification examinations for LSROs are administered under this standard in accordance with the provisions of 10 CFR 55.59(a)(2)(iii).

B. General Differences

The LSRO examinations will be conducted in accordance with the methodology outlined in ES-6.1, with the following exceptions:

1. The dynamic simulator operating test described in ES-6.4, "Requalification Dynamic Simulator Examinations," is not applicable to LSRO requalification examinations.

2. The NRC will coordinate with the facility licensee to schedule the NRC-conducted LSRO examinations concurrent with the facility licensee's LSRO requalification examination schedule. If practical, the examination team will conduct the LSRO examination shortly before or after an outage to facilitate access to refueling equipment because some of the equipment is not accessible during plant operations.

   The NRC may administer LSRO requalification examinations concurrent with full-scope initial license or operator requalification examinations.

3. The facility licensee's LSRO requalification program, LSRO job task analysis, and associated learning objectives will provide the basis for the examination if they are of sufficient scope and depth. The items in 10 CFR 55.43 and 10 CFR 55.45 will be sampled as appropriate to the LSRO's limited responsibilities.

4. The LSRO requalification examination will consist of a written examination and a walkthrough operating test, which are administered and evaluated individually. References to the crew-based dynamic simulator test and the associated crew evaluation criteria and forms do not apply to LSROs.

5. Whenever possible, the facility licensee should include an LSRO on the examination team.

6. The requirement to examine at least 12 operators to arrive at a program evaluation is not applicable to LSRO examinations. The region and, if necessary, the NRR operator licensing program office will determine the appropriate sample size based on the number of LSROs licensed at the facility.

7. The NRC will revise the sample corporate notification letter (Letter 6.1-1, "Sample Corporate Notification Letter") as necessary to reflect the examination arrangements and

to specify a modified list of reference material requirements associated with LSRO fuel handling activities. The NRC regional office will review the reference material using the applicable portions of Form 6.1-4, "Evaluation Checklist for Facility Reference Material."

8. The NRC staff expects the facility licensee to maintain JPMs and written examination banks for use in evaluating LSROs. Facility licensees should periodically update these examination banks to reflect areas of emphasis in training and to ensure that they represent all applicable knowledge and skills. There is no minimum threshold or ceiling for these banks.

9. The NRC regional office will document the agency's LSRO requalification examination results using Form 7.2-1, "Individual Requalification Examination Report for Senior Operators Limited to Fuel Handling," and Form 7.2-2, "Power Plant Requalification Results Summary for Senior Operators Limited to Fuel Handling," instead of Form 6.1-5, "Power Plant Requalification Results Summary Sheet," and Form 6.1-6, "Individual Requalification Examination Report."

10. This standard does not provide for a formal LSRO requalification program evaluation; however, if more than one-third of the examined LSROs at a facility fail, the NRC may need to inspect the LSRO requalification program. The NRC regional office is responsible for determining whether such an inspection should be conducted. If the NRC performs such an inspection, the staff should assess at least the following:

    a. the content of the training program, the development of examination materials, and the quality controls

    b. the administrative controls for maintaining training material current with procedural revisions and design changes

    c. the training and evaluation techniques of the facility licensee's evaluators

    d. the evaluation techniques that the facility licensee uses to determine whether it has effectively implemented and assessed its training

    e. the frequency, scope, and depth of the training provided to the operators

Section C of this examination standard discusses specific exceptions related to each category of the examination. Any questions about the NRR operator licensing program office's expectations for the conduct of LSRO requalification examinations should be referred to the NRR operator licensing program office for resolution.

C. Examination Differences

1. Written Examination

The written examination will be developed, administered, and evaluated as described in ES-6.2, with the following exceptions:

a. The written examination will be "open reference" and will contain a minimum of 25 points in a single section; static simulator scenarios do not apply to the LSRO examination. The time limit for completing the examination shall be 2 hours, but the examination should be constructed so that a competent LSRO can complete it in 1.5 hours. The

examination should emphasize refueling procedures, administrative controls, and abnormal and emergency procedures. The examination should include questions associated with industry and licensee event reports and recent plant modifications that affected refueling operations and systems that apply to the facility.

b. Form 7.2-3, "Written Requalification Examination Cover Sheet for Senior Operators Limited to Fuel Handling," will be used as a cover sheet rather than Form 6.2-1, "NRC Checklist for Open-Reference Test Items.

2. Walkthrough Operating Test

The walkthrough operating test will be developed, administered, and evaluated as described in ES-6.3, with the following exceptions:

a. Each LSRO will be administered an operating test consisting of five JPMs. Whenever possible, these JPMs should include the use of refueling equipment to manipulate dummy fuel only or the use of a refueling machine simulator if one is available at the facility. If dummy fuel manipulation or the use of a simulator is not possible, the refueling tasks should be simulated. The requirement to conduct a minimum number of JPMs in the control room/simulator is not applicable to LSRO examinations.

b. Each JPM will consist of a task that is normally performed by fuel handling personnel and will include tasks performed both before and after refueling and for maintenance, surveillance, or testing of systems or equipment. The examination team may evaluate the LSRO's ability to perform normal fuel handling administrative tasks, including documenting clearances, maintenance activities, and surveillances. The operating test should also evaluate the LSRO's response to abnormal or emergency events associated with fuel handling.

c. If sufficient facility-developed JPMs are not available, the NRC can conduct a walkthrough examination of the type administered to an initial LSRO applicant, as discussed in ES-7.1, "Administration of Initial Examinations for Senior Operators Limited to Fuel Handling."

D. Forms

Form 7.2-1	Individual Requalification Examination Report for Senior Operators Limited to Fuel Handling
Form 7.2-2	Power Plant Requalification Results Summary for Senior Operators Limited to Fuel Handling
Form 7.2-3	Written Requalification Examination Cover Sheet for Senior Operators Limited to Fuel Handling

Form 7.2-1 Individual Requalification Examination Report for Senior Operators Limited to Fuel Handling

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

U.S. Nuclear Regulatory Commission Individual Requalification Examination Report for Senior Operators Limited to Fuel Handling		
Operator's Name:	Facility:	
Docket No.: 55-	Retake Exam: 1st / 2nd / #	Date of Last Exam:
License No.: SOP-	Expiration Date:	
Written Examination Results		
Date of Exam:	NRC Examiner:	Facility Evaluator:
Overall Grade (%)	NRC	Facility
	%	%
Operating Test Results		
Date of Test:	NRC Examiner:	Facility Evaluator:
No. of Job Performance Measures Correct	of	of
Final Grade (%)	%	%
NRC Examiner Recommendations		
Category	Results	Signature
Written	Pass/Fail	
Operating	Pass/Fail	
NRC Supervisor Review		
Date:	Pass/Fail	

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Form 7.2-2 Power Plant Requalification Results Summary for Senior Operators Limited to Fuel Handling

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Power Plant Requalification Results Summary for Senior Operators Limited to Fuel Handling

Facility:	Exam Date:
Examiners:	

Overall Results --->	Total # of Operators	Passed (# / %)	Failed (# / %)

Individual Results

Operator's Name	Docket No. 55-	Grader	JPM % Overall	Written (%)	Results ((P)ass/(F)ail)	
					Written	Operating
		NRC				
		Facility				
		NRC				
		Facility				
		NRC				
		Facility				
		NRC				
		Facility				
		NRC				
		Facility				
		NRC				
		Facility				

PRIVACY ACT INFORMATION—FOR OFFICIAL USE ONLY

Form 7.2-3 Written Requalification Examination Cover Sheet for Senior Operators Limited to Fuel Handling

U.S. Nuclear Regulatory Commission
Written Requalification Examination for Senior Operators Limited to Fuel Handling

Operator Information

Name:	
Date:	Region: I ☐ II ☐ III ☐ IV ☐
Facility/Unit:	Reactor Type: W ☐ CE BW ☐ GE ☐ AP1000 ☐ ABWR ☐
Start Time:	Stop Time:

Instructions

Use the answer sheets provided to document your answers. Staple this cover sheet on top of the answer sheets. Points for each question are indicated in parentheses after each question. Passing the examination requires a final grade of at least 80 percent. Examination papers will be picked up 2 hours after the examination begins.

Operator Certification

All work done on this examination is my own. I have neither given nor received aid.

_____
Operator's Signature

Results

Test Value	_____	Points
Operator's Score	_____	Points
Operator's Grade	_____	Percent

8 GLOSSARY

Annual: In most instances, a period of time equal to 365 days calculated from any point in a calendar year to the same point in the following calendar year. However, annual requirements in successive years can reach a period of nearly 2 years. That is, "annual" could encompass a range extending to 729 days, depending on when an event occurred in the first calendar year and viewing December 31 of the following calendar year as meeting the annual requirement.

Applicable K/A catalog: The revision of the technology- or vendor-specific (e.g., pressurized-water reactor, boiling-water reactor, AP1000) knowledge and abilities (K/A) catalog reviewed by the U.S. Nuclear Regulatory Commission (NRC) and used to develop the written examination outline and operating test outline for initial operator licensing examinations.

Applicant: Any individual who has submitted an NRC Form 398, "Personal Qualification Statement—Licensee," in pursuit of a reactor operator (RO) or senior reactor operator (SRO) license. For the purposes of the NRC's other examination standards, "applicant" is synonymous with "candidate."

Applicant license level: The level of operator license (i.e., RO or SRO) for which the applicant has applied.

Average: A score that indicates the typical performance of a group of scores. The mean, median, and mode of a distribution of scores are all commonly used as averages.

Bank question: A written examination question taken from any facility licensee collection of questions that have previously appeared on any operator training-related examination at the facility. This definition includes NRC examination questions used at other facility licensee sites.

Biennial: In most instances, a period of time equal to 730 days and synonymous with 2 years. Biennial requirements can extend beyond 730 days if the requirement is met during the anniversary month of the second year. For example, a biennial medical examination last performed on January 10, 2020, would be due again by January 31, 2022. In this case, January is seen as the anniversary month, and the biennial requirement is satisfied even though the period of time between the two examinations is longer than 730 days.

Bloom's taxonomy: A classification system that depicts knowledge and information processing in a hierarchy from lowest to highest as fundamental knowledge, comprehension, analysis, synthesis, and evaluation.

Calendar quarter: One of four parts of a calendar year, each consisting of a 3-month segment. In any calendar year, the first quarter is from the first day of January to the last day of March, the second quarter is from the first day of April to the last day of June, the third quarter is from the first day of July to the last day of September, and the fourth quarter is from the first day of October to the last day of December.

Central tendency: A term referring to the most typical performance of a group of individuals, generally the mean, median, or mode.

Cold-plant operator licensing: Also called the operator licensing process for cold plants. A term that refers to a facility licensee's method for operations personnel to acquire the knowledge and experience required for licensed operator duties during the unique conditions of new plant

construction and initial operation. This method usually applies during plant construction and ends with the completion of the first refueling outage.

Cognitive: Aspects of a person or test level that refer to knowledge or understanding.

Content validity: The degree to which a test measures the specific objectives or content.

Correlation coefficient: A numerical value, ranging from -1 to +1, that indicates the relationship between two sets of scores or other measures of each individual in a group. A value of 0 indicates no relationship; +1 or -1 indicates a perfect relationship (either positive or negative).

Criterion: A characteristic or combination of characteristics used as the basis for assessing performance.

Criterion-referenced test: An examination based upon mastery of objectives of content that was or should have been taught and mastered and one that uses an established standard or cut score as a measure of acceptable performance.

Critical task: A task used by the NRC during simulator scenarios to evaluate whether an individual or crew can complete actions that are of significant importance to the safety of the plant and the public. These tasks must meet specific criteria in order to be designated as critical tasks. See Examination Standard (ES)-3.3, "Testing Guidelines for Dynamic Simulator Scenarios."

Critical performance deficiency: A performance deficiency associated with a critical task.

Cut score: The score at which a trainee is deemed to have met the criteria for an examination.

Defer: To postpone completion of a license application requirement(s) until a later date, typically after the applicant passes an initial NRC licensing examination. An applicant's request to defer a requirement(s) is documented as a "deferral" on NRC Form 398. The applicant shall complete the deferred item(s) before the NRC issues a license.

Diagnostic test: An instrument that is designed to identify an individual's strengths and weaknesses in a given content area.

Different units: Two or more units owned or managed by a single facility licensee and any of the following:

- units having the same vendor but significantly different age or power level (e.g., Nine Mile Point Nuclear Station, Units 1 and 2)
- units having the same vendor and similar design but different locations (e.g., Sequoyah Nuclear Plant and Watts Bar Nuclear Plant, Byron Station and Braidwood Station)
- units having different vendors (pressurized-water reactors only) but located on the same site (e.g., Arkansas Nuclear One, Units 1 and 2; Millstone Power Station, Units 2 and 3)

Difficulty index: A numerical index, ranging from 0.00 to 1.00, that indicates the percentage of trainees who correctly answer a test item. An index of 0.00 indicates that no one correctly answered the test item, while an index of 1.00 indicates that all trainees correctly answered the item.

Discrimination index: A measure of a test item's ability to differentiate between good and poor trainees. A high discrimination index indicates that more high performers than low performers correctly answered the item. ("High" and "low" are typically determined by overall test scores, but they may also be established by external criteria.)

Discrimination validity: Setting the item difficulty at an estimated level around the cut score.

Distractor: An incorrect alternative among the possible answers for a test item.

Error of measurement: Any difference between an obtained score and a true score on a test. The actual error of measurement can only be estimated, since it is impossible to know the true score.

Event: Any normal evolution, instrument or component failure, equipment malfunction, reactivity manipulation, and major plant transient when used in the context of the simulator scenario portion of the operating test.

Excuse: To excuse a reapplicant from the requirement to complete portions of a reexamination or test in accordance with 10 CFR 55.35(b). Granting such a release is referred to as an "excusal."

Frequency distribution: A graphic display listing scores or score intervals on one axis of a graph and the number of trainees at that score or in that interval on the other.

Item analysis: A set of procedures performed on test items to determine their difficulty and discriminating power.

Item bank: A group of test items covering a defined area. Items for a test can be chosen from this source.

Item stem: The part of a test item that presents the problem or situation to be solved. The item stem may be a question requiring a response, or a statement that is followed by the alternatives from which the trainee must choose the best answer.

Job performance measure: An evaluation tool that is based on tasks contained in the facility's job task analysis or the applicable NRC K/A catalogs (NUREG-1122, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors"; NUREG-1123, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Boiling Water Reactors"; NUREG-2103, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized-Water Reactors Westinghouse AP1000"; and NUREG-2104, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Advanced Boiling Water Reactors") and requires the applicant to perform (or simulate) a task that is applicable to the license level of the examination.

Job task analysis: A systematic analysis of the knowledge, skills, and abilities required to perform a particular occupation.

Learning objective: A statement of the behavior a trainee is expected to exhibit following instruction.

Low power: In accordance with NUREG-1449, "Shutdown and Low-Power Operation at Commercial Nuclear Power Plants in the United States," issued September 1993, the range of reactor power from criticality to 5 percent.

Mastery test: A term synonymous with "criterion-referenced test" (i.e., one that evaluates the expected behavior following instruction).

Mean: An indication of "central tendency." Mean usually refers to the arithmetic mean, which is computed by summing all the scores of a group and dividing that sum by the number of scores in the group.

Median: A measure of "central tendency"; the point on a scale of scores that splits the scores in half, with 50 percent of the scores below this point and 50 percent of the scores above this point.

Mode: The least reliable of the common measure of "central tendency"; the "mode" is the most frequently occurring score in a distribution of scores.

Multiple-choice item: A test item that is composed of an item stem and several alternatives from which the trainee must select the best answer.

Normal distribution: A theoretical frequency distribution represented by a symmetrical bell-shaped curve; sometimes referred to as the bell curve.

Norm referenced: A score interpretation based on the comparison of an individual's score with a comparable reference group.

Nuclear power plant experience: As defined in Section 2 of American National Standards Institute (ANSI)/American Nuclear Society (ANS) 3.1-1993, "American National Standard for Selection, Qualification, and Training of Personnel for Nuclear Power Plants," applicable work performed in a nuclear-fueled electric power production plant during preoperational, startup testing, or operational activities. Observation of others performing work does not constitute experience.

Objective test: A test that can be scored without subjective judgment in the scoring.

On-the-job training: Participation in nuclear power plant startup, operation, maintenance, or technical services as a trainee under the direction of experienced personnel.

Operating test: That portion of the operator licensing examination based on direct interaction between an examiner and an applicant. The operating test assesses applicant knowledge of the design and operation of the reactor and its associated plant systems, both inside and outside the control room. It is administered in a plant walkthrough and a simulation facility.

Operational validity: A test item that (1) relates to the operations of the job and appears reasonable to ask and (2) is expressed in an operational context that requires the candidate to perform mentally or physically through understanding or analysis.

Performance deficiency: An observed action or inaction (including operational tasks, procedure/process implementation, communications, and administrative functions), or a statement of understanding or intent, that demonstrates a lack of ability or understanding as outlined by an established standard for operator performance (e.g., facility procedure, policy,

learning objective, regulatory requirement).

Performance test: Any test that requires the trainee to demonstrate either mental performance through knowledge testing or skill by actual operation or manipulation of tools and equipment. Typically, performance tests involve skill testing.

Plant-referenced simulator: Refer to definition in 10 CFR 55.4, "Definitions."

Power plant experience: As defined in Section 2 of ANSI/ANS 3.1-1993, applicable work performed in a fossil-fueled or nuclear-fueled electric power production plant during preoperational, startup testing, or operational activities. Observation of others performing work does not constitute experience.

Predictive validity evidence: The ability of a test to forecast future performance on a subsequent measure.

Psychomotor: The domain of human performance that relates to physical performance based on mental activity.

Range: The smallest interval on a scale of scores that will include all scores; mathematically defined as the largest score minus the smallest score plus one.

Raw score: The numerical score first assigned when scoring a test before conversion to a derived score.

Reactor operator applicant: An unlicensed individual who is applying for an RO license.

Reference plant: Refer to definition in 10 CFR 55.4, "Definitions."

Related technical training: Formal training beyond the high-school level in technical subjects associated with the position in question, such as that acquired in training schools or programs conducted by the military, industry, utilities, universities, vocational schools, or others. Such training programs shall be of a scheduled and planned length and include textual material and lectures.

Reliability: The consistency or repeatability of any measure as an indicator of confidence in that measure.

Scenario: An integrated group of events that simulates a set of plant malfunctions and evolutions at a simulation facility.

Scenario set: For a given operating test, all scenarios that are developed, reviewed, and approved for examination administration. The scenario set does not include the spare scenario unless it is subsequently administered.

Score: A numerical indication of the performance an individual displays on a test.

Senior reactor operator-instant applicant: An unlicensed individual who is applying for an SRO license.

Senior reactor operator-upgrade applicant: A licensed RO who is applying for an SRO license on the same unit(s).

Significant control manipulations: An operation (excluding those required for fuel handling) of an apparatus or mechanism that directly affects the reactivity or power level of a critical reactor by an amount of sufficient magnitude to allow for the observation of clear effects on the plant by the operator. The requirements in 10 CFR 55.31(a)(5) define this term for operations conducted in a simulator.

Significant performance deficiency: Used in the context of simulator scenarios, a performance deficiency that is more severe than a regular applicant performance deficiency but does not meet the criteria for a critical performance deficiency. The identification of a significant performance deficiency only occurs after completion of the scenario because of an error made during the scenario by one or more applicants. (ES-3.5, "Administering Operating Tests," contains the criteria for a significant performance deficiency.)

Simulation facility: Refer to definition in 10 CFR 55.4, "Definitions."

Standard deviation: A measure of variability of a set of scores around the group mean. The standard deviation is mathematically defined as the square root of the mean of the squared deviations of the scores from the mean of the distribution.

Standard error of measurement: An estimate of the standard deviation of the errors of measurement associated with the scores in a given test.

Standardized test: A test that has the directions, time limits, and conditions of administration made consistent for all offerings of the test; this test is usually norm-referenced.

Statistic: A numerical value computed on a sample of data.

Technical specifications: A document that identifies the plant-specific safety limits, system operability and surveillance testing requirements, and administrative controls. Whether stated or not, references to the technical specifications in this NUREG include those administrative controls that have been moved to other technical requirements documents.

Test: A measurement instrument; examination.

True score: The ideal or correct score for an individual. Its value cannot be known, but it can be estimated when assumptions about error of measurement are made.

Validity: The degree to which a test measures what it purports to measure.

Verifiable action: A term used in the context of evaluating an examinee's competence during portions of the operating test. A verifiable action is an examinee action who provides insight for the examiner to be able to determine whether the examinee can operate the equipment/equipment controls and control the system response. The purpose of a verifiable action is to allow the examiner to observe the examinee perform an action or, in the case of a job performance measure in the plant, describe exactly what it takes to perform an action.

Video recording: An electronic medium used for recording, copying, and playback of moving visual images and associated audio components. Storage media include digital file, digital video disk, video cassette tape, and compact disk.

Waive: To forgo or relinquish a legal requirement that the NRC is legally entitled to enforce. Forgoing such a requirement is documented as a "waiver." The NRC specifies its ability to

waive examination and test requirements in 10 CFR 55.47, “Waiver of examination and test requirements.”

APPENDIX A
OVERVIEW OF GENERIC EXAMINATION CONCEPTS

This appendix explains the rationale for providing instructions and guidance (through NUREG-1021) for the preparation, review, and approval of U.S. Nuclear Regulatory Commission (NRC) operator licensing and requalification examinations. It provides an overview of two fundamental examination concepts—validity and reliability—as they apply to the development of NRC examinations. It also includes background information about the written examination for licensing purposes. Specifically, this appendix discusses the following topics:

- the various aspects of validity and how the NRC establishes the validity of its examinations (Section B)
- the concept of reliability and how it is maintained on NRC examinations (Section C)
- the importance of the written examination (Section D)
- the difference between objective and subjective test items (Section E)

A. Background

The NRC's operator licensing examinations are prepared and administered by many different individuals working in various locations; therefore, it is imperative to establish and follow a defined set of administrative structures and protocols to ensure that the examinations are administered successfully and consistently. Consistent external attributes, such as the number and types of items, the length of the examination, security procedures, proctoring instructions, and other administrative details, are essential to the orderly conduct of an examination. These factors have a significant effect on the validity and reliability of an examination—the examination cornerstones that allow the NRC to make confident licensing decisions.

The internal attributes of the examination, such as the level of knowledge it requires, level of difficulty, and use of item banks, also impact the operational and discriminatory validity of the examination, which, in turn, can affect its validity and reliability. If the internal and external attributes of examinations are allowed to vary significantly, the uniform conditions that are required by Section 107 of the Atomic Energy Act of 1954, as amended, and the basis upon which the NRC's licensing decisions rest are challenged. The NRC must reasonably control and structure the examination processes to ensure the integrity of the licenses it issues.

Acceptable levels of examination consistency, uniformity, and fairness would be impossible to achieve without quantitative and qualitative acceptance criteria. The examination standards identify many of the quantitative criteria necessary for a well-balanced and consistent examination. Although NUREG-1122, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors"; NUREG-2103, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Pressurized Water Reactors Westinghouse AP1000"; NUREG-1123, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Boiling Water Reactors"; and NUREG-2104, "Knowledge and Abilities Catalog for Nuclear Power Plant Operators: Advanced Boiling Water Reactors," for pressurized-water reactors and boiling-water reactors have brought a degree of consistency to the qualitative issue of safety significance, there is no comparable mechanism to aid in determining an examination's required level of knowledge or difficulty before it is administered. In the end, the validity and consistency of the NRC's examinations depend largely on the individual and collective judgments of the

people who write and review the examinations. The discussions herein clarify the intent of the NRC's examination criteria, thereby decreasing the likelihood that inconsistencies among examinations, particularly with regard to the level of knowledge and difficulty, will jeopardize the integrity of the NRC's licensing decisions.

B. Validity

For a test to be considered valid, it must be shown to measure that which it is intended to measure. The NRC examinations are intended to measure the examinee's knowledge and ability (K/A) such that those who pass will be able to perform the duties of a reactor operator (RO) or senior reactor operator (SRO) to ensure the safe operation of the plant. The following subsections outline the three principal facets of test validity and the techniques that are used to establish the validity of NRC examinations.

1. Content Validity

a. Establish a Link to Job Duties

In order to develop valid examinations, the K/As selected for testing must be linked to and based upon a description of the most important job duties. This is accomplished by conducting a job task analysis (JTA) focusing on the delineation of essential K/As.

The testing industry endorsed this approach to the development of content-valid licensing examinations in the 1985 revision of the "Standards for Educational and Psychological Testing" published by the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education. Those standards treat licensing examinations in a separate section in recognition of their importance and uniqueness. Accordingly, those seeking additional technical guidance are encouraged to consult Chapter 11 of those standards for further clarification.

To ensure content validity in the NRC's examinations, the JTA performed on the licensed operator and senior operator positions by the Institute of Nuclear Power Operations (INPO) served as the initial source of information. The INPO JTA identified more than 28,000 K/As and nearly 800 tasks. The extensive number of tasks and K/A statements is attributable, in part, to the specific purpose of the analysis, which was to provide an information base to be used in developing training programs that would be applicable to all pressurized- and boiling-water reactor facilities. Accordingly, many of the individual statements were too specific or too elementary for use as the basis for development of the NRC's examinations. The job content of special interest to the NRC is that subset of K/As that are required for the safe operation of the nuclear plant. Although safe performance and efficient performance may have considerable overlap, any K/A that contributes to efficiency but not to safety is an inappropriate focus for the NRC's examinations.

The applicable K/A catalogs provide the basis for the development of content-valid examinations for ROs and SROs, consistent with the testing industry standards described above.

The fact that the K/As from which test items are developed are drawn or sampled from the same universe regardless of who develops the examination helps ensure that the examinations are consistently content valid. Furthermore, developing the examinations using the appropriate K/A catalog in conjunction with the applicable examination standards and related appendices helps

ensure that the examinations cover a representative sample of the topics listed under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 55, "Operators' licenses."

The NRC developed K/A catalogs NUREG-1122 and NUREG-1123 based on the INPO JTA. The catalogs were reviewed by licensed ROs and SROs, as well as the NRC's own license examiners. The NRC developed K/A catalogs NUREG-2103 and NUREG-2104 based on the design center JTA. These catalogs were reviewed by system experts and personnel knowledgeable of the design, many of whom were legacy-plant ROs and SROs, as well as the NRC's own license examiners. These experts reviewed the K/A statements for accuracy and completeness and then rated each statement with respect to its importance to safe plant operation. Chapter 1 of each catalog further explains the content of the K/A catalogs.

In addition to the NRC's K/A catalogs, learning objectives from the facility licensee's training program often provide a supportive reference for test items to include in the NRC's examination. Since facility learning objectives are specific to the job requirements at a given site, they should provide an excellent basis for test item development. However, because they are not always stated at the comprehension- or analysis-level of knowledge (the preferred focus for NRC examinations), they should be referenced only to the extent that they support a test item that is being developed.

b. Use a Sample Plan

Once the essential K/As have been identified through the JTA, test specifications must be developed. The test specifications consist of a content outline or sample plan indicating what proportion of items or questions shall deal with each K/A. Because a single test cannot measure every K/A required to be a licensed operator, it must sample the required knowledge or performance in a manner that allows inferences to be made about the examinees' performance on the broader population of knowledge, even though the full body of knowledge was not tested. The sample must be evenly distributed and soundly based so that the NRC can confidently assume that the untested knowledge is proportionately known or not known in relation to the score on the sample. In other words, by testing performance on the sample, it is possible to make inferences concerning the broader area of knowledge not tested. This is referred to as a "validity inference."

The sample plan is at the heart of making a validity inference. Research indicates that when samples are not chosen systematically and according to the sample plan, the sample is biased, and, therefore, its validity is reduced. When the sample is biased or skewed in a particular direction, it introduces some degree of sampling error, which makes it impractical to infer or generalize that the examinees have mastered the larger population of untested knowledge from which the sample was drawn.

Test items selected for inclusion in an NRC examination should be based on K/As contained in the appropriate K/A catalog. Testing outside the documented K/As can jeopardize the content validity of the examination. Content validity can also be reduced if the examination excludes important K/As. Therefore, the sample of K/As that are tested should cover all of the K/A categories in the catalog in a fashion that is consistent with their contribution to the public protection function of the examination. Not all categories are equal in this regard. This conclusion is based on the analysis of ratings on importance and testing emphasis collected from licensed SROs and NRC license examiners. The specific examination standards provide additional guidance on how to develop test outlines that will ensure adequate content coverage.

It is important to note that the testing demands for an initial examination are different than those for a requalification examination. The requalification examination is based on the plant's systems approach to training during the requalification cycle and will more closely parallel the training received in the requalification program. Consequently, the instructional and testing processes are more closely linked. The initial examination, on the other hand, covers all instruction related to safety-significant K/As that either were or should have been taught during the training program. The examination standards ensure that the K/As are sampled in a relatively uniform process that would likely include content and instruction that occurred from the beginning to the end of the program and would not focus on any particular segment of instruction.

2. Operational Validity

The second facet of validity is operational validity. To the extent possible, test items should address an actual or conceivable mental or psychomotor activity performed on the job. In this regard, the more operationally oriented a test item is, the more valid the test item will be. Because operationally valid items involve skills central to job performance (i.e., analysis, prediction of events or system responses, or solving problems), the items should be written at the comprehension or analysis level rather than at the level of simple fundamental knowledge. The theoretical knowledge classification system upon which the NRC bases its operational validity estimates is Bloom's taxonomy.

Bloom's taxonomy suggests that testing knowledge at a higher cognitive level (HCL) (i.e., comprehension and analysis) is more efficient and operationally valid because those higher levels include the fundamental knowledge required, in part, to answer the higher level question. Furthermore, the higher the level tested in the test item, generally the more operationally valid that test item will be, since it is at the higher levels that questions invoke problem-solving, diagnosis, prediction, and analysis of conditions, events, and responses.

Designing test items that test the *application* of knowledge in different content situations (i.e., process testing) is at the heart of designing good, discriminatory test items. Just as a math teacher would not design a test to ask multiplication questions that were identical to practice questions, so too should the examination author minimize asking questions that are identical to those previously rehearsed or tested. Test items should attempt to assess similar knowledge applications in different contexts, thereby assessing the examinee's problem-solving skills in new and different applications. These applications should be item substitutions of comparable difficulty, neither harder nor easier than those practiced. This practice provides assurance that the examination is valid and discriminatory, since the process (rather than the specific content) is primarily measured.

The NRC cannot make confident and consistent validity inferences (i.e., licensing decisions) if one examination assesses knowledge at lower cognitive levels and another assesses knowledge at higher levels (greater depth). Although each examination may meet sample plan coverage guidelines, they test different levels of knowledge; consequently, they are different and inconsistent measuring instruments. Therefore, they yield different validity inferences of minimally safe operator performance. Section D of this appendix provides a more detailed discussion of consistency and reliability, and Appendix B gives a more detailed discussion of the various levels of knowledge as they relate to the development of written examination questions.

3. Discrimination Validity

The third facet of validity concerns the examination's ability to discriminate or make some distinction along a continuum of examinee performance. In that regard, the primary objective of the NRC's examinations is to determine whether the examinees have sufficiently "mastered" the knowledge, skills, abilities, and other attributes to perform the job of an RO or SRO at a specific plant. The NRC's examinations are not intended to distinguish among levels of competency or to identify the most qualified individuals but to make reliable and valid distinctions at the minimum level of competency that the agency has selected in the interest of public protection.

a. Criterion-Referenced Testing

The NRC's initial and requalification examinations, like most licensing examinations, are criterion- rather than norm-referenced tests. This means that the examinee must achieve a pass/fail or minimal cut score or grade to demonstrate sufficient K/As to safely operate the power plant. If the examination does not intend to discriminate at an agreed-upon minimal measure of knowledge or performance, there is little reason to administer the examination. For a criterion-referenced test to be effective, both the individual test items and the overall examination must discriminate between applicants who have and have not mastered the required K/As and skills.

b. Cut Scores

For NRC examinations, the overall cut scores (on the written examination and walkthrough portion of the operating test) are fixed at 80 percent (although lower cut scores apply to subparts of the examination); it is the content of the examination that varies from occasion to occasion because of the plant-specific character of the test material. As discussed below, the cut score must be fixed for several reasons, including the uniqueness of each examination, consistency, and public confidence.

In the writing, reviewing, setting of scoring standards, and grading of any particular NRC examination, both the examination author and the reviewer are well aware of the NRC-established passing score of 80 percent. They may also have knowledge of how prior examinees have performed on questions similar to those used on the examination being prepared and expectations as to how a qualified or unqualified applicant should perform on the examination. They must use this knowledge to control the nature and difficulty of the examination such that an examinee who is deemed to be qualified scores above the passing grade, while an examinee who is deemed to be unqualified scores below that grade.

The traditional cut score on the examination should not be viewed as arbitrary. Rather, it reflects a point on the test at which author and reviewer judgment separates the qualified from the unqualified. Nonetheless, the judgment is probably similar to other methodologies for determining passing test scores. For example, rather than explicitly judging the probability that a minimally qualified applicant will pass an item, the author is implicitly being asked to write an examination on which, in the author's judgment, the minimally qualified applicant will obtain a score of at least 80 percent. Achieving this objective requires the author and reviewer to integrate their content and process skills.

c. Level of Knowledge Versus Level of Difficulty

As further discussed in Appendix B, the NRC uses Bloom's taxonomy as the basis for classifying the level of knowledge of its test items (i.e., written examination questions, job

performance measures (JPMs), and simulator events). Simply stated, level of knowledge represents the range of mental demands required to answer a question or perform a task. In other words, level of knowledge is a continuum of mental rigor that ranges from retrieving fundamental knowledge (low level) to retrieving that knowledge and understanding, analyzing, and synthesizing that knowledge with other knowledge (high level).

The accurate classification of knowledge as either low or high level requires the application of objective criteria. Although different reviewers can arrive at different conclusions about the knowledge level needed for individual test items, a common set of criteria can make the classification an informed process, thereby minimizing the differences among reviewers. Consistency among reviewers is important because this NUREG establishes specific criteria relative to the number of HCL test items on the site-specific written licensing examination. Keep in mind that classifying a test item's required level of knowledge is not equivalent to determining its level of difficulty, which is discussed as a separate issue below.

When evaluating level of knowledge, two key elements must be considered:

1. the number and type of mental steps necessary to process the given data and arrive at the correct answer

2. the training and experience level of the target test group

Generally, an HCL test item will require at least two mental steps—one requires the recall of acquired knowledge, and the other requires associating two or more pieces of data. The number and types of mental steps that must be considered are those necessary to *rule out* plausible incorrect distractors, as well as the steps needed to *identify* the correct answer. Distractors can contain knowledge that the applicant might need to manipulate with other information contained in the question in order to answer the question, and this, in turn, may raise the level of knowledge needed for the question. However, it is largely the *stem* of the question that drives the mental thought required to answer the question.

An HCL test item will have at least *two data points* that must be associated. The test item may provide these data points, or the examinee may have to recall them from memory. For example, the examinee may be given one plant operating parameter in the stem of a question and have to recall a setpoint to evaluate whether a particular action should have occurred. This is considered HCL because it requires the examinee to (1) recall a setpoint beyond the information given in the stem and (2) compare the setpoint to a given data point. Because more than one mental step was necessary to answer this question and two data points had to be associated or compared, it should be classified as HCL.

Similarly, if a test item elicits a mental demand that requires a "why" or "how" response such that the examinee must derive the correct explanation, prediction, or action, the item is testing at the comprehension or application level. Comprehension/application-level test items require the examinee to recall stored knowledge and understand the relationship between *two or more* pieces of data (such as events or conditions) given in the stem of the test item. In sum, HCL test items require multiple mental processing steps, which usually involve the recall and integration of two or more pieces of data. Good HCL test items are operational in nature and require demonstration of understanding and problem-solving.

Test items that simply ask examinees to provide a single answer that requires a "who, what, when, or where" response are typically fundamental knowledge (low-level) questions because they involve recalling or recognizing a single answer or block of information. The examinee is

not required to understand cause-effect relationships or system responses. Therefore, if a test item simply asks for a reactor trip setpoint and does not require a comparison with an operating parameter value, it would be considered a lower cognitive-level question because only one mental step, with no data association, is necessary to arrive at the answer.

As previously noted, the training and experience of the target test group also must be considered when evaluating level of knowledge. A reviewer can approach the classification from the perspective of an "expert," with a predetermined belief about the mental processes required to answer a given question, and incorrectly assume that the novice applicant will use the same processes. This is a form of perceptual bias that can affect classifications of the level of knowledge, as well as the level of difficulty. When examining new license applicants, the NRC expects that the typical applicant will need to mentally analyze, or figure out, the answers to HCL questions. Whereas the expert is able to answer a test item quickly and easily, the novice may have to eliminate plausible distractors to arrive at the correct answer, an indication of an HCL question. Therefore, when making the level of knowledge determination, examination writers and reviewers should place themselves in the context of the "novice applicant" and assess the components of the test item that the novice must manipulate to answer the test item.

Keep in mind that many test takers may easily arrive at the answer; however, ease of answering a question is a relative concept and should be clearly separated from the mental processes, or level of knowledge, required to answer the test item.

For the operating test items (i.e., JPMs and simulator events), the regulations at 10 CFR 55.45(a) and 10 CFR 55.59(a)(2)(ii) specifically require an assessment of the examinees' understanding of and ability to perform the actions specified in the regulation. Alternate-path JPMs are used to assess such understanding during the walkthrough portion of the operating test because they require examinees to evaluate unplanned conditions or events while executing procedures and to implement acceptable, alternative methods of accomplishing the assigned tasks.

In summary, the following concepts apply:

- Level of knowledge is a taxonomy to determine the mental processes used to answer a question. Those processes are classified as either lower or higher cognitive level and should not be confused with level of difficulty.

- An HCL test item requires at least two mental steps—one involving the recall of acquired knowledge and the other requiring the association of two or more pieces of data. The number and type of mental steps that must be considered include those necessary to rule out plausible incorrect distractors, as well as the steps needed to identify the correct answer. If there is doubt concerning the number of associations, an item should be classified as HCL. As a tip, the author should attempt to answer the question in an unaided recall manner (i.e., if the question were in the completion or short answer format, by covering the distractors and attempting to complete the answer). Then, the author should analyze the mental process needed to answer the question using the "who, what, when, or where" (fundamental) or the "how or why" (comprehension/analysis) criteria discussed above.

- When assessing level of knowledge, the examination writers/reviewers must use the perspective of the test taker in the target group (i.e., novice versus expert) to avoid

perceptual bias. The reviewer has seen the item, knows the answer, and may not appreciate the mental processes that an examinee may use to answer the question.

Level of difficulty is a separate concept but is often influenced by the level of knowledge needed to answer a test item. Although HCL test items are generally more difficult, this may not always be true. A fundamental knowledge question may be easy (e.g., how many inches are in a foot) or difficult (e.g., in what year was the printing press invented).

The NRC evaluates the level of difficulty to answer a test item to ensure that the item can help discriminate between safe and unsafe operators. The examination's overall level of difficulty, as well as that of its individual test items, should center around the 80-percent cut score, as described further in the next subsection.

Assigning a level of difficulty rating to an individual test item is a somewhat subjective process. As when assessing the level of knowledge needed to answer an item, examination authors and reviewers must "detach themselves" as subject matter experts, place themselves in the position of the novice applicant, and apply what they know about previous applicants' performance on similar test items. For example, if 10 to 20 percent of past license applicants missed a particular item, the item would be considered moderately discriminating, with a difficulty rating of 3 on a 5-point scale. It would be reasonable to expect that a comparable test group would perform in the same way with a similar item. Conversely, if 95 percent or more of license applicants typically answer a particular test item correctly, future use of a comparable item will likely yield a similar result; therefore, a difficulty rating of 1 would be justified.

d. Cut Scores and the Level of Difficulty

For the cut score of 80 percent to be meaningful, individual test items must be written "near" that level. A target level of difficulty range of 70 to 90 percent is recommended for individual test items. Test items that are so difficult that few (if any) of the examinees are expected to answer correctly do not discriminate and should not be used on an NRC examination. Similarly, test items that are so easy or fundamental that even those examinees who are known to have performance problems will be able to answer them correctly should be used with discretion. The NRC expects that every examination will contain some test items that all or most of the examinees will answer correctly or incorrectly. This does not necessarily mean that the test items or the examination are invalid.

It should be stressed that the intent is not for all examinees to achieve a score of 80 percent. In fact, historically about 90 percent of examinees score 80 percent or above on the NRC examinations. A score of 80 percent is the minimal pass score that the author and reviewer must keep in mind as a functional level of discrimination for setting item difficulty. To achieve this, the test author must keep in mind and integrate the following concepts:

- the level of knowledge required of examinees taking the examination
- the operational validity of the questions (i.e., are they expressed as a conceivable job behavior)
- the ability of the distractors to distract the examinees
- the examinees' past performance on items of similar difficulty

e. Use of Item Banks

Test item banks are a valuable resource for learning and represent one fundamental basis for training and testing. However, it would be inappropriate to copy all or a significant portion of the items for an examination directly from the bank if the same items were previously used for testing or training. Test item banks must be used properly to maintain the validity, reliability, and consistency of the examinations. Previously administered test items reduce examination integrity because examination discrimination is reduced.

Discrimination is reduced because the cognitive level at which the examinees are tested could decrease to the simple recognition level if the item bank is small and available for the examinees to study. The comprehension and analysis levels of knowledge may not be assessable because mental thought has been reduced to a recognition level, and decisionmaking is absent because test items, JPMs, or scenario events have been rehearsed and are anticipated. In short, challenge and mental analysis are lost, and the examinees are tested at a rote-rehearsal level. An examination cannot assess higher cognitive and analytical abilities if examinees have already seen a significant portion of the items within the examination.

Furthermore, when the bank of items from which the examination is drawn is known to the examinees before the examination, the examination is said to be highly predictable. Predictable examinations tend not to discriminate because what is being tested is simple recognition of the answer. Although studying past examinations can have a positive learning value, total predictability of examination coverage through overreliance upon examination banks reduces examination integrity. When the examinees know the precise and limited pool from which test items will be drawn, they will tend only to study from that pool (i.e., studying to the test) and may likely exclude from study the larger domain of job knowledge. When this occurs, it decreases the confidence in the validity inferences that are made from performance on the test to the larger realm of knowledge or skill to be mastered.

Therefore, the NRC has placed limits on the use of facility item banks or other such available banks or resources that have been published, reviewed, or used as the basis for training; the examination standards discuss the specific limits. The NRC appreciates the amount of resources required to develop new test items that are appropriate for use on an NRC examination, and it realizes that existing test items are a valuable resource that should not be wasted. Therefore, the NRC has elected to strike a balance in setting limits on the mix of previously used bank items, modified bank items, and newly developed (i.e., not previously seen) items. The agency has placed additional limits on the repetition of test items from prior quizzes and examinations given at the facility.

C. Reliability

Reliability is the second fundamental testing concept that has played a decisive role in the development of the NRC's initial and requalification examination programs. Whereas the notion of validity emphasizes the appropriateness of the content of the NRC examinations, reliability stresses consistency, repeatability, and the degree of confidence that the examination process will result in valid pass/fail decisions. The reliability of an examination is as important as its validity; if an examination is not reliable, it cannot be valid.

The importance of examination consistency (reliability) cannot be overstated. In fact, test reliability represents the consistency among examinations that, in turn, gives the NRC the confidence that all examinations are valid measures from which to make confident and valid licensing decisions. The combined effects of item bank use, the level of knowledge tested in the

individual test items, and the expected discriminatory (difficulty) level of the items play an important role in determining the reliability of the examination.

The higher the reliability of a test, the fewer errors will be made in determining whether the examinees have mastered the job requirements. Examinations should differ only in the specific content covered, not in their developmental processes, manner of sampling, item construction criteria, level of item bank use, or levels of knowledge required and difficulty. The standardization of the process creates consistency of measurement. Ideally, any two examinations that are developed using these procedures and guidelines and administered to the same group of examinees should produce comparable results; likewise, the results of any examination administered to different but similarly trained and qualified examinees should also yield comparable results.

The standardized examination development, administration, and grading procedures described in this NUREG have evolved over a period of years in an effort to enhance the reliability and, hence, the validity of the NRC's licensing decisions. The importance of having these procedures and complying with their intent has grown in proportion with the number of individuals and organizations that have become involved in the examination process.

Section 107 of the Atomic Energy Act of 1954, as amended, requires the Commission to prescribe uniform licensing conditions for operators. Therefore, the NRC expects facility licensees to develop and submit their proposed examinations based on the guidelines and instructions contained here. The NRC discourages facility licensees from using testing methodologies that do not conform to the policies, procedures, and practices defined in this NUREG. Nonetheless, facility licensees may propose alternatives to specific guidance in NUREG-1021, and the NRC will review and rule on the acceptability of those alternatives.

D. The Importance of the Written Examination

Society has institutionalized written examinations as an accepted and important facet of performance testing, and these examinations are used routinely as an integral factor in measuring human performance in nearly every field of study. Educational institutions from elementary through graduate schools use written examinations as all or part of an assessment to measure intended competencies. Moreover, many fields of business, including the legal, medical, education, and accounting professions, use written examinations for licensing and credentialing activities.

The importance of knowledge testing should not be underestimated, because knowledge is the underpinning of professional performance. The objectives of knowledge testing are varied; they may include assessing fundamental understanding, as well as testing more advanced levels of expertise. The most effective tests of knowledge include questions and test items that measure the application of knowledge that directly relates to an individual's job. In the case of operator licensing, the NRC's written examination yields a key measure that allows the agency to make a confident decision about the safety-significant performance of the individual seeking a license.

Deemphasizing or sidestepping knowledge testing through careless or simplistic testing processes or treating it secondarily to other portions of the examination that are more operationally oriented could affect subsequent job performance. Failing to focus on testing the individual operator's cognitive abilities (i.e., comprehension, problem-solving, and decisionmaking) or paying insufficient attention to the operator's fundamental understanding of job content (e.g., systems, components, and procedures) may ultimately place job performance at risk of gradual degradation. When the demand for disciplined learning and study declines or

the level of knowledge (depth of application) required for the job is reduced, it could lead to less time spent in training preparation, less mental review and practice, more forgetting of factual details, less reinforcement and application of job concepts, and a gradual decline in performance.

Moreover, without a solid fundamental knowledge base, operators may not perform acceptably in situations that procedures do not specifically address. Since every performance has an underlying knowledge component, that knowledge and its depth need development and assessment to ensure the operators' competence on the job. Studies assessing mental performance in cognitively demanding emergencies point out that higher level cognitive thought (such as event diagnosis and response planning) are important in responding to safety-related events.

E. Objective Versus Subjective Test Items

Traditionally, questions that require the examinee to supply an answer (e.g., short answer and essay) have been considered "subjective," while questions requiring the examinee to select an answer (e.g., multiple choice) have been considered "objective." These terms arose from the scoring of the items. If graders need to have subject matter expertise to interpret the answers, the question is considered subjective. By contrast, if graders can score the examination by verifying a single letter or number, the question is considered objective.

Multiple choice items are the most common and most popular of the select type items. For reasons of consistency and reliability, they are currently the only type of items acceptable for use on NRC initial licensing examinations. Although multiple choice items are not as easy to construct as other question forms, they are very versatile, can be used to test for all levels and types of knowledge, and minimize the likelihood that the examinee will obtain the correct answer by guessing. Scoring multiple choice examinations is also considerably more reliable and less time consuming than scoring open-ended response items. Furthermore, since each item requires less time to answer, more items can be used to test a larger sample of K/As. This provides better content coverage and increases test reliability.

For the purposes of NRC requalification examinations and initial operating tests, the definition of "objective" differs from the traditional definition discussed above. In this case, an objective test item is one for which (1) there is only one correct answer, and (2) all qualified graders would agree on the amount of credit allowed for any answer.

Therefore, all questions on NRC examinations shall be objectively gradable, regardless of the item format. Questions with no single correct answer or for which the credit given can vary, depending on who graded it or when it was graded, have no place on an NRC examination.

APPENDIX B
EXAMPLES OF WRITTEN EXAMINATION QUESTIONS

Sections A – G of this appendix contain examples of written examination questions that illustrate the psychometric principles. Section H of this appendix contains examples of satisfactory and unsatisfactory Senior Reactor Operator (SRO)- only questions.

A. Levels of Knowledge

The first three examples in this category illustrate how the level of knowledge tested can vary among a series of questions that focus on the same pair of knowledge and ability (K/A) statements. Even though the K/A statements below use verbs (i.e., identify, define) that elicit a fundamental or simple memory level of knowledge, the item author can increase their operational validity by testing at a higher cognitive level:

- 19104K101 (pressurized-water reactor (PWR)) or 291004K101 (boiling-water reactor (BWR)): identification, symptoms, and consequences of cavitation
- 193006K111 (PWR) or 293006K109 (BWR): definition or explanation of cavitation

1. Fundamental Knowledge/Simple Memory

Which one of the following describes pump cavitation?

a. Vapor bubbles form when the enthalpy difference between pump discharge and pump suction exceeds the latent heat of vaporization.

b. Vapor bubbles form in the eye of the pump and collapse as they enter higher pressure regions of the pump.

c. Vapor bubbles are produced when the localized pressure exceeds the vapor pressure at the existing temperature.

d. Vapor bubbles are discharged from the pump, where they impinge on downstream piping and cause a water hammer.

This question simply asks for a description of cavitation and, as such, is a “low cognitive order” question that does not require any understanding, analysis, or problem-solving. The examinee merely needs to recognize the correct description (b); the other options appear plausible but are, nonetheless, incorrect.

2. Comprehension

Cavitation in an operating pump may be caused by:

a. lowering the pump suction temperature
b. throttling the pump suction valve
c. increasing the pump back-pressure
d. increasing the pump suction pressure

This example requires the examinee to determine causation, which requires an understanding of the correct answer and recognition that the incorrect answers are, indeed,

incorrect. As with any item, the quality of this item is determined by the ability of the incorrect options to distract from the correct answer.

3. Analysis

While on surveillance rounds, an operator notices that a centrifugal pump is making a great deal of noise (like marbles rattling inside the pump casing), and the discharge pressure is fluctuating. This set of conditions indicates pump:

a. runout
b. cavitation
c. bearing deterioration
d. packing deterioration

This example requires the candidate to analyze multiple abnormal indications (multiple effects) for an operating centrifugal pump and determine the cause (complex cause-effect). All the distractors are initially plausible in that they have face validity (i.e., they have reasonable connections to centrifugal pump operation).

4. Low Level of Knowledge Examples

The following four examples illustrate questions requiring a low level of knowledge, which should be used judiciously on U.S. Nuclear Regulatory Commission (NRC) examinations.

Which one of the following is powered from 4,160 VAC bus 1A?

a. residual heat removal (RHR) pump A
b. RHR pump B
c. RHR pump C
d. RHR pump D

Select the full core display indication of a drifting control rod:

a. red light
b. white light
c. blue light
d. amber light

Although the above items have high K/A values, they are written at a low level of knowledge and have low operational validity and low discriminatory value. The following question tests at a low level of knowledge because it does not test the examinee's ability to recognize the class of fire or select the correct extinguisher.

Concerning the use of water as a fire extinguishing agent, select the correct statement from the following:

a. It is the primary agent for extinguishing Class A fires and is also effective on Class B and C fires.

b. It is the primary agent for extinguishing Class B fires and is also effective on Class A and C fires.

c. It is the primary agent for extinguishing Class A and B fires but is not effective on

Class C fires.

d. It is the primary agent for extinguishing Class B and C fires but is not effective on Class A fires.

The next question might be considered a fundamental knowledge-level question that errs in the opposite direction (i.e., it could be too difficult *unless* the operators are expected to memorize the correct time requirement to prevent damage to equipment). Moreover, this item may also have low discriminatory validity unless at least 80 percent of the examinees are expected to know the answer from memory.

RCP 2A tripped after running for 50 minutes. The RCP was restarted but tripped again within 15 seconds. Which ONE of the following is the minimum required interval before the next attempt to start RCP 2A?

a. 15 minutes
b. 30 minutes
c. 45 minutes
d. 60 minutes

B. Low Operational Validity

The next three questions illustrate another common psychometric deficiency, known as low operational validity, which should be avoided on NRC examinations.

1. Under which one of the following conditions should the shift supervisor inform the shop steward?

a. initiation of a directed overtime request
b. disciplinary action against a supervisory employee
c. medical injury of a contractor employee
d. personnel error by a bargaining unit member

While this question may be related to a shift supervisor's job, it has nothing to do with nuclear safety and should not be included on an NRC examination.

2. Which one of the following main steam line components is designed to limit the differential pressure across the steam dryer assembly?

a. main steam line flow elbows
b. main steam isolation valves
c. main steam shutoff valves
d. main steam line flow restrictors

Knowing the purpose of a flow restrictor is not a good indicator of the operator's ability to operate the plant. Thus, knowing the answer to this question is not clearly job related.

3. Given that all components controlled by the "Locked Valve, Breaker, and Component Control" administrative procedure must be properly sealed and tagged, which one of the following is the correct location for the "XXXX-XXXX" tag for an electrical breaker?

a. wired to the breaker handle

b. glued to the breaker cubicle
c. attached to the breaker cubicle with a magnetic clip
d. wired to the breaker cabinet door

This question is likely unrelated to the reactor operator's (RO's) job function and, therefore, would be unacceptable.

C. Low Discriminatory Validity

The next three questions illustrate another common psychometric deficiency, known as low discriminatory validity, which should be avoided on NRC examinations.

1. Which one of the following reactor water levels will initiate the RHR pumps?

a. level 1 only
b. levels 1 and 2 only
c. levels 1 and 2 and 3 only
d. level 6 only

The information in this question should be known by all operators at all times. Therefore, the question has low discriminatory value and also tests at a low level of knowledge.

2. The plant is recovering from a scram that resulted from a spurious Group I isolation. The cause of the isolation has been repaired, and preparations are being made to reopen the main steam isolation valves (MSIVs). Reactor pressure is currently 825 psig and the main steam lines are being pressurized.

   WHICH ONE of the following is the LOWEST main steam line pressure that will allow the MSIVs to be opened in accordance with the procedure?

a. 625 psig
b. 675 psig
c. 725 psig
d. 775 psig

Similar to the previous example, this question also has low discriminatory validity.

3. $$\text{SG (corrected)} = \text{SG (uncorrected)} + \frac{(\text{T - 77 degrees F})(0.001)}{3} + (\text{Level Mark})(0.003)$$

   Based on the above information, the specific gravity (SG) is ___?___, which ___?___ meet the technical specification (TS) Category A limit. Note: This question requires the use of TS 3.8.2.3.

a. 1.198, does NOT
b. 1.195, does NOT
c. 1.207, does
d. 1.201, does

This question might appear to test the examinees' ability to understand and apply battery parameters to the determination of TS operability. However, the question really only tests their ability to substitute certain parameters into a given equation and perform an arithmetic

calculation. Reference to the TS noted in the question is not required based on the three different values of SG (corrected) supplied as distractors. Therefore, the question has a low discriminatory value because any individual possessing adequate arithmetic knowledge will arrive at the correct answer.

D. Implausible Distractors

The next two questions illustrate the concept of implausible distractors, which is another common psychometric deficiency that should be avoided on NRC examinations.

1. Which of the following will cause the RHR pumps to start during a design-basis loss-of-coolant accident (LOCA)?

a. low drywell pressure
b. high reactor water level
c. high drywell pressure
d. MSIVs in the NOT OPEN position

Distractors "a," "b," and "d" are implausible, considering minimal knowledge of the plant response to a LOCA.

2. Which ONE of the following conditions will NOT result in a shutdown of the standby gas treatment system?

a. manual shutdown
b. high-temperature (107 degrees C, 225 degrees F) charcoal bed
c. high-temperature (82 degrees C, 180 degrees F) heater inlet
d. overloads in the local control panel

Distractor "a" is very implausible, and distractor "d" is subjective. The question is also written from a negative perspective.

E. Confusing Language

The following questions illustrate how confusing language and inappropriate negatives in the stem of the question can mislead examinees. NRC examinations should avoid such questions.

1. Which of the following parameters will start the high-pressure coolant injection, reactor core isolation cooling, or standby gas treatment systems?

a. low reactor water level
b. high primary containment pressure
c. high reactor building exhaust radiation
d. low reactor building differential pressure

This question could result in four correct answers, since the question could be interpreted individually or collectively.

2. Which ONE of the following most accurately describes the response to a static inverter failing?

a. The power supply will automatically transfer to the alternate 600-V Bus 2C/Vital AC Transformer 2A.

b. The 125-V DC battery will maintain power to the Vital AC Cabinet for up to 5 hours.

c. The power supply can be manually transferred to the alternate 600-V Bus 2C/Alternate Static Inverter by pressing a transfer pushbutton.

d. The power supply can be manually transferred to the alternate 600-V Bus 2C/Vital AC Transformer 2A by positioning the transfer switch to ALTERNATE.

This question implies an automatic response, but the listed correct answer and one distractor are operator actions, not responses to the loss of the static inverter.

3. With regard to temporary plant alterations (TPAs), technical reviews are NOT required for the following:

a. a TPA NOT installed using an approved procedure

b. TPAs installed on balance-of-plant systems, BUT they ARE required for safety-related systems

c. a TPA that has NOT been directed by the shift supervisor to be an emergency TPA

d. all TPAs directed by the shift supervisor

This question contains two main problems. First, although negative questions can be used, they should be used for good reason; there appears to be no good basis for asking this question negatively. Second, two of the distractors ("a" and "c") also contain a negative, thus creating a double negative with readability confusion, which violates good item writing practice. The question should more appropriately ask the conditions under which technical reviews are required, thereby eliminating the negative in the stem.

F. Collection of True/False Statements

Collections of true/false statements typically only test simple rote memory; the examinee simply needs to recall a definition or condition. The questions elicit no comprehension or problem-solving; hence, they lack operational validity. This type of question allows an examinee to answer the question without referring to the stem of the question and should be avoided on NRC examinations.

1. Which ONE of the following is true?

a. High drywell pressure will automatically start the emergency diesel generators.
b. Low reactor water level will trip the main turbine.
c. High reactor pressure will initiate reactor core isolation cooling.
d. High reactor power with the mode switch in startup will NOT close the MSIVs.

2. Which one of the following describes pump cavitation?

a. Vapor bubbles form when the enthalpy difference between pump discharge and pump suction exceeds the latent heat of vaporization.

b. Vapor bubbles form in the eye of the pump and collapse as they enter higher pressure regions of the pump.

c. Vapor bubbles are produced when the localized pressure exceeds the vapor pressure at the existing temperature.

d. Vapor bubbles are discharged from the pump where they impinge on downstream piping and cause a water hammer.

G. Backward Logic

Backward logic questions ask the examinee for information that is normally received while providing the examinee with information that he or she normally has to supply. In an operational setting, operators are faced with conditions and are required to know which procedure(s) to use. These questions ask them to do just the opposite and, therefore, should be avoided on NRC examinations.

1. Which of the following parameters will simultaneously start high-pressure coolant injection, reactor core isolation cooling, and the standby gas treatment system?

a. high reactor pressure vessel water level
b. high drywell pressure
c. low reactor pressure vessel water level
d. low drywell pressure

It would be better to select a parameter and then request the expected system response because that is more operationally relevant.

2. If it takes 0.354 cubic meters (12.5 cubic feet) of concrete to build a square loading pad that is 6 inches thick, what is the length of one side of the pad?

This question gives the examinees information they should be asked to calculate, while it requires them to provide information they would be given in an actual work situation.

H. Senior Reactor Operator-Only Questions

1. Examples of Satisfactory Senior Reactor Operator-Only Questions

a. Westinghouse: E07 Saturated Core Cooling

EA2.2: Ability to determine and interpret the following as they apply to the saturated core cooling: Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. (CFR: 43.5 / 45.13): 3.3/3.9

A steam generator tube rupture has occurred, and the crew is performing actions contained in Emergency Operating Procedure (EOP) 3.1, "SGTR with Loss of Reactor Coolant—Subcooled Recovery." The following plant conditions currently exist:

- All critical safety function (CSF) status trees are GREEN except:
  - core cooling—YELLOW due to reactor vessel level instrumentation system (RVLIS) level
  - inventory—YELLOW due to RVLIS level
- The crew has determined that the RHR sump level (based on refueling water storage

tank drawdown) is LESS than expected.

Which ONE of the following identifies the correct implementation of procedures for this event?

A. Transition to EOP 3.2, “SGTR with Loss of Reactor Coolant—Saturated Recovery.”
Implementation of the CSF Yellow Path procedures is not allowed while in EOP 3.2.

B. Remain in EOP 3.1.
Implementation of the CSF Yellow Path procedures is not allowed while in EOP 3.1.

C. Transition to EOP 3.2.
The actions of both Yellow Path procedures may be performed if desired.

D. Remain in EOP 3.1.
The actions of both Yellow Path procedures may be performed if desired.

Justification: The question requires the applicant to assess plant conditions and to know the content of procedures in order to select a required course of action. Linked to 10 CFR 55.43(b)(5).

b. EPE: 295028 High Drywell Temperature

EA2.01: Ability to determine or interpret (or both) the following as they apply to HIGH DRYWELL TEMPERATURE: Drywell temperature. (CFR: 41.10 / 43.5 / 45.13): 4.0/4.1**

Following a small-break LOCA on Unit 2, the following conditions exist:

- drywell temperature 270 degrees F
- drywell pressure 5.0 psig
- torus pressure 2.5 psig
- torus level +5 inches
- reactor pressure 395 psig

Containment H_2O_2 Monitors CAC-AT-4409 and -4410 are not available at this time. The Chemistry staff has been notified but has not yet sampled the drywell.

Which ONE of the following procedures provides the required actions that mitigate these plant conditions?

A. SEP-05, “Primary Containment Purging”
B. SEP-10, Section 4, “Defeating Drywell Cooler LOCA Lockout”
C. SEP-03, “Suppression Pool Spray Procedure”
D. SEP-02, “Drywell Spray Procedure”

Justification: The question requires the applicant to assess plant conditions and to know the content of procedures in order to select a required course of action. These procedures are not major EOPs (i.e., they are supplementary emergency procedures directed from within the major EOP). Linked to 10 CFR 55.43(b)(5).

c. Generic APE: 027 Pressurizer Pressure Control System (PZR PCS) Malfunction

AA2.15: Ability to determine and interpret the following as they apply to the pressurizer

pressure control malfunctions: actions to be taken if the PZR pressure instrument fails high. (CFR: 43.5 / 45.13): 3.7/4.0

Unit 1 initial conditions:

- time = 10:00
- reactor power = 100%
- 1-RC-PORV-1455C (PZR Pressure PORV) indicates open
- both PZR spray valves indicate open
- RCS pressure = 2,200 psig decreasing
- 1-AP-31.00 (Increasing or Decreasing RCS Pressure) initiated

Current conditions:

- time = 10:01
- reactor power = 97%
- RCS pressure = 2,100 psig increasing
- spray valve in MANUAL and closed
- 1-RC-PORV-1455C in MANUAL and closed

Based on these conditions, which ONE of the following identifies (1) the PZR pressure control component that failed high and (2) the status of 1-RC-PORV-1455C operability in accordance with TS?

A. 1-RC-PT-1444
Power-operated relief valve (PORV) is OPERABLE.

B. 1-RC-PT-1444
PORV is INOPERABLE.

C. 1-RC-PT-1445
PORV is OPERABLE.

D. 1-RC-PT-1445
PORV is INOPERABLE.

Justification: The first part of the question can be answered using RO knowledge of systems. The second part of the question can only be answered by a senior reactor operator (SRO) applicant if he/she knows the information in the TS bases. No reference was provided. This question is linked to 10 CFR 55.43(b)(5).

d. Generic K/A G2.2.6: Knowledge of the process for making changes to procedures. (CFR: 41.10 / 43.3 / 45.13): 3.0/3.6

The plant has developed a new surveillance test procedure with the following attributes:

- The test procedure involves a process that was NOT previously described in the final safety analysis report.
- The test procedure does NOT constitute an unreviewed safety question.
- The test procedure will require a change to TS.

Which ONE of the following identifies whether a license amendment is required and whether

the surveillance test procedure can be implemented without NRC approval in accordance with 00056-C, 10 CFR 50.59 screening and evaluation?

A. License amendment is NOT required; NRC approval is NOT required.
B. License amendment is NOT required; NRC approval is required.
C. License amendment is required; NRC approval is NOT required.
D. License amendment is required; NRC approval is required.

Justification: The question is linked to one of the duties reserved for the SRO licensed individual (i.e., 10 CFR 55.43(b)(5) (procedures used to obtain authority for design and operating changes to the facility)).

2. Examples of Unsatisfactory Senior Reactor Operator-Only Questions

a. APE: 008 Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open)

AA2.22: Ability to determine and interpret the following as they apply to the pressurizer vapor space accident: consequences of loss of pressure in the RCS; methods for evaluating pressure loss. (CFR: 43.5 / 45.13): 3.8/4.2

- A pressurizer steam space LOCA has caused PPLS and SIAS actuation.
- CETs are stable at 550 degrees F.
- RCS pressure is stable at 1,300 psia.
- Pressurizer level is 20 percent and rising.
- High-pressure safety injection (HPSI) flow is 390 gpm.

With no operator action and assuming temperatures remain constant, how will pressurizer level, pressurizer pressure, and HPSI flow respond?

A. Pressurizer level will stabilize slightly above 20 percent, pressure will lower, and HPSI flow will increase.

B. Pressurizer level will rise to 100 percent, pressure and HPSI flow will remain constant.

C. Pressurizer level will rise to 100 percent, pressure will rise and HPSI flow will decrease.

D. Pressurizer level will stabilize slightly above 20 percent, pressure will rise, and HPSI flow will decrease.

Justification: The question stem does not link to one of the seven 10 CFR 55.43(b) statements even though the K/A is linked to 10 CFR 55.43(b)(5). The question only tests the assessment of plant conditions. An RO is expected to understand integrated system response.

b. Generic K/A G2.1.7: Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. (CFR: 41.5 / 43.5 / 45.12 / 45.13): 4.4/4.7

Reactor power is 29 percent during a reactor startup when the reactor operator trips the main turbine due to high vibration. Which ONE of the following identifies the required

procedures?

The SRO should now anticipate implementing procedures that will do the following:

A. Maintain reactor power less than 29 percent since power will increase after the main turbine trip.

B. Recover from the reactor scram caused by the turbine trip.

C. Recover vessel level using the feed and condensate system.

D. Scram the reactor.

Justification: The question asks for plant response and what to do about it, NOT selection or application of a procedure. An applicant can answer the question using integrated plant and system knowledge (i.e., knowledge that is not unique to the SRO).

c. APE: 065 Loss of Instrument Air

AA2.06: Ability to determine and interpret the following as they apply to the loss of instrument air: When to trip the reactor if instrument air pressure is decreasing. (CFR: 43.5 / 45.13): 3.6/4.2*

Unit 1 is currently at 82 percent power. A down power is in progress to remove the 1A main feedwater pump from service. Which ONE of the following plant conditions would require you to direct an IMMEDIATE manual trip of the reactor?

A. Instrument air pressure is currently 59 psig and lowering.
B. 1A and 1B SG levels are 75 percent and increasing.
C. BOTH heater drain pumps trip.
D. 4.16-kV bus 1B3 deenergizes due to an electrical fault on the bus.

Justification: The SRO is responsible for directing the action to trip the reactor; however, the RO is still required to know immediate reactor trip criteria listed in the abnormal event procedure. Just because the SRO directs the action does not mean that the knowledge is unique to the SRO position.

d. K/A 007: Pressurizer Relief Tank/Quench Tank System

G2.2.44: Ability to interpret control room indications to verify the status and operation of a system and understand how operator actions and directives affect plant and system conditions. (CFR: 41.5 / 43.5 / 45.12): 4.2/4.4

Given the following—

- Unit 1 is at 100-percent power; RCS pressure indicates 2,225 psig and stable.
- 1B-F1, PRZ RELIEF TK HI PRESS alarm is received.
- Pressurizer relief tank (PRT) pressure indicates 14 psig and rising slowly.
- PRT temperature is 92 degrees F and stable.
- PRT level is 70 percent and stable.

Which ONE of the following describes the appropriate operator response?

A. Ensure PZR PORVs are closed and PG and N2 to PRT are isolated.
Go to 1-AP-16, “Increasing Primary Plant Leakage.”

B. Ensure PZR PORVs are closed and PG and N2 to PRT are isolated.
Vent the PRT in accordance with 1-OP-5.7, “Operation of the Pressurizer Relief Tank.”

C. Submit a WR. Verify PG water alignment and cool the PRT by draining and refilling in accordance with 1-OP-5.7.

D. Submit a WR. Cool the PRT by draining and refilling in accordance with 1-OP-5.7. Refer to 1-AP-16.

Justification: Each choice required the selection of procedures. However, this is not SRO-only knowledge because the choices also include responsive actions, which an RO can deduce using systems knowledge; therefore, procedure selection is not actually required to answer the question.

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NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," establishes the policies, procedures and guidance for the development, administration, and grading of written examinations and operating tests used for examining licensees and applicants for reactor operator and senior reactor operator licenses at power reactor facilities in accordance with Title 10 of the Code of Federal Regulations (10 CFR) Part 55, "Operators' Licenses." NUREG-1021 also provides procedures and guidance for maintaining operators' licenses and for the NRC to conduct requalification examinations when necessary.

The NRC is issuing Revision 12 of NUREG-1021 to (1) streamline information into topic-based sections for ease of use, (2) clarify instructions for the identification and grading of performance deficiencies on the operating test, (3) revise instructions for the selection of critical tasks and the assessment of critical and significant performance deficiencies, and (4) implement changes to support the testing of fundamentals topics on the site-specific initial licensing examination, in the place of a separate generic fundamentals examination.

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