U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

2017 National Examiners Conference

Operating Test Changes
NUREG 1021, Revision 11

Sections

- ES-301: Preparing Initial Operating Tests
- ES-302: Administering Operating Tests
- ES-303: Documenting and Grading Initial Operating Tests
- Appendix C: JPM Guidelines
- Appendix D: Simulator Testing Guidelines

Preparing Op Tests (ES-301)

- Terminology
  - JPM and walkthrough mean the same thing
  - Simulator operating test = simulator test, which consists of a set of simulator scenarios
  - Simulator scenario consists of a set of events
- Admin JPMs are typically administered in a classroom walkthrough format
- Facility Licensee Responsibilities
  - Prepare and Review *proposed* material instead of final material
  - If requested/coordinated, meet with the NRC exam team to review comments otherwise, do over the phone with the NRC chief examiner
  - Make the simulation facility available for NRC examiners to develop/validate the op tests (for NRC developed exams) and the onsite validation visit
- All SRO Admin JPMS MUST be written at the SRO level

Preparing Op Tests (ES-301) cont'd

- At new reactor facilities that use the ATC operator primarily for monitoring plant parameters, the SRO-Instant applicants may be evaluated in either the ATC or BOP position for SRO Competency 3, "Operate Plant Component Controls" (Form ES 303 1)
- Form ES-301-5, Transient and Event Checklist, Instructions added "new reactor facility" to clarify placement of SRO-I applicants in either RO position for evaluating plant component controls operation
- SRO-Upgrade applicants are given credit for their previous RO license evaluation and experience and are normally not required to manipulate the controls unless they are put in the ATC or BOP position to prevent the need for a surrogate to complete the crew

Preparing Op Tests (ES-301) cont'd

- Simulator Op Test Overlap Criteria:
  - Every scenario MUST be new or significantly modified
  - Significantly modified means that for each scenario, at least two events have not been used on the previous 2 NRC exams
  - Reactivity manipulation events are exempt from this overlap limit
- Events that do not require an operator to take one or more ~~substantive~~ verifiable actions will not count toward the minimum number of events required for each operator

Preparing Op Tests (ES-301) cont'd

- Chief examiners and exam writers should ensure that each scenario includes at least two preidentified critical tasks
- To assist in promoting exam consistency among applicants, chief examiners and exam writers should carefully assign applicant teams to each scenario set so that, whenever possible, the applicants are evaluated on a similar number of preidentified critical tasks

Form ES-301-4 Changes

ES-301 **Simulator Scenario Quality Checklist** **Form ES-301-4**

Facility: Date of Exam: Scenario Numbers: / / Operating Test No.:

QUALITATIVE ATTRIBUTES	Initials a	b*	c#
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)			
4. The events are valid with regard to physics and thermodynamics.			
5. Sequencing and timing of events is reasonable and allows the examination team to obtain complete evaluation results commensurate with the scenario objectives.			
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 Section D.5 of ES-301.			
10. All individual operator competencies can be evaluated, as verified using Form ES-301-6 (submit the form along with the simulator scenarios).			
11. The scenario set provides the opportunity for each applicant to be evaluated in each of the applicable rating factors. (Competency rating factors as described on Forms ES-303-1 and ES-303-3.)			
12. Each applicant will be significantly involved in the minimum number of transients and events specified on Form ES-301-5 (submit the form with the simulator scenarios).			
13. Applicants are evaluated on a similar number of preidentified critical tasks across scenarios, when possible.			
14. The level of difficulty is appropriate to support licensing decisions for each crew position.			

Target Quantitative Attributes per Scenario (See Section D.5.d)	Actual Attributes	–	–	–
1. Malfunctions after 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)	/ /			
6. Preidentified critical tasks (≥ 2)	/ /			

* The facility licensee signature is not applicable for NRC-developed tests.
\# An independent NRC reviewer initials items in column "c"; chief examiner concurrence is required.

Preparing Op Tests (ES-301) cont'd

- Facility Licensee Management Review: If the facility licensee prepared the operating test, a supervisor or manager familiar with both the exam contents and the examination standards in this NUREG shall independently review the preliminary outline and the proposed test before they are submitted to the NRC regional office for review and approval in accordance with ES- 201
- NRC Examiner Review: The chief examiner shall determine the acceptability of the submitted operating test by reviewing every JPM and simulator operating test scenario using Form ES-301-7

New Form: ES-301-7
Operating Test Review Worksheet p.1

ES-301 Operating Test Review Worksheet Form ES-301-7

Facility:												Exam Date:
Admin JPMs	1 ADMIN Topic and K/A	2 LOD (1-5)	3 Attributes: I/C Focus	Cues	Critical Steps	Scope (N/B)	Overlap	Perf. Std.	Key	4 Job Content: Minutia	Job Link	5 U/E/S	6 Explanation
Simulator/In-Plant JPMs	1 Safety Function and K/A												

Instructions for Completing This Table:

Check or mark any item(s) requiring a comment and explain the issue in the space provided using the guide below.

1. Check each JPM for appropriate administrative topic requirements (COO, EC, Rad, and EP) or safety function requirements and corresponding K/A. Mark in column 1. (ES-301, D.3 and D.4)
2. Determine the level of difficulty (LOD) using an established 1–5 rating scale. Levels 1 and 5 represent an inappropriate (low or high) discriminatory level for the license that is being tested. Mark in column 2 (Appendix D, C.1.f)
3. In column 3, "Attributes," check the appropriate box when an attribute is **not met**:
   - The initial conditions and/or initiating cue is clear to ensure the operator understands the task and how to begin. (Appendix C, B.4)
   - The JPM contains appropriate cues that clearly indicate when they should be provided to the examinee. Cues are objective and not leading. (Appendix C, D.1)
   - All critical steps (elements) are properly identified.
   - The scope of the task is not too narrow (N) or too broad (B).
   - Excessive overlap does not occur with other parts of the operating test or written examination. (ES-301, D.1.a, and ES-301, D.2.a)
   - The task performance standard clearly describes the expected outcome (i.e., end state). Each performance step identifies a standard for successful completion of the step.
   - A valid marked up key was provided (e.g., graph interpretation, initialed steps for handouts).
4. For column 4, "Job Content," check the appropriate box if the job content flaw **does not meet** the following elements:
   - Topics are linked to the job content (e.g., not a disguised task, task required in real job).
   - The JPM has meaningful performance requirements that will provide a legitimate basis for evaluating the applicant's understanding and ability to safely operate the plant. (ES-301, D.2.c)
5. Based on the reviewer's judgment, is the JPM as written (U)nacceptable (requiring repair or replacement), in need of (E)nhancement, or (S)atisfactory? Mark the answer in column 5.
6. In column 6, provide a brief description of any (U)nacceptable or (E)nhancement rating from column 5.

Save initial review comments and detail subsequent comment resolution so that each exam-bound JPM is marked by a (S)atisfactory resolution on this form.

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New Form: ES-301-7
Operating Test Review Worksheet p.2

Facility:								Scenario:	Exam Date:
1 Event	2 Realism/Cred.	3 Required Actions	4 Verifiable actions	5 LOD	6 TS	7 CTs	8 Scen. Overlap	9 U/E/S	10 Explanation

Instructions for Completing This Table:

Use this table for each scenario for evaluation.

2 Check this box if the events are not related (e.g., seismic event followed by a pipe rupture) **OR** if the events do not obey the laws of physics and thermodynamics.

3, 4 In columns 3 and 4, check the box if there is **no** verifiable or required action, as applicable. Examples of required actions are as follows: (ES-301, D.5f)

- 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 (Uncomplicated events that require no operator action beyond this should **not** be included on the operating test unless they are necessary to set the stage for subsequent events. (Appendix D, B.3).)

5 Check this box if the level of difficulty is **not** appropriate.

6 Check this box if the event has a TS.

7 Check this box if the event has a critical task (CT). If the same CT covers more than one event, check the event where the CT started **only**.

8 Check this box if the event overlaps with another event on any of the last two NRC examinations. (Appendix D, C.1.f)

9 Based on the reviewer's judgment, is the event as written (U)nacceptable (requiring repair or replacement), in need of (E)nhancement, or (S)atisfactory? Mark the answer in column 9.

10 Record any explanations of the events here.

In the shaded boxes, sum the number of check marks in each column.

- In column 1, sum the number of events.
- In columns 2–4, record the total number of check marks for each column.
- In column 5, based on the reviewer's judgement, place a checkmark only if the scenario's LOD is not appropriate.
- In column 6, TS are required to be ≥ 2 for each scenario. (ES-301, D.5.d)
- In column 7, preidentified CTs should be ≥ 2 for each scenario. (Appendix D; ES-301, D.5.d; ES-301-4)
- In column 8, record the number of events not used on the two previous NRC initial licensing exams. A scenario is considered unsatisfactory if there is < 2 new events. (ES-301, D.5.b; Appendix D, C.1.f)
- In column 9, record whether the scenario as written (U)nacceptable, in need of (E)nhancement, or (S)atisfactory from column 11 of the simulator scenario table.

New Form: ES-301-7
Operating Test Review Worksheet p.3

Facility:									Exam Date:
Scenario	1 Event Totals	2 Events Unsat.	3 TS Total	4 TS Unsat.	5 CT Total	6 CT Unsat.	7 % Unsat. Scenario Elements	8 U/E/S	11 Explanation

Instructions for Completing This Table:

Check or mark any item(s) requiring comment and explain the issue in the space provided.

1, 3, 5 For each simulator scenario, enter the **total** number of events (column 1), TS entries/actions (column 3), and CTs (column 5). This number should match the respective scenario from the event-based scenario tables (the sum from columns 1, 6, and 7, respectively).

2, 4, 6 For each simulator scenario, evaluate each event, TS, and CT as (S)atisfactory, (E)nhance, or (U)nsatisfactory based on the following criteria:

a. Events. Each event is described on a Form ES-D-2, including all switch manipulations, pertinent alarms, and verifiable actions. Event actions are balanced between at-the-controls and balance-of-plant applicants during the scenario. All event-related attributes on Form ES-301-4 are met. Enter the total number of unsatisfactory events in column 2.

b. TS. A scenario includes at least two TS entries/actions across at least two different events. TS entries and actions are detailed on Form ES-D-2. Enter the total number of unsatisfactory TS entries/actions in column 4. (ES-301, D.5d)

c. CT. Check that a scenario includes at least two preidentified CTs. This criterion is a target quantitative attribute, not an absolute minimum requirement. Check that each CT is explicitly bounded on Form ES-D-2 with measurable performance standards (see Appendix D). Enter the total number of unsatisfactory CTs in column 6.

7 In column 7, calculate the percentage of unsatisfactory scenario elements: $\left(\frac{2+4+6}{1+3+5}\right)100\%$

8 If the value in column 7 is > 20%, mark the scenario as (U)nsatisfactory in column 8. If column 7 is ≤ 20%, annotate with (E)nhancement or (S)atisfactory.

9 In column 9, explain each unsatisfactory event, TS, and CT. Editorial comments can also be added here.

Save initial review comments and detail subsequent comment resolution so that each exam-bound scenario is marked by a (S)atisfactory resolution on this form.

New Form: ES-301-7
Operating Test Review Worksheet p.4

Site name:				Exam Date:		
OPERATING TEST TOTALS						
	Total	Total Unsat.	Total Edits	Total Sat.	% Unsat.	Explanation
Admin. JPMs						
Sim./In-Plant JPMs						
Scenarios						
Op. Test Totals:						

Instructions for Completing This Table:

Update data for this table from quality reviews and totals in the previous tables and then calculate the percentage of total items that are unsatisfactory and give an explanation in the space provided.

1. Enter the total number of items submitted for the operating test in the "Total" column. For example, if nine administrative JPMs were submitted, enter "9" in the "Total" items column for administrative JPMs. For scenarios, enter the total number of simulator scenarios.

2. Enter the total number of (U)nsatisfactory JPMs and scenarios from the two JPMs column 5 and simulator scenarios column 8 in the previous tables. Provide an explanation in the space provided.

3. Enter totals for (E)nhancements needed and (S)atisfactory JPMs and scenarios from the previous tables. This task is for tracking only.

4. Total each column and enter the amounts in the "Op. Test Totals" row.

5. Calculate the percentage of the operating test that is (U)nsatisfactory (Op. Test Total Unsat.)/(Op. Test Total) and place this value in the bolded "% Unsat." cell.

   Refer to ES-501, E.3.a, to rate the overall operating test as follows:
   - satisfactory, if the "Op. Test Total" "% Unsat." is ≤ 20%
   - unsatisfactory, if "Op. Test Total" "% Unsat." is > 20%

6. Update this table and the tables above with post-exam changes if the "as-administered" operating test required content changes, including the following:
   - The JPM performance standards were incorrect.
   - The administrative JPM tasks/keys were incorrect.
   - CTs were incorrect in the scenarios (not including postscenario critical tasks defined in Appendix D).
   - The EOP strategy was incorrect in a scenario(s).
   - TS entries/actions were determined to be incorrect in a scenario(s).

Administering Operating Tests (ES-302)

- Facility licensee must inform the NRC regional office in writing if an applicant withdraws from the exam process before complete or if the facility licensee withdraws its request to administer the written exam/op test to an applicant
- If applicant withdraws, NRC chief examiner will ask applicant to follow the 10 CFR 55.5, “Communications” methods and submit the request to the appropriate regional office. The chief examiner may direct the applicant to 10 CFR 2.107, which states in part that the Commission may permit an applicant to withdraw an application prior to the issuance of a notice of hearing on such terms and conditions as it may prescribe, or may, on receiving a request for withdrawal of an application, deny the application or dismiss it with prejudice. 10 CFR 55.35(a) applies if applicant passed a portion
- If facility licensee withdraws, the application is incomplete and will not be evaluated further by the NRC. 10 CFR 55.35(a) applies is applicant passed a portion

Administering Operating Tests (ES-302)

cont'd

- For simulator scenarios, a single NRC examiner SHALL be assigned to evaluate the same applicant
- For exam efficiency or to minimize the use of surrogates, it may be acceptable for another examiner, other than the examiner of record, to administer one of the scheduled scenarios provided that the examiner of record is present during the scenario administration (e.g., examining one of the other applicants) and that the scenario is in addition to the minimum required for that applicant. This exception requires NRC program office approval

Administering Operating Tests (ES-302)

cont'd

- NRC chief examiner ensures that the licensee develops an efficient schedule
- Clarified that video and audio shall be made available to the NRC upon request and that facility licensees are responsible for laws associated with video and audio recording
- Clarified that applicants who preliminarily or finally fail the simulator operator test will be given an opportunity to view the video recording of the test if applicable
  - The facility licensee shall notify the NRC chief examiner before providing this opportunity to an applicant

Administering Operating Tests (ES-302)

cont'd

- Added language from a FAQ to explain the reason for limiting the simulator operating test to only one SRO position. Expanded on guidance for SRO duties
- The chief examiner SHALL coordinate with the facility to identify, record and retain simulator data recordings for important plant parameters during the simulator operating test scenarios
  - These documents are to be retained until all licensing actions are complete

Administering Operating Tests (ES-302)
cont'd

- Emergency classification during/after simulator operating test scenario:
  - Not a time critical evolution
  - Usually based on simulated plant conditions after scenario complete with the simulator in freeze
  - Event classification is NOT required to be part of the scenario
  - Event classification does NOT meet the critical task criteria in Appendix D

Administering Operating Tests (ES-302)

cont'd

- Exam team discussion immediately after simulator scenario shall include:
  - Critical Tasks during the scenario
  - Did an applicant's actions or inactions result in a **post-scenario** CT? Post-scenario CTs must be validated against the CT methodology in Appendix D
  - Analysis of corrected actions to determine whether they would have resulted in an event that reaches the threshold for classification as a post-scenario CT
  - Did the as-run scenario invalidate any predesignated CTs?

Administering Operating Tests (ES-302)

cont'd

- **Deleted** this example of a reason to run additional scenario for an applicant:

  For example, if an applicant has only one opportunity to demonstrate competence on a particular rating factor, but makes an error that does not affect his or her performance of a critical task, the examiners shall give the applicant another opportunity to demonstrate competence or to make a second error that would justify an unsatisfactory score for the subject rating factor

Administering Operating Tests (ES-302)

cont'd

- If applicants demonstrated potential performance deficiencies during the operating test, the examiner shall ask the facility licensee simulator operator to provide copies of the logs, charts, data, audio, video, or other materials that may be required after leaving the facility to evaluate and document the applicant's performance. The examiner of record shall retain all documentation related to any operating test until the NRC takes its licensing action on all the applications and adjudicatory actions on any hearing demands are complete
- The NRC chief examiner shall also ask the facility licensee simulator operator to retain copies of the same materials until the NRC takes its licensing action on all of the applications and adjudicatory actions on any hearing demands complete

Documenting and Grading Operating Tests (ES-303)

- Terminology: **performance deficiency** replaces error
- Identify the cause of each performance deficiency and code each deficiency with no more than two different Rating Factors. Ensure that the documentation for each performance deficiency appropriately justifies the RF(s) assigned
- Each missed or incorrect Tech Spec entry is a performance deficiency and affects grade
- A TS performance deficiency is not carried forward within the RF 6 area unless follow-up questions reveal additional knowledge deficiencies in these sub-competencies

Documenting and Grading Operating Tests (ES-303) cont'd

- Terminology:
  - critical error, critical task error and missed CT all refer to a performance deficiency associated with a CT failure
  - non-critical errors are all other performance deficiencies not associated with a CT failure

Documenting and Grading Operating Tests (ES-303) cont'd

- Rating Factor Determination:

	No. of Non-Critical Performance Deficiencies			
	1	2	3	4 or more
Communications Competency	**3**	**2**	**2**	**1***
All other Competencies	**2**	**1**	**0**	**0**

	No. of Critical Performance Deficiencies
	1
Communications Competency	**1***
All other Competencies	**0**

*Min RF score for Communication

Documenting and Grading Operating Tests (ES-303) cont'd

- Removal of assigning a point back for correct performance after 2 performance deficiencies noted in the same rating factor (sub-competency area)

Documenting and Grading Operating Tests (ES-303) cont'd

- ES-303-3 RO Competency Grading Worksheet changes reflect 0-3 grading scale
- ES 303-4 SRO Competency Grading Worksheet changed to reflect 0-3 grading scale and addition of a third sub-competency to Technical Specifications area to reduce overemphasis on Technical Specifications

Appendix C JPM Guidelines

- In general, critical steps should consist of verifiable actions
- Some JPM steps may still be critical steps in that they are necessary to meet the task standard but they do not meet the verifiable action definition in ES 301 Attachment 2 (for example, control room JPM requires applicant to direct manual valve manipulation in field)
- Under no circumstances should a control room or in plant JPM consist solely of critical steps that are not verifiable actions

Appendix D Simulator Testing Guidelines

- *Should* changed to *shall* or *must*
  - Example: *NRC and facility licensee ~~should~~ shall review each CT to ensure it is objective*
- Term measurable performance indicator is now measurable performance standard
- Added a <u>new</u> qualitative attribute for simulator scenarios: Scenario Overlap:
  - Every scenario must be new or contain at least two events NOT used on the past 2 NRC initial licensing exams
  - Events found in spare scenarios count as previously used if scenario made public in ADAMS
  - Reactivity manipulations are exempt from limit

Appendix D Simulator Testing Guidelines cont'd

- Quantitative attribute for simulator scenarios: Critical Tasks:
  - The difficulty level and equitable administration of the operating test must be considered when assessing the appropriateness of the number of CTs in a scenario or scenario set
  - Deleted references to EOP-based CTs. CTs are CTs and not restricted to EOPs
  - Defined **preidentified CTs**: CTs initially incorporated into the scenario
  - Scenario should be written with at least 2 preidentified CTs
  - Defined **post-scenario CTs**: Additional events that an individual or the crew created that meet the CT methodology determined after the scenario

Appendix D Simulator Testing Guidelines cont'd

- Critical Tasks methodology:
  - Every error that reveals an operator's competence is considered equal unless it is related to the performance of a CT
  - Clarified how CTs are used in initial licensing exams verses requalification exams
  - Cueing is now initiating cue: an expected signal or notice (indication, alarm communication, procedure step) that designates when a CT should be performed
  - Measurable Performance Indicators is now Measurable Performance Standard

Appendix D Simulator Testing Guidelines cont'd

- Measurable Performance Standard consists of:
  1. Expected action(s)- observable
  2. Safety significant boundary conditions
- For preidentified CTs where applicants inaction/incorrect action could result in an unintentional RPS or ESF action:
  - Measureable performance standard is THAT ACTION taken to preclude the actuation
  - Example
- Applicants will be held accountable for errors that are corrected by other members of the crew:
  - Exam team will determine impact of inaction/incorrect action and the measurable performance standard depends on the consequence of the inaction/incorrect action HAD IT NOT BEEN CORRECTED by the crew
  - Example

Appendix D Simulator Testing Guidelines cont'd

- Taking a preemptive manual action when an automatic action is imminent because of an incorrect action or inaction does not mitigate the initial incorrect action/inaction (in other words, it is still a CT)
  - Example: An applicant fails to manually control pressurizer pressure (where pressure is controllable per the validated scenario), and the pressure reaches a threshold at which the crew initiates a manual trip.

    >>This is a CT because pressure was intended to be a controllable variable in the scenario guide

Appendix D Simulator Testing Guidelines cont'd

- Before exam, developers and examiners should make an effort to identify events for which applicant inaction or common applicant error has the potential to result in an automatic RPS or ESF actuation
  - Recommend adding this statement in the scenario guide: *Causing an unnecessary plant trip or ESF actuation may constitute a CT failure. Actions taken by the applicant(s) will be validated using the methodology for critical tasks in Appendix D to NUREG 1021*

Appendix D Simulator Testing Guidelines cont'd

- Emergency event classifications during simulator scenarios:
  - Not required
  - Improper classifications do not meet CT criteria because applicant not provided performance feedback
- Added CTs to examples ES-D-1 and ES-D-2
- Form ES-D-1: added place to list CTs

Questions