SOP-RTMKTS.0060.0005 - Test and Approve Operations Software Applications

Contents

1. Objective

The objective of this procedure is to outline minimum acceptable testing required prior to using an Operations Software Application (OSA). An OSA is an Excel spreadsheet developed and used by the ISO New England (ISO) Operations Support Services (OSS) personnel as a calculator tool.

2. Background

OSAs tested in accordance with this procedure include the maximum voltage transfer limit calculators for the following interfaces:

- New England - New Brunswick.

An OSA is a complex tool developed by OSS Engineer personnel to aid Energy Market planning by OSS personnel and Real-Time Operations personnel in the daily planning and operations of the New England Transmission System by providing interface voltage limits for some of the major New England interfaces. An OSA contains complex algorithms that must be fully tested before the OSA becomes a production tool. Each OSA must be designed with system operations and key operating procedures in mind, such as ISO New England Operating Procedure No. 19 - Transmission Operations (OP-19) and Master/Local Control Center Procedure No. 15 - System Operating Limits Methodology (M/LCC 15).

This procedure is only applicable to an OSA that has been developed by OSS Engineers.

3. Responsibilities

NOTE

Any North American Electric Reliability Corporation (NERC) Certified System Operator, certified at the Reliability Coordinator (RC) level, has the authority to take action(s) required to comply with NERC Reliability Standards.

1. The OSS Engineer OSA developer is responsible for:

   - Developing a new and revising an existing, OSA
   - Developing a plan to test the limits produced by OSA
   - Updating the design requirements documentation required to adequately test any OSA in the Energy Management System (EMS) environment
   - Retiring the OSA if, after appropriate internal review, it is no longer needed

2. Power System Model Management (PSMM) personnel (or designee) is responsible for verifying:

   - Data inputs and outputs between the Excel calculator and the EMS are in sync
   - The OSA architecture meets both of the following:
     - Applicable internal and external Information Technology (IT) standards
     - Any specified security requirements related to an OSA use with EMS

3. The ISO Manager, Operations Analysis and Integration (or designee) and designated OSS personnel are responsible for developing an acceptable OSA test plan that verifies the OSA functionality and by comparing limit trends (positive or negative) that assesses the algorithm calculating the limit for various data input values.

4. To verify an OSA is consistent and accurate, the OPTI personnel, OSS personnel and PSMM personnel are responsible for comparing the limits between the OSA and the EMS environment set up to test the limits.

4. Controls

1. The Director, OSS (or designee) and the Director, Operations (or designee) designate the ISO personnel performing functions pertaining to the product test for any OSA employed in Energy Market planning and Real-Time system operation.

2. The assigned OPTI personnel and OSS personnel communicate test results of any OSA problem found during testing to the designated OSS OSA developer or OSS Real-Time Studies on-call Engineer by:

   - Taking a screen shot of the input and output conditions
   - Providing a written description of the conditions leading up to the discovered problem (e.g., load level, generation dispatch etc.).

3. When a problem is found after deployment of an OSA, the designated OSS Real-Time Studies on-call Engineer is notified.

4. If the designated OSS Real-Time Studies on-call Engineer is **not** able to resolve the problem found in the OSA, the designated OSS Real-Time Studies on-call Engineer provides limits to the Energy Market planning and Control Room Operations personnel as required until the OSA problem is resolved.

5. Instructions

5.1 Document an OSA Problem

NOTE

An OSA developed by OSS personnel is a complex algorithm that:

- Covers combinations of operating conditions that include the following:
  - system load
  - area load
  - generation dispatch
  - reactive resource availability
  - interchange levels
- Is used by the Control Room System Operators to efficiently make operating decisions and Forecasters, OSS Outage Coordinators and Day-Ahead Energy Market personnel to dispatch the system, both related to reliable system operation in accordance with OP-19 and M/LCC 15.

OSA development entails complex programming that captures many independent variables that are combined with mathematical modeling of the inter-relationships to develop both first and second contingency limits.

OSA revisions may also be required when any OSS personnel observes unexpected software behavior that affects the functionality and accuracy of the existing OSA.

1. When a discrepancy in an OSA is discovered by any member of the Control Room Operations personnel, OPTI personnel, OSS personnel, or PSMM personnel during testing of a new or revised OSA or anytime during Real-Time system operation, that person shall contact the designated OSS Real-Time Studies on-call Engineer and discuss the problem.

2. To assist the designated OSS Real-Time Studies on-call Engineer in the timely resolution of the issue, any member of the Control Room Operations personnel, OPTI personnel, OSS personnel, or PSMM personnel discovering the discrepancy shall provide detailed documentation of the problem, including any related screenshots and the system conditions.

NOTE

The designated OSS Real-Time Studies on-call Engineer or OSS software application developer maintains the Change Request System that tracks the problem or issue until it is resolved.

3. Following notification of a problem, the designated OSS Real-Time Studies on-call Engineer shall document the problem in the Change Request System.

4. The designated OSS Real-Time Studies on-call Engineer shall assess the problem and determine if the Control Room Operations personnel can continue using the OSA or if the Control Room Operations personnel shall cease using the OSA until the problem is resolved.

   A. Upon determination that an OSA **cannot** be used, the designated OSS Real-Time Studies on-call Engineer shall provide limits to the applicable Energy Market personnel, OSS Outage Coordinators and the Control Room Operations personnel until the OSA problem is resolved.

5. If a new or a revised OSA is required, the designated OSS Real-Time Studies on-call Engineer or OSA developer shall document the new OSA requirements consistent with the following applicable ISO New England procedures:

   - INFTCH.0010.0020 - Develop Test Plan and Conduct Testing
   - INFTCH.0030.0020 - Review and Approve New Change Requests
   - INFTCH.0030.0030 - Manage Change Development
   - INFTCH.0030.0040 - Manage Emergency Migrations or Outages
   - INFTCH.0030.0050 - Review and Manage Change Deployment
   - MNGPJT.0007.0010 - Identify Business Requirements

5.2 Revise/Develop an OSA

NOTE

Significant changes in the Bulk Electric System (BES) network and load may require the OSS staff to develop a new OSA or revise an existing an OSA.

It may require significant time for off-line studies by personnel internal and external to ISO to develop a new OSA and/or revise an existing OSA. These off-line studies may involve personnel from the following groups:

- ISO System Planning
- ISO Power System Modeling Management
- ISO OPTI
- ISO Control Room Operations
- ISO Market & Resource Administration
- ISO Outage Coordinators
- Local Control Center (LCC) affiliates.

Any OSA development or revision is to be performed in a manner that verifies the resulting OSA conforms to all ISO IT policies related to:

- Change Management (CM) review and approval of the software changes
- Documentation of software development and testing that is in accordance with IT procedures

1. The designated OSS Real-Time Studies on-call Engineer shall obtain the OSA business requirements and verify that the business requirements are documented and approved by the business owner prior to any software development or revision.

   A. In order to avoid potential testing failures due to omissions or gaps in the design requirements, the designated OSS Real-Time Studies on-call Engineer shall determine if there are any omissions or gaps in the design requirements by performing the following:

      (1) Compare the test plan against the design requirements before developing the OSA test plan.

      (2) Perform a Real-Time review of the OSA Test Plan with the developer and business owner and verify all omissions or gaps in the design requirements are closed prior to starting the OSA test.

2. When a new OSA or a revision to an existing OSA is required, the designated OSS Real-Time Studies Engineer or OSA developer shall perform the following:

NOTE

OSA development entails complex programming that captures many independent variables that are combined with mathematical modeling of the inter-relationships to produce both first and second contingency limits.

A. Either develop the new OSA or revise the existing OSA.

B. Go to Section 5.3 and develop an OSA Test Plan that validates the functional and design requirements as documented in the approved business requirements document.

5.3 Develop an OSA Test Plan

1. When a revision to or development of a new OSA is required, the designated OSS Engineer shall develop an OSA Test Plan that validates existing business and technical design requirements.

> **NOTE**
>
> Even when an unplanned emergency arises that requires either a revision of an existing OSA or development of a new OSA, coincident with a compressed time frame, an OSA Test Plan is still required.
>
> The OSA Test Plan is a roadmap or prescriptive sequence of conditions that the test employs to determine if the OSA will perform as designed

2. When an OSA Test Plan is required, the designated OSS Engineer or software developer shall perform the following concurrently:

   A. Develop an OSA Test Plan that validates the functional and technical design requirements based upon the approved business requirements are:

      (1) Achieved in accordance with IT policies

      (2) Located in the ISO Change Request Database

   B. If the functional requirements are **not** available in the Change Request Database, obtain documented and approved functional or design requirements from the business owner(s).

> **NOTE**
>
> The OSA Test Plan simply verifies specific actions or functions that the business owner expects to see when parameters are entered into the OSA.

3. The designated OSS Engineer shall verify the new OSA or revised OSA conforms to its functional or technical design requirements by designing an OSA Test Plan based on the approved business requirements document.

4. To avoid testing errors due to omissions or gaps in the functional or technical design requirements that can result in testing failures, the OSS engineer shall perform the following:

   A. Determine if there are any omissions or gaps in the functional or technical design requirements before developing the OSA Test Plan by performing the following:

      (1) Review the functional or technical design requirements with the OSA developer and verify there are **no** omissions or gaps in the approved business requirements prior to starting the test.

5. The designated OSS Real-Time Studies on-call Engineer or OSA developer shall use the following sources when developing the OSA Test Plan:

   A. Study results

   B. Knowledge of existing software issues (CR Database) that require resolution

   C. All available business requirements

6. The designated OSS Real-Time Studies on-call Engineer or OSA developer shall verify the OSA Test Plan as follows:

   A. Test each input parameter independently and over each input parameter range of acceptable input values: (e.g., between the New England load level minimum and maximum)

   B. Include boundary parameter testing to confirm output and compare against expected outcomes.

NOTE

Unlike a static test that is done manually, a dynamic test allows for more extensive testing by employing a program (automated test script) that runs through all defined scenarios automatically and records the results. These automated custom scripts are maintained by designated OSS Engineers and are archived with the OSA Test Plan results in the CR database.

7. Whenever possible, the designated OSS Real-Time Studies on-call Engineer or OSA developer shall employ dynamic testing to conduct an assessment of the OSA functionality by including the following in the OSA Test Plan.

   A. Use standard OSA Test Plan scripts to allow consistent testing of OSAs from cycle-to-cycle to confirm testing consistency with:

      (1) Each new/revised OSA released

      (2) Archival OSA performance testing

   B. Use standard OSA test scripts maintained by designated OSS Engineers as supplemental data to fulfill a Product Test within the CM cycle.

   C. The designated OSS Real-Time Studies on-call Engineer shall verify the new/revised OSA Test Plan requirements are established and the OSA Test Plan is ready for use.

5.4 Test an OSA

NOTE

A new or revised OSA requires thorough testing before its use as either of the following types of an OSA:

- A stand-alone OSA:
  e.g., as in the case of an Excel spreadsheet.
- A fully integrated OSA within a larger OSA, e.g., a form, as in the case of voltage calculator spreadsheets residing within the DOUBLC application of the EMS software.

1. The designated OSS Real-Time Studies on-call Engineer shall verify a complete product test of the revised OSA is performed in accordance with an approved OSA Test Plan.

   A. The approved OSA Test Plan shall verify that the revised OSA will:

      (1) Work as expected

      (2) Meet all design specifications

      (3) Satisfy the OSA test requirements

2. Once the OSA Test Plan has been developed, the designated OSS Real-Time Studies on-call Engineer shall verify that a member of OSS, other than the OSA developer/reviser, and a member of OPTI are assigned as testers of the new or revised OSA.

   A. The assigned testers from OPTI and OSS shall conduct their tests independently and compare their findings.

      (1) Each tester shall enter each condition described in the OSA Test Plan into the OSA and record the outcome.

      (2) Since the OSA is also employed in the Real-Time environment, each tester shall compare the outcome of the OSA against the results observed from the EMS.

NOTE

To facilitate efficient product testing of a new/revised or existing, automated test scripts are used to verify a larger number of scenarios than compared to a manual test script.

- Standard OSA test scripts maintained by the OSS group can be used as supplemental data to fulfill a Product Test within the CM cycle.
- Standard OSA test scripts allow consistent testing of an OSA from cycle to cycle to confirm testing consistency with:
  - Each new/revised OSA released
  - Archival OSA performance testing

B. When appropriate and to allow more extensive testing, the assigned OSS group tester shall employ custom automated scripts to test all of the OSA functionality.

C. If during testing, a discrepancy is discovered by any tester (i.e., assigned from OPTI, OSS or PSMM, the tester shall contact the designated OSS Real-Time Studies on-call Engineer and discuss the discrepancy.

(1) To assist the designated OSS Real-Time Studies on-call Engineer in the timely resolution of the discrepancy, the assigned tester shall develop detailed documentation of the problem including any related screenshots of the existing system conditions when the discrepancy was found.

D. If the new/revised OSA Test Plan results in one or more testing requirement failures, the OSA is **not** ready for deployment and the designated OSS Real-Time Studies on-call Engineer shall verify the following actions are taken:

(1) The applicable tester from OPTI, OSS or PSMM shall immediately contact the designated OSS Real-Time Studies on-call Engineer and discuss the problem

(2) The new/revised OSA shall be revised as necessary to eliminate the testing requirement failure(s)

(3) The new/revised OSA shall be retested

E. When the new/revised OSA testing requirements are satisfied, the designated OSS Real-Time Studies on-call Engineer shall send email notification to the applicable Energy Market personnel, OSS Outage Coordinators and Real-Time Control Room Operations personnel that the OSA is ready for use.

5.5 Review ISO Staff Testing Process

NOTE

To comply with INFTCH.0030.0030 - Manage Change Development requirements, the assigned principal OSA developer documentation is subject to an independent peer review by another qualified OSS member.

1. The OSS member designated as the independent peer reviewer shall participate in both of the following:

   A. Code Review of the Operations Software Application (tool) algorithmic structure and design.

      1) The OSS Real-Time Studies on-call Engineer participating in the OSA code review shall perform the following:

         a. Verify code has been properly documented showing the intent of each major component.

         b. Verify assumptions have been properly documented

         c. Limit the Code Review to small and manageable pieces of the code

         d. Review the data flow (inputs and outputs) and identify any potential data flow issues among the various parts of the OSA

         e. Identify key characteristics that appear repeatedly and verify they are carried out consistently throughout the OSA

   B. Testing of the finished OSA including all test documentation required to meet the CM cycle requirements.

2. Since the OSA integrates into the EMS, a qualified IT representative shall test the OSA in its final resident environment and validate that the input and output variables align properly.

3. Even though the members of both ISO Control Room Operations and OSS are the ultimate end users of the OSA, OPTI personnel train the Control Room personnel on the OSA use, and assigned members from OPTI and OSS shall participate in final testing prior to full acceptance of the OSA.

   - If any discrepancies are discovered, each applicable assigned member from Control Room Operations, OPTI and OSS shall provide written notification to the designated OSA developer and OSS Real-Time Studies on-call Engineer for remediation.

6. Performance Measures

1. This procedure is properly followed as evidenced by the following:

   - Code Review Results
   - Unit Test Results
   - OSA Test Plan Results
   - Documentation of any issue during production and notification to the designated OSS Real-Time Studies on-call Engineer.

7. References

ISO New England Operating Procedure No. 19 - Transmission Operations (OP-19)

Master/Local Control Center Procedure No. 15 - System Operating Limits Methodology (M/LCC 15)

INFTCH.0010.0020 - Develop Test Plan and Conduct Testing

INFTCH.0030.0020 - Review and Approve New Change Requests

INFTCH.0030.0030 - Manage Change Development

INFTCH.0030.0040 - Manage Emergency Migrations or Outages

INFTCH.0030.0050 - Review and Manage Change Deployment

MNGPJT.0007.0010 - Identify Business Requirements

8. Revision History

Rev. No.	Date	Reason	Contact
0	11/29/10	Initial draft procedure	Dean LaForest
1	11/26/12	Biennial review by procedure owner; Headers, updated copyright date & added Process Title; 1st page Footer, deleted disclaimer 2nd paragraph; Step 3.3, modified; Step 4.1, use acronym "OSS" and corrected punctuation; Globally minor grammar and format changes; Step 5.3.6.A, deleted the e.g., "…Min and Max Load MW values";	Dean LaForest

Rev. No.	Date	Reason	Contact
2	11/05/14	Biennial review by procedure owner; Globally removed the use of the terms "shall" and "ensure" per a directive from ROC and made the required editorial and grammar changes; Section 2, added M/LCC 15; Globally updated and made editorial changes required to be consistent with current practices and management expectations; Section 5.1, 1st NOTE, 2nd bullet added M/LCC 15; Section 7, added M/LCC 15	Dean LaForest
3	10/31/16	Biennial review by procedure owner; Added required corporate document identity to all page footers; Globally made editorial changes consistent with current practices and management expectations including grammar changes to make all directed actions be in the present tense;	Dean LaForest
3.1	10/24/18	Periodic review performed requiring no changes; Made administrative changes required to publish a Minor Revision;	Dean LaForest
3.2	10/21/20	Biennial review, removed reference and change of document approver	Dean LaForest
3.3	10/17/22	Biennial review performed by procedure owner requiring no changes; Made administrative changes required to publish a Minor Revision.	Dean LaForest
3.4	10/16/24	Biennial review performed by procedure owner requiring no intent changes; Section 3.3: Updated title; Made administrative changes required to publish a Minor Revision.	Dean LaForest

9. Attachments

None