



PROCEDURE

**Market Manual 11: Reliability
Compliance**

**Part 11.5: Model
Validation of Generation
Facilities, Electricity
Storage Facilities and
Other Devices**

Issue 4.0

This procedure describes the verification and reporting for *Generation Facilities* and *Electricity Storage Facilities* and other devices capability, models and protection settings, intended to provide current and accurate modeling information for *reliability* assessments of the Bulk Electric System, the Bulk Power System and the *IESO-controlled grid*

Disclaimer

The posting of documents on this Web site is done for the convenience of *market participants* and other interested visitors to the *IESO* Web site. Please be advised that, while the *IESO* attempts to have all posted documents conform to the original, changes can result from the original, including changes resulting from the programs used to format the documents for posting on the Web site as well as from the programs used by the viewer to download and read the documents. The *IESO* makes no representation or warranty, express or implied, that the documents on this Web site are exact reproductions of the original documents listed. In addition, the documents and information posted on this Web site are subject to change. The *IESO* may revise, withdraw or make final these materials at any time at its sole discretion without further notice. It is solely your responsibility to ensure that you are using up-to-date documents and information.

This document may contain a summary of a particular *market rule*. Where provided, the summary has been used because of the length of the *market rule* itself. The reader should be aware, however, that where a *market rule* is applicable, the obligation that needs to be met is as stated in the “*Market Rules*”. To the extent of any discrepancy or inconsistency between the provisions of a particular *market rule* and the summary, the provision of the *market rule* shall govern.

| | |
|-------------------------|--------------------------------------------------------------------------------------------------------|
| Document ID | IESO_PRO_0876 |
| Document Name | Part 11.5: Model Validation of Generation Facilities, Electricity Storage Facilities and Other Devices |
| Issue | Issue 4.0 |
| Reason for Issue | Issue released for Baseline 45.1 |
| Effective Date | June 2, 2021 |

Document Change History

| Issue | Reason for Issue | Date |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 1.0 | This document is new, superseding M.M 1.4 “Generation Verification” | March 6, 2013 |
| 2.0 | Issue released in advance of Baseline 33.1 to update the IESO logo | March 31, 2015 |
| 3.0 | Updated to meet accessibility requirements pursuant to the <i>Accessibility for Ontarians with Disabilities Act</i> . | December 2, 2020 |
| 4.0 | The title of the <i>market manual</i> has been updated. References to NPCC Directories 9 and 10 (now retired) have been replaced by related <i>NERC</i> standards, and applicable <i>market rules</i> requirements. No additional compliance obligations on <i>market participants</i> have been introduced. The changes have been made to update procedural steps, and consolidate existing related <i>reliability standards</i> and <i>market rule</i> requirements. | June 2, 2021 |

Related Documents

| Document ID | Document Title |
|-------------|------------------------------------------------------------|
| MAN-103 | Reliability Compliance Monitoring and Enforcement Overview |

Table of Contents

| | |
|-----------------------------------------------------------|------------|
| Table of Contents | i |
| List of Figures | ii |
| List of Tables | iii |
| Table of Changes | iv |
| Market Manuals | 1 |
| Market Procedures | 1 |
| 1. Introduction | 3 |
| 1.1 Purpose..... | 3 |
| 1.2 Applicability and Scope | 3 |
| 1.3 Periodicity of Testing and Model Validation | 3 |
| 1.3.1 Requirements Under Ontario Market Rules | 4 |
| 1.3.2 Requirements Under NERC Reliability Standards | 5 |
| 1.4 Overview | 5 |
| 1.5 Roles and Responsibilities | 6 |
| 2. Procedural Work Flow | 8 |
| 3. Procedural Steps | 12 |
| 3.1 Maintain a Tracking Database | 12 |
| 3.2 Establish Verification Milestones..... | 12 |
| 3.2.1 BES Facilities | 12 |
| 3.2.2 Non-BES Facilities | 12 |
| 3.3 Obtain Verified Element Data..... | 13 |
| 3.4 Submit Verified Element Data | 13 |
| 3.5 Assess Verified Element Data..... | 14 |
| 3.6 Procedural steps | 15 |
| Appendix A: Forms | 19 |
| References | 20 |

List of Figures

| | |
|------------------------------------------------------------------------------------------|----|
| Figure 2–1: Work flow for establishing verification milestones for BES elements..... | 9 |
| Figure 2–2: Work flow for establishing verification timelines for non-BES elements | 10 |
| Figure 2–3: Work flow for processing verified element data | 11 |

Archive

List of Tables

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Table 1–1: Requirements for <i>generation facilities</i> and <i>electricity storage facilities connected to the IESO-Controlled Grid</i> | 4 |
| Table 1–2: Requirements for synchronous condensers and other voltage-compensating devices <i>connected to the IESO-Controlled Grid</i> | 4 |
| Table 2–1: Legend for Work Flow Diagrams..... | 8 |
| Table 3–1: Workbooks for Submission of Verified Element Data | 13 |
| Table 3–2: Procedural steps for establishing verification milestones for BES elements..... | 15 |
| Table 3–3: Procedural steps for establishing verification timelines for non-BES elements .. | 16 |
| Table 3–4: Procedural steps for processing verified element data | 17 |

Table of Changes

| Reference (Section and Paragraph) | Description of Change |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Document | Changes made to multiple sections of this manual to update procedural steps, and replace references to <i>NPCC</i> Directories 9 and 10 with references to applicable <i>market rule</i> requirements and the related <i>NERC</i> standards. |

Archive

Market Manuals

The *market manuals* consolidate the market procedures and associated forms, standards, and policies that define certain elements relating to the operation of the *IESO-administered markets*. Market procedures provide more detailed descriptions of the requirements for various activities than is specified in the *market rules*. Where there is a discrepancy between the requirements in a document within a *market manual* and the *market rules*, the *market rules* shall prevail. Standards and policies appended to, or referenced in, these procedures provide a supporting framework.

Market Procedures

The “Reliability Compliance Manual” is Volume 11 of the *market manuals*, where this document forms Part 11.5: Model Validation of *Generation Facilities, Electricity Storage Facilities and Other Devices*.

A list of the other components included in the Reliability Compliance Manual is provided in Part 11.0: “Reliability Compliance Monitoring and Enforcement Overview” in Section 2, ‘About This Manual’

Structure of Market Procedures

Each market procedure is composed of the following sections:

1. **'Introduction'**, which contains general information about the procedure, including an overview, a description of the purpose and scope of the procedure, and information about roles and responsibilities of the parties involved in the procedure.
2. **'Work Flow'**, which contains a graphical representation of the steps and flow of information within the procedure.
3. **'Procedural Steps'**, which contains a table that describes each step and provides other detail related to each step.
4. **'Appendices'**, which may include such items as forms, standards, policies, and agreements.

Conventions

The *market manual* standard conventions are defined in the "Market Manual Overview" document

Definitions

Within the context of this *market manual*, the terms listed below have the indicated meanings when they appear in **bold** typeface. For further clarity, these definitions are used for consistency of meaning within this manual and for convenience, to avoid repeating lengthy descriptive text. They do not add to the definitions contained in Chapter 11 of the *market rules*.

- **applicable market participant:** a *market participant* that owns or operates a *generation facility* or *electricity storage facility*, synchronous condenser or other voltage-compensating device connected to the *IESO-controlled grid*, or required by a *connection assessment* performed by the *IESO* to meet *market rule* requirements related to these *facilities* or devices.
- **applicable reliability standards:** *NERC reliability standards* listed in Section 1.3.2 of this *market manual*.
- **approved element data:** **verified element data** that have been approved by the *IESO* for use in *reliability* assessments.
- **verified element data:** the protection settings and model parameters for a *generation facility*, *electricity storage facility* or other devices obtained either through testing and measurements, or by downloading settings implemented in the field.

– End of Section –

1. Introduction

1.1 Purpose

This *market manual* consolidates the obligations of **applicable market participants** related to model verification of *generation facilities*, *electricity storage facilities*, synchronous condensers or other voltage-compensating devices contained within the *market rules* and applicable *NERC reliability standards*. The *market manual* also includes a description of the procedure for submitting the related **verified element data** to the *IESO*.

This procedure is intended to ensure that the *IESO* maintains and uses updated steady-state and dynamic models of *generation facilities*, *electricity storage facilities*, synchronous condensers or other voltage-compensating devices, and related field-implemented protection settings, to accurately reflect their physical characteristics and performance. These updated models and protection settings allow the *IESO* to reliably plan and operate the *IESO-controlled grid* (ICG).

1.2 Applicability and Scope

This procedure describes the steps and interfaces that **applicable market participants** shall use to submit **verified element data** to the *IESO*. The procedural workflows and steps described in this document serve as a roadmap for **applicable market participants** and reflect the requirements set out in the relevant *market rules* and *NERC* standards.

The *market rule* requirements referenced below in Section 1.3.1 apply to all **applicable market participants**.

Additionally, the *NERC reliability standards* requirements included in Section 1.3.2 apply to **applicable market participants** that own or operate a *facility* that the *IESO* has classified as a bulk electric system (“**BES**”) *facility*, and that meets the applicability criteria of each individual *reliability standard*.

1.3 Periodicity of Testing and Model Validation

This manual also aims to clearly delineate the requirements for ongoing testing, including periodicity of model validation, applicable to *BES facilities* from those that are applicable to non-*BES facilities*.

A *generation facility* or synchronous condenser that has been classified by the *IESO* as a *BES facility* is required to meet the periodicity of testing and model verification requirements prescribed within applicable *NERC reliability standards*.

Although the *market rules* do not prescribe periodic testing or model validation of the *facilities* owned by **applicable market participants**, the *IESO* has the authority to request such testing or validation from time to time as may be necessary, to maintain the *reliability* of the power system, pursuant to the *market rules* Chapter 4, Section 5.2.1.

1.3.1 Requirements Under Ontario Market Rules

An **applicable market participant** is required to meet any applicable requirements set out in Chapter 4 of the *market rules*, Sections 5.1 and 5.2, and Appendix 4.2, and Chapter 5, Section 14.1.3.4, as shown in Tables 1-1 and 1-2 below.

The performance requirements in Table 1-1 are applicable to the *generation facilities* and *electricity storage facilities connected* to the *IESO-controlled grid*. A subset of performance requirements in Table 1-1 are applicable to *embedded generation facilities* and *electricity storage facilities* if, and as, required by a SIA performed by the *IESO*.

Table 1–1: Requirements for generation facilities and electricity storage facilities connected to the IESO-Controlled Grid

| Item | Description |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mkt rule Ch. 4, section 5.1.1 | 'obligation to test and monitor its equipment to ensure and maintain compliance with all applicable <i>reliability standards</i> required by these <i>market rules</i> .' |
| Mkt rule Ch. 4, section 5.2.1 | '...the <i>IESO</i> may require a <i>generator</i> to test any <i>generation facility connected</i> to the <i>IESO-controlled grid</i> in order to determine whether such <i>facility</i> meets the requirements of this Chapter. The relevant <i>generator</i> shall comply with such request.' |
| Mkt rule Ch. 5, section 14.1.3.4 | 'each <i>market participant</i> shall provide to the <i>IESO</i> a report describing any modification proposed to be made to protection on a primary relay...' |
| | Requirements in Chapter 4, Appendix 4.2 of the market rules: |
| Requirements 1, 3 (as applicable) | Demonstrate capability to withstand and ride-through voltage disturbances and/or frequency deviations |
| Requirement 2 (as applicable) | Demonstrate capability to regulate speed and frequency |
| Requirement 5 | Demonstrate reactive power injection and absorption capability |
| Requirements 6, 7, 8 | Demonstrate voltage control capability: Automatic Voltage Regulator (AVR), excitation system, Power System Stabilizer (PSS) |
| Requirements 7, 10 | Demonstrate coordination between voltage regulation system controls and protection systems to avoid unnecessary tripping or limit equipment damage |
| Requirement 4 | Demonstrate active power capability |
| Requirement 9 | Demonstrate operation with phase voltage unbalance within specified parameters |
| Requirement 11 | Demonstrate connection point performance characteristics |

Table 1–2: Requirements for synchronous condensers and other voltage-compensating devices connected to the IESO-Controlled Grid

| Item | Description |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mkt rule Ch. 4, section 5.1.1 | '...obligation to test and monitor its equipment to ensure and maintain compliance with all applicable <i>reliability standards</i> required by these <i>market rules</i> .' |
| Mkt rule Ch. 5, section 14.1.3.4 | 'each <i>market participant</i> shall provide to the <i>IESO</i> a report describing any modification proposed to be made to protection on a primary relay... or, where the modification is effected on an unplanned emergency basis...' |

1.3.2 Requirements Under NERC Reliability Standards

A *generation facility* or synchronous condenser that is *connected* to the *IESO-controlled grid*, and the *IESO* has classified as part of the *NERC BES*, is subject to the following **applicable reliability standards**, where the applicability criteria of each standard is met:

- “MOD-025-2: Verification and Data Reporting of Generator Real and Reactive Power Capability and Synchronous Condenser Reactive Power Capability”; compliance with this standard also facilitates compliance with Requirement 5 of Appendix 4.2 of the *market rules*;
- “MOD-026-1: Verification of Models and Data for Generator Excitation Control System or Plant Volt/Var Control Functions”; compliance with this standard also facilitates compliance with Requirements 6, 7 and 8 of Appendix 4.2 of the *market rules*;
- “MOD-027-1: Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions”; compliance with this standard also facilitates compliance with Requirement 2 of Appendix 4.2 of the *market rules*;
- “PRC-019-2: Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection”; compliance with this standard also facilitates compliance with Requirements 7 and 10 of Appendix 4.2 of the *market rules*;
- “PRC-024-2: Generator Frequency and Voltage Protective Relay Settings”; compliance with this standard also facilitates compliance with Requirements 1 and 3 of Appendix 4.2 of the *market rules*;
- “PRC-025-2: Generator Relay Loadability”; and
- “PRC-026-1: Relay Performance During Stable Power Swings”.

For *generation facilities* and synchronous condensers, that have been classified as part of the *BES*, additional information on verification periodicity, data requirements, test parameters and assessment criteria is provided in the **applicable reliability standards**.

The overview information in Section 1.4 below is provided for context purposes only, highlighting the main actions that comprise the procedure as illustrated in Section 2 and described in greater detail in Section 3.

1.4 Overview

Market rules (Chapter 4, Sections 5.1 and 5.2) include compliance obligations for all **applicable market participants** to test and monitor their equipment, including *generation facilities*, *electricity storage facilities*, synchronous condensers and other voltage-compensating devices *connected* to the *ICG*, to ensure compliance with the requirements of the *market rules*.

Furthermore, for those **applicable market participants** who have been classified by the *IESO* as owning or operating *BES facilities*, the **applicable reliability standards** establish additional responsibilities. These responsibilities relate to the verification and reporting of capability, models, and protection settings of *generation facilities*, *electricity storage facilities*, synchronous condensers and other voltage-compensating devices, to ensure that accurate information is available to the *IESO* for real-time and planning *reliability* assessments.

1.5 Roles and Responsibilities

This section describes the roles and responsibilities of the *IESO* and **applicable market participants**, as part of the procedure for model validation, based on the *market rules* (Chapter 4, Sections 3, 5 and Appendices 4.1 to 4.4) and **applicable reliability standards**.

The *IESO* is responsible for:

- Establishing and maintaining this procedure;
- Periodically identifying non-BES *generation facilities*, *electricity storage facilities*, synchronous condensers and other voltage-compensating devices that are subject to the requirements of this procedure, and informing the **applicable market participants** of required tests in a timely manner;
- Maintaining the list of acceptable dynamic models that is located in Section 5.7 of “[Market Manual 1, Part 1.6 - Performance Validation \(IESO_REQ_0208\)](#)”;
- Responding to **applicable market participants’ verified element data** submissions, as required, within the timelines stipulated by the **applicable reliability standards**; and
- Maintaining a database of **approved element data** provided by **applicable market participants**.

Applicable market participants are responsible for:

- Complying with applicable *market rules* requirements, including those referenced in this procedure, and for BES *facilities*, the **applicable reliability standards**, including those referenced in this procedure, where the applicability criteria of each standard are met;
- Complying with the *IESO*’s requests to periodically submit **verified element data** for each of their *generation facilities*, *electricity storage facilities*, synchronous condensers and other voltage-compensating devices using the appropriate forms (workbooks) listed in Appendix A of this *market manual*, and supporting documentation, as necessary, within the timelines stipulated by the *IESO* or otherwise mutually agreed to by the parties, or stated in the **applicable reliability standards**.
 - For *generation facilities*, *electricity storage facilities*, synchronous condensers and other voltage-compensating devices that are part of the BES, **applicable market participants** shall submit their **verified element data** according to the schedules described in Section 3.2 of this procedure; and
 - For *generation facilities*, *electricity storage facilities*, synchronous condensers and other voltage-compensating devices that are not part of the BES, **applicable market participants** shall comply with requirements of Chapter 4, Section 5.1, and Appendix 4.2 and when required by the *IESO*, Chapter 4, Section 5.2, of the *market rules*, and submit their **verified element data** within the timeframe stipulated by the *IESO* as outlined in Section 3.2.
- Ensuring that the **verified element data** submitted to the *IESO* is complete and accurately represents the performance of their *generation facilities*, *electricity storage facilities*, synchronous condensers and other voltage-compensating devices;
- Responding promptly to the *IESO*’s inquiries regarding the **verified element data**, providing any missing or omitted information and addressing any identified errors or deficiencies; and

Maintaining up-to-date records of their contacts, *facilities* and equipment, as they relate to the applicability of this *market manual*, in Online *IESO*.

– End of Section –

Archive

2. Procedural Work Flow

The following diagrams represent the flow of work and information relating to the procedure for model validation of *generation facilities*, *electricity storage facilities*, synchronous condensers and other voltage-compensating devices between the *IESO*, and the **applicable market participant**.

Figure 2-1 represents the process for establishing and planning the verification milestones for **applicable market participants** to perform the required verifications and submitting the verified element data to the *IESO* for BES classified elements.

Figure 2-2 represents the process for establishing and planning the verification milestones for **applicable market participants** to perform the required verifications and submitting the verified element data to the *IESO* for non-BES elements.

Figure 2-3 represents the process for the submission of verified element data to the *IESO*. The steps illustrated in the diagram are described in detail in Section 3.

Table 2–1: Legend for Work Flow Diagrams

| Legend | Description |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Oval | An event that triggers task or that completes task. Trigger events and completion events are numbered sequentially within procedure (01 to 99). |
| Task Box | Shows reference number, the party responsible for performing task (if “other party”), and task name or brief summary of task. Reference number (e.g., 1A.02) indicates procedure number within current <i>market manual</i> (1), sub-procedure identifier (if applicable) (A), and task number (02). |
| Solid horizontal line | Shows information flow between the <i>IESO</i> and external parties. |
| Solid vertical line | Shows linkage between tasks. |
| Broken line | Links trigger events and completion events to preceding or succeeding task. |

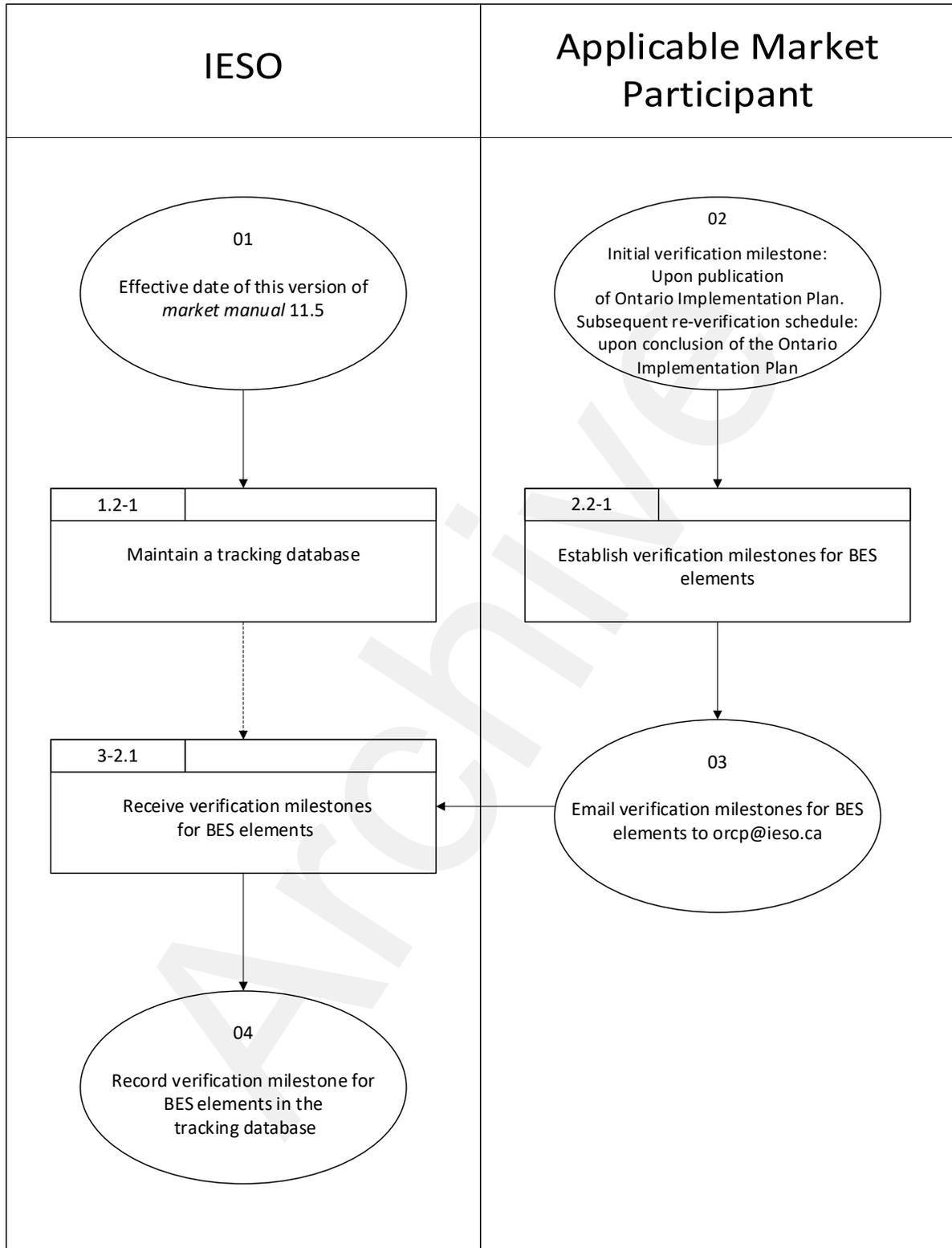


Figure 2–1: Work flow for establishing verification milestones for BES elements

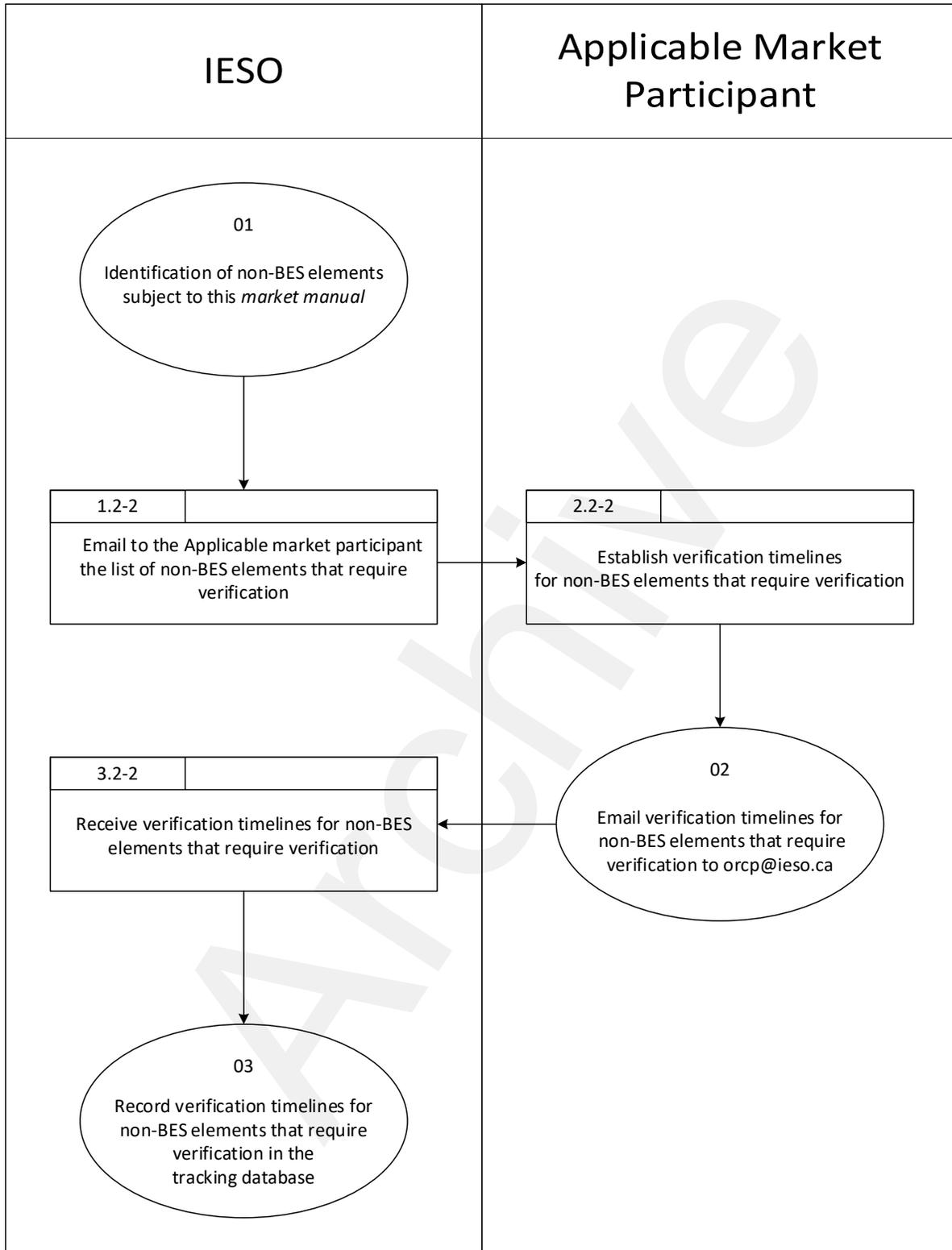


Figure 2–2: Work flow for establishing verification timelines for non-BES elements

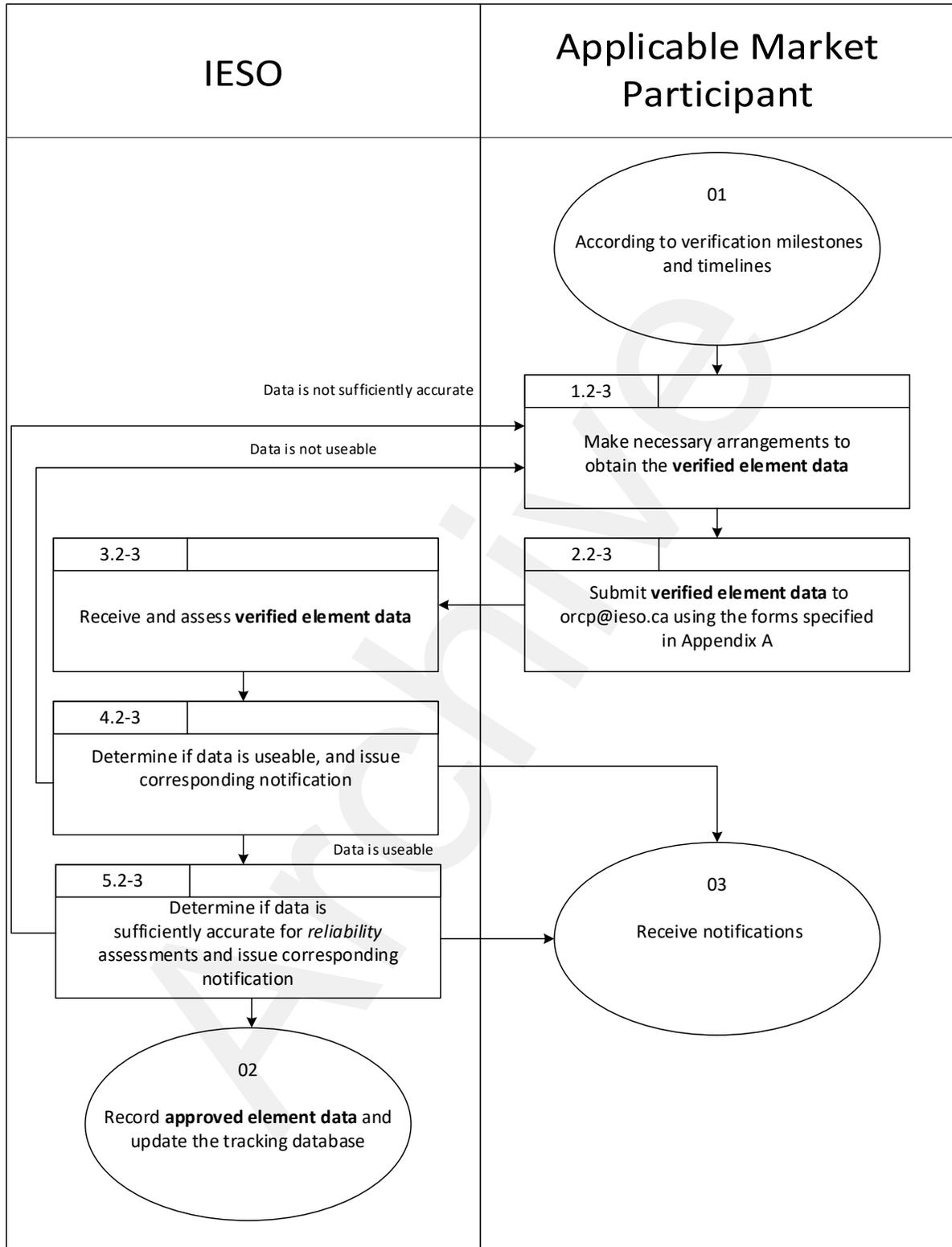


Figure 2–3: Work flow for processing verified element data

– End of Section –

3. Procedural Steps

3.1 Maintain a Tracking Database

The *IESO* shall maintain a database to track the verification process and record the **approved element data** for the *generation facilities*, *electricity storage facilities*, synchronous condensers and other voltage-compensating devices whose models and protection settings are used for *reliability assessments* and are subject to verification according to the *market rules* and **applicable reliability standards**.

3.2 Establish Verification Milestones

3.2.1 BES Facilities

For **applicable reliability standards** coming into effect in Ontario, an Ontario Implementation Plan will be available on the *IESO*'s web site where necessary, detailing various milestones for enforcing compliance with specific requirements of the standard. Each Ontario Implementation Plan defines the initial verification milestones for *generation facilities* and synchronous condensers *connected to the IESO-controlled grid* that are part of the BES.

Once the Ontario Implementation Plan has been completed, the periodicity of each subsequent verification will be as set out in the **applicable reliability standard**.

In addition, an **applicable market participant** is requested to provide its **verified element data** for its *generation facilities* and synchronous condensers to the *IESO* at intervals evenly spaced throughout the verification period, on a best effort basis. This will facilitate an orderly review and approval by the *IESO* over the entire verification period, and to ensure that the timeline requirements stipulated in the **applicable reliability standards** will be met.

For an *electricity storage facility* and other voltage-compensating device that is part of the BES, the **applicable market participant** will be notified by the *IESO* in a timely manner of the need for tests to be performed to obtain **verified element data**, and the timeframe for its submission to the *IESO* as per Section 1.3.1.

3.2.2 Non-BES Facilities

NERC reliability standards do not apply to non-BES *facilities*. The *market rules* listed in Section 1.3.1 require *facilities connected to the IESO-controlled grid* to be tested to demonstrate their capability under various operating and planning conditions. To this end, the *IESO* will, where necessary, require testing to demonstrate compliance with relevant requirements of Section 1.3, and to assess the performance of a non-BES *facility*, including potential equipment limitations.

For a *generation facility*, *electricity storage facility*, synchronous condenser and other voltage-compensating device that is not part of the BES, the **applicable market participants** will be notified by the *IESO* in a timely manner of the need for tests to be performed to obtain **verified element data**, and the timeframe for submission to the *IESO*.

3.3 Obtain Verified Element Data

An **applicable market participant** shall plan and execute the tasks, tests and simulations necessary to obtain and provide the **verified element data** to the *IESO* in accordance with the verification timelines described in Section 3.2. This activity may include obtaining the *IESO*'s approval of equipment outages, securing the services of consultants or contractors, conducting testing and measurement, and downloading settings stored in equipment installed in the field.

3.4 Submit Verified Element Data

Applicable market participants shall use the forms (workbooks) listed in Appendix A of this *market manual* to submit **verified element data** to the *IESO*, where applicable, as shown in Table 3-1 below:

Table 3–1: Workbooks for Submission of Verified Element Data

| Form Name | Form Number | for Compliance with |
|----------------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------|
| Active and Reactive Capability Verification | Form 56 | <i>market rules</i> , Appendix 4.2, requirement 5, or <i>NERC</i> standard MOD-025 |
| Verification of Models and Data for Generator Excitation | Form 57 | <i>market rules</i> , Appendix 4.2, requirements 6, 7 and 8, or <i>NERC</i> standard MOD-026 |
| Verification of Models and Data for Generator Turbine/Governor and Load Control | Form 58 | <i>market rules</i> , Appendix 4.2, requirement 2, or <i>NERC</i> standard MOD-027 |
| Verification of Coordination of Generator Capabilities, Limiters and Protections | Form 69 | <i>market rules</i> , Appendix 4.2, requirements 7 and 10, or <i>NERC</i> standard PRC-019 |
| Verification of Generator Frequency and Voltage Protective Relay Settings | Form 70 | <i>market rules</i> , Appendix 4.2, requirements 1 and 3, or <i>NERC</i> standard PRC-024 |
| Generator Relay Loadability – Synchronous Type Generation | Form 90 | <i>market rules</i> , chapter 5, section 14.1.3.4, or <i>NERC</i> standard PRC-025 |
| Generator Relay Loadability – Asynchronous Type Generation | Form 92 | <i>market rules</i> , chapter 5, section 14.1.3.4, or <i>NERC</i> standard PRC-025 |
| Verification of FACTS Voltage Regulating Devices | Form 107 | <i>market rules</i> , chapter 4, section 5.1.1 |
| Verification of Synchronous Condenser Control System or Control Functions | Form 108 | <i>market rules</i> , chapter 4, section 5.1.1, or <i>NERC</i> standard MOD-025 |

The forms shall be sent to the *IESO* together with any necessary supporting documentation in electronic format to orcp@ieso.ca.

Applicable market participants are required to send individual emails for each *generation facility*, *electricity storage facility*, synchronous condenser and other voltage-compensating device that they own or operate, that are subject to the requirements of this *market manual*. The subject line of each email must contain the form number, or the number of the **applicable reliability standard** (MOD/PRC followed by the corresponding three-digit number), followed by the station designation and the *generation facility* or *energy storage facility*, synchronous condenser or other voltage-compensating device identifier, as registered with the *IESO*.

Required Subject Format: “(form #, or *NERC* Standard ID)_Station Name_Unit ID Workbook”

Example: MOD-027_ABC Generation Station_Unit 4 Workbook

Failure to follow the submission process outlined above may result in an **applicable market participant’s** submission not being reviewed or assessed by the *IESO*.

3.5 Assess Verified Element Data

Upon receiving an **applicable market participant’s** submission of **verified element data**, the *IESO* shall:

- Confirm with the **applicable market participant** that their workbook submission has been received by the *IESO* for assessment.
- Determine if the **verified element data** received by the *IESO* is complete and if not, inform the **applicable market participant** accordingly;
- Assess the **verified element data** against the requirements of Appendix 4.2 or the **applicable reliability standards**, as applicable, and inform the **applicable market participant** of the results of the assessment within the timelines set out in the **applicable reliability standards**;
- Confirm the result of the verification to the **applicable market participant** and record the **approved element data** in the *IESO*’s tracking database; or
- Request updates or re-testing, as necessary, from the **applicable market participant** for **verified element data** that is found insufficiently accurate for real-time and planning *reliability* assessments.

3.6 Procedural steps

This section contains detail on the tasks listed in Figure 2-1.

Table 3–2: Procedural steps for establishing verification milestones for BES elements

| Ref. | Task Name | Task Detail | When | Resulting Information | Method | Completion Events |
|-------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| 1.2-1 | Maintain a tracking database | The <i>IESO</i> maintains the tracking database described in Section 3.1 of this <i>market manual</i> . | Ongoing maintenance of the tracking database to support the associated model validation tasks described in <i>market manual</i> 11.5. | The updated tracking database. | Electronic record kept by the <i>IESO</i> . | The <i>IESO</i> maintains an up to date tracking database described in Section 3.1. |
| 2.2-1 | Establish verification milestone for BES elements | Each applicable market participant follows the verification milestones stated in the Ontario Implementation Plan, and the subsequent re-verification milestones established in the applicable reliability standard , for their BES <i>generation facilities, electricity storage facilities, synchronous condensers</i> and other voltage-compensating devices according to Section 3.2.1. | Initial verification milestone: Upon publication of the Ontario Implementation Plan. Subsequent re-verification schedule: Upon conclusion of the Ontario Implementation Plan. | The verification milestones for each BES <i>generation facilities, electricity storage facilities, synchronous condensers</i> and other voltage-compensating devices owned by the applicable market participant . | One copy of the list is sent to the <i>IESO</i> via email at orcp@ieso.ca | The <i>IESO</i> and applicable market participant have the verification schedule for BES elements. |
| 3.2-1 | Receive verification milestone for BES elements | The <i>IESO</i> receives the verification milestones for BES elements from the applicable market participant and records it in the tracking database. | The tracking database is updated each time a new verification milestone for BES elements is received by the <i>IESO</i> . | The verification milestones for BES elements. | Electronic record kept by the <i>IESO</i> . | The <i>IESO</i> updated the tracking database. |

Table 3–3: Procedural steps for establishing verification timelines for non-BES elements

| Ref. | Task Name | Task Detail | When | Resulting Information | Method | Completion Events |
|-------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| 1.2-2 | Identification of non-BES elements | The <i>IESO</i> communicates to the applicable market participant the list of non-BES <i>generation facilities, electricity storage facilities, synchronous condensers</i> and other voltage-compensating devices, the testing timeframe, and the tests required to obtain verified element data . | Upon determination of potential <i>reliability</i> impact by the <i>IESO</i> . | The list of non-BES <i>generation facilities, electricity storage facilities, synchronous condensers</i> and other voltage-compensating devices that require verification. | Email from orcp@ieso.ca to the applicable market participant | The applicable market participant has the list of non-BES elements they own that require verification. |
| 2.2-2 | Receive email notification and establish verification timelines for non-BES elements that require verification | The applicable market participant establishes the verification timelines for their non-BES <i>generation facilities, electricity storage facilities, synchronous condensers</i> and other voltage-compensating devices based on the notification received from the <i>IESO</i> . | Upon receiving the list of non-BES <i>generation facilities, electricity storage facilities, synchronous condensers</i> and other voltage-compensating devices from the <i>IESO</i> . | The verification timelines for each <i>generation facilities, electricity storage facilities, synchronous condensers</i> and other voltage-compensating devices owned by the applicable market participant | Email to orcp@ieso.ca | The <i>IESO</i> receives the verification timelines for non-BES elements. |
| 3.2-2 | Receive verification timelines for non-BES elements | The <i>IESO</i> receives the verification timelines for non-BES elements from the applicable market participant and records it in the tracking database. | The tracking database is updated each time a new verification timeline for non-BES elements is received by the <i>IESO</i> . | The verification timelines for non-BES elements. | Electronic record kept by the <i>IESO</i> . | The <i>IESO</i> updates the tracking database. |

Table 3–4: Procedural steps for processing verified element data

| Ref. | Task Name | Task Detail | When | Resulting Information | Method | Completion Events |
|-------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-2-3 | Obtain verified element data | The applicable market participant makes the necessary arrangements to obtain for the <i>generation facilities, electricity storage facilities</i> , synchronous condensers and other voltage-compensating devices, data specified in the forms set out in Appendix A. | According to the established schedule. | Complete sets of verified element data for each <i>generation facilities, electricity storage facilities</i> , synchronous condensers and other voltage-compensating devices owned or operated by the applicable market participant . | Electronic format. | The applicable market participant has the verified element data for the <i>generation facilities, electricity storage facilities</i> , synchronous condensers and other voltage-compensating devices they own or operate. |
| 2.2-3 | Submit verified element data | The applicable market participant submits to the <i>IESO</i> data for the <i>generation facilities, electricity storage facilities</i> , synchronous condensers and other voltage-compensating devices required under the applicable reliability standards or <i>market rules</i> , and specified in the forms set out in Appendix A. | According to the established schedule. | Verified element data. | Email to orcp@ieso.ca | Verified element data received by the <i>IESO</i> . |
| 3.2-3 | Confirm receipt of and assess, verified element data | The <i>IESO</i> confirms to the applicable market participant receipt of verified element data . The <i>IESO</i> performs the necessary tests to confirm the usability and accuracy of the received verified element data . | When verified element data is received by the <i>IESO</i> | An email to the applicable market participant indicating receipt of their verified element data . Test results that indicate the usability and accuracy of the verified element data | Electronic record kept by the <i>IESO</i> . | The <i>IESO</i> has tested verified element data to determine whether it is usable or not, and/or sufficiently accurate for <i>reliability</i> studies or not, as required under the applicable reliability standards and this <i>market manual</i> . |
| 4.2-3 | Determine if data is useable, and issue corresponding notification | The <i>IESO</i> determines that verified element data is usable or not usable | When the <i>IESO</i> assesses verified element data submitted under the <i>market rules</i> , requirement R6 of MOD-026-1 (or successors) or under requirement R5 of MOD-027-1 (or successors). | The verified element data is either usable or not usable | Email to the applicable market participant from the <i>IESO</i> . | The <i>IESO</i> has informed the applicable market participant that verified element data has been found usable or not. If the verified element data has been found not usable, the applicable market participant may be required to loop back to Ref. 1.2-3. |

| Ref. | Task Name | Task Detail | When | Resulting Information | Method | Completion Events |
|-------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5.2-3 | Determine if data is sufficiently accurate for <i>reliability</i> assessments and issue corresponding notification. | The <i>IESO</i> determined whether or not verified element data is sufficiently accurate for <i>reliability</i> assessments. | When the <i>IESO</i> assessed verified element data . | The verified element data is either sufficiently accurate for <i>reliability</i> assessments or is not. | Email to the applicable market participant from the <i>IESO</i> . | The <i>IESO</i> has informed the applicable market participant whether or not verified element data has been found sufficiently accurate for <i>reliability</i> studies. If the verified element data has not been found sufficiently accurate for <i>reliability</i> studies the applicable market participant may be required to loop back to Ref. 1.2-3. |

– End of Section –

Appendix A: Forms

This appendix contains a list of the forms associated with the Model Validation of *generation facilities, electricity storage facilities*, synchronous condensers and other voltage-compensating devices. These are available on the *IESO* public Web site in the same location as this procedure (hyperlinks are provided in the table below).

| Form Name | Form Number |
|----------------------------------------------------------------------------------|--------------------------|
| <i>IESO</i> Active and Reactive Capability Verification | Form 56 |
| Verification of Models and Data for Generator Excitation | Form 57 |
| Verification of Models and Data for Generator Turbine/Governor and Load Control | Form 58 |
| Verification of Coordination of Generator Capabilities, Limiters and Protections | Form 69 |
| Verification of Generator Frequency and Voltage Protective Relay Settings | Form 70 |
| Generator Relay Loadability – Synchronous Type Generation | Form 90 |
| Generator Relay Loadability – Asynchronous Type Generation | Form 92 |
| Verification of FACTS Voltage Regulating Devices | Form 107 |
| Verification of Synchronous Condenser Control System or Control Functions | Form 108 |

Note: No forms are needed for PRC-026-1. Applicable *market participants* must submit an email to the *IESO* that includes the required information in the body of the email or attachments to demonstrate their compliance

– End of Section –

References

| Document Name | Document ID |
|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| “MOD-025-2 Verification of Data Reporting of Generator Real and Reactive Power Capability and Reactive power Capability” | <i>NERC reliability standards are posted on the NERC website.</i> |
| “MOD-026-1 Verification of Models and Data for Generator Excitation Control System or Plant Volt/Var Control Functions” | <i>NERC reliability standards are posted on the NERC website.</i> |
| “MOD-027-1 Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions” | <i>NERC reliability standards are posted on the NERC website.</i> |
| “PRC-019-2 Coordination of Generating Element or Plant Capabilities, Voltage Regulating Controls, and Protection” | <i>NERC reliability standards are posted on the NERC website.</i> |
| “PRC-024-2 Generator Frequency and Voltage Protective Relay Settings” | <i>NERC reliability standards are posted on the NERC website.</i> |
| “PRC-025-2 Generator Relay Loadability” | <i>NERC reliability standards are posted on the NERC website.</i> |
| “PRC-026-1 Relay Performance During Stable Power Swings” | <i>NERC reliability standards are posted on the NERC website.</i> |
| “TOP-002-2 Normal Operations Planning” | <i>NERC reliability standards are posted on the NERC website.</i> |
| “FAC-009-1 Establish and Communicate Facility Ratings” | <i>NERC reliability standards are posted on the NERC website.</i> |
| “Market Manual 1: Market Entry, Part 1.5: Market Registration Procedures” | PRO-408 |
| “Generation Facilities” | IMO_FORM_1004 |
| “Market Manual 1: Connecting to Ontario's Power System Part 1.6: Performance Validation” | IESO_REQ_0208 |

– End of Document –