
Market Manual 7: System Operations

Part 7.1: IESO- Controlled Grid Operating Procedures

Issue 44.12-MRP
~~July 14, 2023~~ March 13, 2024

This *market manual* is provided for stakeholder engagement purposes. Please note that additional changes to this document may be incorporated as part of future engagement in MRP or other *IESO* activities prior to this *market manual* taking effect.

This market manual provides procedures and guidelines for market participants and IESO that are required to ensure the security and reliability of the interconnected power system. It covers the span from normal conditions to emergency conditions that are just less than a system-wide shutdown.

Document Change History

| Issue | Reason for Issue | Date |
|---|--|-----------------------|
| For changes prior to 2015, refer to versions 31.0 and prior. | | |
| For changes from 2015 through 2017, refer to versions 42.0 and prior. | | |
| 34.0 | Issue released for Baseline 39.0 | March 7, 2018 |
| 35.0 | Issue released in advance of Baseline 39.1 | May 1, 2018 |
| 36.0 | Issue released in advance of Baseline 40.1 | November 14, 2018 |
| 37.0 | Updated to meet accessibility requirements pursuant to the Accessibility for Ontarians with Disabilities Act | December 2, 2020 |
| 38.0 | Issue released in advance of Baseline 45.0 | December 18, 2020 |
| 39.0 | Issue released in advance of Baseline 45.0. Updated to include electricity storage participation. | February 26, 2021 |
| 40.0 | Issue released for Baseline 45.1 | June 2, 2021 |
| 41.0 | Issue released for Baseline 46.0 | September 15, 2021 |
| 42.0 | Issue released for Baseline 47.0 | March 2, 2022 |
| 43.0 | Issue released for Baseline 48.0 | September 14, 2022 |
| 44.0 | Issue released in advance of Baseline 48.1 | November 21, 2022 |
| 44.1 | Updated for stakeholder engagement to reflect Market Renewal Program | July 14, 2023 |
| <u>44.2</u> | <u>Updated after considering external stakeholder review</u> | <u>March 13, 2024</u> |

Related Documents

| Document ID | Document Title |
|---|--|
| <u>IMP_POL_0002IM</u> <u>P_POL_0002</u> | Market Manual 7.4: IESO-Controlled Grid Operating Policies |

Table of Contents

| | |
|---|------------|
| Table of Contents | i |
| List of Tables | v |
| List of Figures | v |
| Table of Changes | vi |
| Market Manuals | vii |
| Market Manual Conventions | vii |
| 1 Introduction | 1 |
| 1.1 Purpose | 1 |
| 1.2 Scope | 1 |
| 1.3 Contact Information | 4 |
| 2 Maintaining Reliability of the IESO-Controlled Grid | 5 |
| 2.1 IESO Responsibilities..... | 5 |
| 2.1.1 Interconnected Systems | 5 |
| 2.1.2 System Re-preparation | 5 |
| 2.2 Market Participant Responsibilities | 6 |
| 2.2.1 Independent Actions for Facilities Connected to the IESO-Controlled Grid | 6 |
| 2.2.2 Facilities Not Connected to the IESO-Controlled Grid..... | 6 |
| 2.3 IESO-Controlled Grid Operating States | 7 |
| 2.3.1 Normal Operating State | 7 |
| 2.3.2 High-Risk Operating State..... | 7 |
| 2.3.3 Conservative Operating State | 8 |
| 2.3.4 Emergency Operating State..... | 9 |
| 2.4 IESO Actions in Advance of Reliability Events..... | 10 |
| 2.4.1 Extreme Conditions | 11 |
| 2.4.2 System Flexibility Events | 12 |
| 2.4.3 Degraded Transmission System Performance | 13 |
| 3 Communication: General Requirements | 15 |
| 3.1 IESO Requirements | 15 |
| 3.1.1 Internal Post-contingency Communication | 15 |
| 3.2 Market Participant General Requirements | 15 |

| | | |
|----------|--|-----------|
| 3.2.1 | Communication Facilities | 15 |
| 3.2.2 | Registration Data Updates | 16 |
| 3.3 | Operating Instructions..... | 16 |
| 3.3.1 | Operating Instructions to Generators and Electricity Storage Participants | 16 |
| 3.3.2 | Operating Instructions to Transmitters and Distributors | 17 |
| 4 | Communication: Normal Operating State | 18 |
| 4.1 | IESO Communication..... | 18 |
| 4.2 | Market Participant Communication | 18 |
| 4.2.1 | Transmitters..... | 18 |
| 4.2.2 | Generators | 19 |
| 4.2.3 | Distributors and Connected Wholesale Customers | 21 |
| 4.2.4 | Electricity Storage Participants | 21 |
| 4.2.5 | All Market Participants..... | 22 |
| 4.3 | Normal Operating State Diagram | 23 |
| 5 | Communication: Abnormal Conditions | 24 |
| 5.1 | IESO Communication..... | 24 |
| 5.2 | Market Participant Communication | 25 |
| 5.2.1 | Transmitters..... | 25 |
| 5.2.2 | Generators | 26 |
| 5.2.3 | Distributors | 27 |
| 5.2.4 | Connected Wholesale Customers | 28 |
| 5.2.5 | Embedded Market Participants..... | 30 |
| 5.2.6 | Electricity Storage..... | 30 |
| 5.2.7 | Any Market Participant | 31 |
| 5.3 | Abnormal Conditions Diagram | 32 |
| 6 | Communication: Event Reporting | 33 |
| 6.1 | IESO Reporting Responsibilities | 33 |
| 6.2 | Market Participant Reporting Responsibilities | 34 |
| 6.3 | Physical and Cyber Event Reporting | 35 |
| 6.3.1 | NERC E-ISAC Reporting | 35 |
| 7 | Grid Control Actions: Readiness Programs..... | 36 |
| 7.1 | Voltage Reduction Test..... | 36 |
| 7.1.1 | Purpose | 36 |
| 7.1.2 | Scheduling and Responsibilities | 36 |
| 7.1.3 | Notification | 37 |

| | |
|---|-----------|
| 7.1.4 Reporting..... | 37 |
| 7.1.5 Requests for Exclusion from Voltage Reduction Test | 38 |
| 7.2 Simulation of Load Shedding | 39 |
| 7.2.1 System Restoration | 40 |
| 7.3 Unit Readiness Program..... | 40 |
| 8 Grid Control Actions: Voltage Control / Voltage Reduction | 42 |
| 8.1 Voltage Control | 42 |
| 8.1.1 Transformer Taps | 42 |
| 8.1.2 Related Generation Unit and Electricity Storage Unit Equipment | 42 |
| 8.1.3 Static Reactive Resources | 43 |
| 8.2 Voltage Reduction..... | 44 |
| 9 Grid Control Actions: Non-Dispatchable Load Shedding | 45 |
| 9.1 Non-Dispatchable Load Shedding via Manual Intervention | 45 |
| 9.1.1 Non-Dispatchable Load Shedding Initiated by IESO..... | 45 |
| 9.1.2 Non-Dispatchable Load Shedding For Frequency..... | 46 |
| 9.1.3 Non-Dispatchable Load Shedding Schedules: Transmitters and Connected Distributors..... | 46 |
| 9.1.4 Non-Dispatchable Load Shedding Schedules: Connected Wholesale Customers | 47 |
| 9.1.5 Non-Dispatchable Load Shedding via Local Appeals..... | 47 |
| 9.1.6 Non-Dispatchable Load Shedding via Global Appeals | 47 |
| 10 Grid Control Actions: Nuclear Manoeuvres Forecasted or Occurring..... | 49 |
| 11 System Security: Automatic Reclosure | 52 |
| 12 System Security: Frequency Regulation | 53 |
| 12.1 Generation and Electricity Storage Units..... | 53 |
| 12.2 Generators and Electricity Storage Participants Experiencing Abnormal Frequency | 53 |
| 12.3 Automatic Under-Frequency Load Shedding | 55 |
| Appendix A: Voltage Reduction Test Form | 59 |
| Appendix B: Emergency Operating State Control Actions | 60 |
| B.1 Actions in Advance of and During the IESO-Controlled Grid Emergency Operating State..... | 61 |
| B.2 Emergency Operating State Actions (IESO and External Control Area Deficiency) | 73 |
| B.2.1 Initial Actions | 73 |

List of Acronyms 76
Defined Terms 78
References 79

List of Tables

| | |
|---|----|
| Table 2-1: Types of Emergencies | 9 |
| Table 2-2: IESO Actions to Manage Extreme Conditions | 11 |
| Table 2-3: IESO Actions to Manage Variable Generation Events..... | 12 |
| Table 2-4: IESO Actions to Manage Degraded Transmission System Performance .. | 13 |
| Table 10-1: Grid Control Actions: Nuclear Manoeuvres Forecasted or Occurring | 49 |
| Table 10-2: Grid Control Actions when Nuclear Units are being Dispatched Down in Real-Time | 51 |
| Table 12-1: Under-Frequency Load Shedding Areas | 55 |
| Table 12-2: UFLS Relay Connected Loads for Peak Loads \geq 100 MW | 56 |
| Table 12-3: UFLS Relay Connected Loads for Peak Loads 50 MW - 99 MW | 57 |
| Table 12-4: UFLS Relay Connected Loads for Peak Loads 25 MW - 49 MW | 57 |
| Table B-1: Actions in Advance of and During the IESO-Controlled Grid Emergency Operating State..... | 61 |
| Table B-2: Emergency Operating State Actions (IESO and External Control Area Deficiency) | 73 |

List of Figures

| | |
|--|----|
| Figure 4-1: Communications for Normal Conditions | 23 |
| Figure 5-1: Communications for Abnormal Conditions | 32 |
| Figure 12-1: Generator and Electricity Storage Participant Actions During Abnormal Frequency | 54 |
| Figure A-1: Voltage Reduction Test Form..... | 59 |



Table of Changes

| Reference | Description of Change |
|-----------|-----------------------|
| | |
| | |

Market Manuals

Market manuals set out procedural and administrative details with respect to *market rule* requirements. Where there is a conflict between the requirements described in a *market manual* or appended document, and those within the *market rules*, the *market rules* shall prevail.

Market Manual Conventions

The standard conventions followed for *market manuals* are as follows:

- the word 'shall' denotes a mandatory requirement;
- references to *market rule* sections and sub-sections may be abbreviated in accordance with the following representative format: '**MR Ch.1 ss.1.1-1.2**' (i.e. *market rules*, Chapter 1, sections 1.1 to 1.2);
- references to *market manual* sections and sub-sections may be abbreviated in accordance with the following representative format: '**MM 1.5 ss.1.1-1.2**' (i.e. *market manual* 1.5, sections 1.1 to 1.2);
- internal references to sections and sub-sections within this manual take the representative format: 'sections 1.1 – 1.2';
- terms and acronyms used in this *market manual* in its appended documents that are italicized have the meanings ascribed thereto in **MR Ch.11**;
- all user interface labels and options that appear on the IESO gateway and tools are formatted with the bold font style; and
- data fields are identified in all capitals.

– End of Section –

1 Introduction

1.1 Purpose

This *market manual* sets out the activities that are undertaken by the *IESO*, *market participants* and other parties to ensure the *reliability* of the *IESO-controlled grid* (ICG) and addresses the following areas:

- the responsibilities of the *IESO* and *market participants*;
- operating states of the *IESO-controlled grid*;
- the communication requirements to be followed by the *IESO* and *market participants*;
- grid control actions in relation to readiness programs, voltage control and reduction, and *non-dispatchable load* shedding; and
- system *security* in relation to automatic reclosure and frequency *regulation*.

This *market manual* should be read in conjunction with:

- ~~Market Manual 7.4: IESO-Controlled Grid Operating Policies~~ [Market Manual 7.4: IESO-Controlled Grid Operating Policies](#) (MM 7.4), which defines the *IESO* policies for reliable operation of the *IESO-controlled grid*; and
- the *market rules* referenced in this *market manual*.

The operating procedures in this *market manual* describe how the *market rules* will be implemented when the method is not described in the rule itself.

Market participants are expected to have local procedures in place to handle details not covered in this *market manual*.

In some cases, alternative procedures to those set out in this *market manual* may be sufficient to satisfy the intent of the corresponding *market rules*, and may be mutually agreed upon as between a *market participant* and the *IESO*. Such alternative procedures must be documented in an *operating agreement* between the *IESO* and the relevant *market participant*.

Terminology is intended to be consistent with the *market rules*.

1.2 Scope

This *market manual* supplements the following *market rules*:

- MR Ch.1 s.11.3: Correction of Incorrect Information

- MR Ch.2 App.2.2: Technical Requirements: Voice Communication, Monitoring and Control, Workstations and Re-Classification of Facilities
- MR Ch.3 s.5.3: Exceptions
- MR Ch.4 s.5: Compliance, Inspection, Testing, and Monitoring
- MR Ch.4 s.7.3.1.2
- MR Ch.4 App.4.2: Requirements for Generation and Electricity Storage Facilities Connected to the IESO-Controlled Grid
- MR Ch.4 App.4.4: Transmitter Requirements
- MR Ch.4 App.4.15: IESO Monitoring Requirements: Generators
- MR Ch.4 App.4.16: IESO Monitoring Requirements: Transmitters
- MR Ch.5 s.1.2.1
- MR Ch.5 s.2.2: Normal Operating State
- MR Ch.5 s.2.3: Emergency Operating State
- MR Ch.5 s.2.4: High-Risk Operating State
- MR Ch.5 s.2.5: Conservative Operating State
- MR Ch.5 s.3.2: Obligations of the IESO
- MR Ch.5 s.3.3: Reliability-Related Information
- MR Ch.5 s.3.4: Obligations of Transmitters
- MR Ch.5 s.3.5: Obligations of Wholesale Customers
- MR Ch.5 s.3.6: Obligations of Generators (Embedded and Non-embedded)
- MR Ch.5 s.3.7: Obligations of Distributors
- MR Ch.5 s.3.8: Obligations of Electricity Storage Participants (Embedded and Non-embedded)
- MR Ch.5 s.4.5.1.3
- MR Ch.5 s.4.6.3
- MR Ch.5 s.5.1.2.7
- MR Ch.5 s.5.8: Operation Under an Emergency Operating State
- MR Ch.5 s.5.9A: Operation Under a Conservative Operating State
- MR Ch.5 s.5.10: Restoration of System Security Following a Contingency Event
- MR Ch.5 s.6.1.6

- MR Ch.5 s.6.3.5
- MR Ch.5 s.6.4.4.1
- MR Ch.5 s.6.4.9: Revoke Advance Approvals
- MR Ch.5 s.6.4.11: Recalls
- MR Ch.5 s.7.3.1.4
- MR Ch.5 s.7.4.4
- MR Ch.5 s.7.7.7: Advisory Notices
- MR Ch.5 s.8.1.2
- MR Ch.5 s.8.2.3
- MR Ch.5 s.9.2: Under Load Tap Changers
- MR Ch.5 s.9.3: Off Load Tap Changers
- MR Ch.5 s.10.2: Demand Control Initiated by a Market Participant
- MR Ch.5 s.10.3: Demand Control Initiated by the IESO in an Emergency Operating State
- MR Ch.5 s.10.4: Under-Frequency Load Shedding
- MR Ch.5 s.10.5: Generator Obligations During Abnormal Frequency
- MR Ch.5 s.10.5A: Electricity Storage Participant Obligations During Abnormal Frequency
- MR Ch.5 s.11.7: Testing
- MR Ch.5 s.12: Communications
- MR Ch.5 s.14: Information and Reporting Requirements
- MR Ch.7 s.7.2: Information Used to Determine Dispatch Instructions
- MR Ch.7 s.11.2: Process for Synchronization
- MR Ch.7 s.11.3: Process for De-Synchronization
- MR Ch.7 s.12.1.3.2
- MR Ch.7 s.12.1.3A
- MR Ch.7 s.12.2.1

1.3 Contact Information

Changes to this *market manual* are managed via the ~~IESO Change Management process~~. IESO Change Management process. Stakeholders are encouraged to participate in the evolution of this *market manual* via this process.

To contact the *IESO*, you can email *IESO* Customer Relations at customer.relations@IESO.ca or use telephone or mail. Telephone numbers and the mailing address can be found on the ~~IESO website~~ (http://www.IESO.ca/corporate-IESO/contact). ~~IESO website~~. *IESO* Customer Relations staff will respond as soon as possible.

– End of Section –

2 Maintaining Reliability of the IESO-Controlled Grid

2.1 IESO Responsibilities

(MR Ch.5 s.3.2.1)

Delegation to transmitters – The *IESO* may delegate portions of its responsibilities under the *market rules* to *transmitters* in accordance with the terms and conditions of the applicable *operating agreements*.

2.1.1 Interconnected Systems

(MR Ch.5 s.5.1.2.7)

Use and support – The *IESO* must use and support *interconnected systems* as necessary to maintain *reliability* of the *IESO-controlled grid* in accordance with agreements with other *security coordinators*, *balancing authorities* and *interconnected transmitters* operators.

2.1.2 System Re-preparation

(MR Ch.5 ss.1.2.1, 5.10.1 – 5.10.2, 8.2.3, 9.2.1 and 10.4)

IESO actions during contingencies – The *IESO* control room operators, assisted by the Energy Management System (EMS), continuously monitor important power system variables such as power flows and voltages at different locations on the *IESO-controlled grid*, and continually update operating plans to deal with contingencies. These plans typically involve such actions as: generation *dispatch*, load transfers, under-load tap changer (ULTC) movement pursuant to **MR Ch.5 s.9.2.1**, arming *remedial action schemes (RASs)* pursuant to **MR Ch.5 s.8.2.3**, recalling *outages* pursuant to **MR Ch.5 s.6.4.11**, curtailing *dispatchable loads*, etc. In *emergency* situations, the *IESO* may order *non-dispatchable load* shedding pursuant to **MR Ch.5 s.10.4**.

Overriding market mechanisms – The *IESO* will use market mechanisms to the extent feasible to solve system operating limit (SOL) exceedances. However, because of the short times permitted to return the *IESO-controlled grid* to a secure state, the *IESO* may pursuant to **Ch.5 s.1.2.1** order actions such as *dispatch of generation* ~~*dispatch-resources*~~ or *electricity storage resources* with regard only to their effectiveness in solving the limit exceedance.

Steps necessary to restore security – Pursuant to **MR Ch.5 ss.5.10.1 – 5.10.2**, the *IESO* and *market participants* will complete the following activities to restore power system *security* following a contingency:

1. Relevant *facility* operators report the event to the *IESO*.
2. *IESO* reviews and, if necessary, revises its operating plan.
3. *IESO* issues operating instructions to relevant *facility* operators.
4. Relevant *facility* operators execute operating instructions.

All reporting and execution of operating instructions are to be completed promptly¹. The 30-minute system re-preparation timeframe includes reporting and operating plan preparation and execution. Relevant *facility* location operators shall execute directions from the *IESO*, as specified, and as soon as practical, with due regard to equipment, human and environmental safety. Any discussion between a *market participant* and the *IESO* about the relative merits of an alternative set of control actions shall take place after the *IESO-controlled grid* has been restored to a *normal operating state*.

2.2 Market Participant Responsibilities

2.2.1 Independent Actions for Facilities Connected to the IESO-Controlled Grid

(MR Ch.5 ss.3.4.1.5, 3.5.1.3, 3.6.1.6, 3.7.1.5, 3.8.1.6 and 6.1.6)

Communication where market participant anticipates being unable to comply to IESO directions – *Market participants* must provide the *IESO* with as much advance notice as possible of any situation that may prevent them from being able to comply with *IESO* directions pursuant to **MR Ch.5 ss.3.4.1.5, 3.5.1.3, 3.6.1.6, 3.7.1.5** or **3.8.1.6**, as the case may be.

Communication where market participant disconnects on emergency basis – After taking independent actions to disconnect from the *IESO-controlled grid* pursuant to **MR Ch.5 s.6.1.6**, but prior to reconnecting to the *IESO-controlled grid* or continuing with participation in the *IESO-administered markets*, the *market participant* must provide the *IESO* with an explanation for their actions and, where applicable, any mitigating steps to prevent reoccurrence.

2.2.2 Facilities Not Connected to the IESO-Controlled Grid

(MR Ch.4 s.7.3.1.2)

¹ 'Promptly' means *market participants* are expected to execute the operating instruction within five minutes unless told otherwise by the *IESO*.

Impact Assessment and Exceptions – For the purpose of designation pursuant to **MR Ch.4 s.7.3.1.2**, the *IESO* assesses, as part of the Market Registration process, the impact that any *market participants' facilities* not directly connected to the *IESO-controlled grid* may have on the reliable operation of the *IESO-controlled grid*. The *IESO* will document any exceptions to requirements for the operation of embedded *facilities*.

2.3 IESO-Controlled Grid Operating States

(MR Ch.5 ss.2.2 – 2.5)

More than one operating state – The *IESO-controlled grid* can be in more than one operating state. Examples include:

- *high-risk operating state* for a certain area of the *IESO-controlled grid* while a *normal operating state* remains for rest of the *IESO-controlled grid*; and
- *conservative operating state* for a certain area of the *IESO-controlled grid* while a *normal operating state* remains for rest of the *IESO-controlled grid*.

Actions more likely – While the *IESO* has authority to safeguard *reliability* in all operating states, the *IESO* is more likely to undertake the actions discussed in this section 2.3 during a *high-risk operating state*, *conservative operating state*, or *emergency operating state* than during a *normal operating state*.

Additional Provisions – Policy information for grid operating states can be found in **MM 7.4 s.2.4**.

2.3.1 Normal Operating State

(MR Ch.5 s.2.2)

2.3.2 High-Risk Operating State

(MR Ch.5 s.2.4)

Conditions justifying declaration – For the purposes of **MR Ch.5 s.2.4.1**, the *IESO* may declare a *high-risk operating state* in the presence of any of the following conditions:

- adverse weather such as lightning, freezing precipitation, or widespread or heavy fog within 50 km of a *facility* that form part of the *IESO-controlled grid*;
- extreme weather such as tornadoes or wind gusts equal to or exceeding 80 km/h within 50 km of a *facility* that form part of the *IESO-controlled grid*;
- natural phenomena such as earthquakes, geomagnetic storms, floods, etc. that are either present or imminent;

- confirmed or suspected degradation of protective relaying, including any associated communications media;
- *outages*, deratings, or erratic behaviour of equipment such as regulation that affect the security of the *IESO-controlled grid*;
- unusual hazards such as forest fires, bomb threats, etc.; or
- any other condition that the *IESO* believes will significantly increase the exposure of the *IESO-controlled grid* to contingencies beyond normal *reliability* criteria. In such cases, the *IESO*, if requested, will explain the reason after the incident has passed.

High-risk operating states frequently involve a reasonable probability that additional contingencies may occur before there has been time to re-prepare after the first one.

IESO actions – During a *high-risk operating state*, the *IESO* may temporarily and selectively increase the level of system *security*. The *IESO* may take actions such as implementing high-risk system operating limits, re-dispatching generation or electricity storage, and recalling or cancelling relevant *outages*, in accordance with **MM 7.4**.

2.3.3 Conservative Operating State

(MR Ch.5 s.2.5)

Purpose of declaration – Conditions may require the *IESO-controlled grid* to be operated in a *conservative operating state* in response to a *reliability* concern to help prevent an *emergency operating state*.

Conditions justifying declaration – For the purposes of **MR Ch.5 s.2.5.1**, the *IESO* may declare a *conservative operating state* in the presence of any of the following conditions:

- forecasted or present extreme hot or cold weather;²
- tight supply conditions including when the *IESO* anticipates or has issued an Energy Emergency Alert 1 (EEA-1);
- forecasted strong or severe geomagnetic disturbance;
- situations requiring an unplanned evacuation of the *IESO* primary control centre; and
- IT-related unplanned *outages* that impair *IESO* market or system applications or tools (e.g. Energy Management System (EMS), or Market Interface System (MIS)), resulting in an adverse impact on system *security*. The aforementioned

² Extreme hot weather: Southern Ontario temperature forecast $\geq 35^{\circ}\text{C}$ or a humidex $\geq 40^{\circ}\text{C}$.
Extreme cold weather: Southern Ontario temperature forecast $\leq -20^{\circ}\text{C}$ or a wind chill $\leq -30^{\circ}\text{C}$;
Northern Ontario temperature forecast $\leq -30^{\circ}\text{C}$ or a wind chill $\leq -40^{\circ}\text{C}$

disruptions can be triggered either by the *IESO*, external entities/providers, or reasons beyond the control of the *IESO*.

IESO Actions – At the discretion of the *IESO*, *market participants* may be required to suspend any non-urgent maintenance or switching activities to minimize any potential risks to the *IESO-controlled grid*. The *IESO* may reduce transfers on key interfaces to increase resiliency. In addition, the *IESO* may reject or revoke advance approval of relevant *outages*; commit additional *resources*; or return equipment to service in accordance with **MM 7.4**.

2.3.4 Emergency Operating State

(MR Ch.5 s.2.3)

Energy, capacity and security emergencies – There are primarily three types of *IESO-controlled grid emergencies* that may result in the *IESO* declaring an *emergency operating state* pursuant to **MR Ch.5 s.2.3.1**. These *emergency* types will typically apply to global issues but may also apply to local issues. The *IESO* will refrain from declaring an *emergency operating state* when there is no material benefit to doing so.

Table 2-1: Types of Emergencies

| Type | Description |
|----------|--|
| Energy | When the <i>IESO</i> has exhausted all options and can no longer provide the expected <i>energy</i> requirements of the Ontario Balancing Authority area. |
| Capacity | When the operating capacity of the Ontario Balancing Authority area – plus purchases from other systems (to the extent available or limited by transfer capability) – is not adequate to meet Ontario <i>demand</i> plus regulating requirements. |
| Security | When the <i>IESO-controlled grid</i> : <ul style="list-style-type: none"> • is in an unstudied operating state, where for example there was an equipment failure that resulted in a system configuration for which limits were not derived (e.g. a stuck breaker); or • has a limit exceedance (e.g. voltage, circuit loading) that cannot be resolved through normal/routine control actions and requires shedding of <i>non-dispatchable load</i>. |

Declaration where actions necessary – The *IESO* generally declares an *emergency operating state* pursuant to **MR Ch.5 s.2.3.1** when an *IESO-controlled grid emergency* requires the implementation of one or more of the following control actions (refer to [Appendix B: Emergency Operating State Control Actions](#)):

- purchasing *emergency energy*
- implementing 3% or 5% voltage reductions
- operating to *emergency condition limits*³
- shedding *non-dispatchable load*
- disregarding normal regulatory or legal requirements

Declaration to assist neighbouring control areas – The *IESO* may also declare an *emergency operating state* pursuant to **MR Ch.5 s.2.3.1** when this state exists in a neighbouring *balancing authority area*, and respecting *normal operating state security limits* would restrict *IESO's* ability to assist that *balancing authority*.

IESO actions – When the *IESO* has declared an *emergency operating state* pursuant to **MR Ch.5 s.2.3.1**:

- the *IESO* shall inform *market participants*, neighbouring *balancing authorities*, transmission operators and *reliability coordinators* as required. Notification will be through an advisory notice and other industry-related sites. The telephone or other available means may also be used;
- *emergency condition limits*, representing the minimum acceptable level of *security*, will be respected; and
- through the use of operating instructions, the *IESO* shall direct relevant *facilities location operators*⁴ to take actions and return the *IESO-controlled grid to normal operating state*.

The *IESO* shall also inform *market participants*, balancing authorities, and reliability coordinators for adjacent balancing authority areas when the *IESO-controlled grid* has returned to a *normal operating state* and the *emergency operating state* has concluded (**MR Ch.5 s.2.3.3**).

2.4 IESO Actions in Advance of Reliability Events

(MR Ch.5 ss.1.2.1 and 3.2.2)

Operating plan – *NERC* Transmission Operations (TOP) and Emergency Preparedness and Operations (EOP) standards require the *IESO* to have a viable operating plan for reliable operations. This plan should be designed to evaluate options and set procedures for reliable operation through a reasonable future time period. Among other things, a viable operating plan must address expected commitments of generation ~~resource commitment~~ resources and electricity storage resources and

³ Described in **MM 7.4** and referred to as “emergency condition operating limits”.

⁴ The location operator is the person who physically controls the equipment.

dispatch, interchange scheduling, capacity and *energy* reserve requirements, and *demand* patterns.

IESO actions – To ensure the viability of the operating plan, there may be situations that require the *IESO* to take control actions outside of market timelines pursuant to **MR Ch.5 s.1.2.1**. These situations include:

- extreme conditions
- *variable generation* events
- degraded *transmission system* performance

In these situations, the *IESO* will use normal market mechanisms to the extent feasible.

2.4.1 Extreme Conditions

(MR Ch.5 s.1.2.1; Ch.7 s.12.1.3A)

Notice of extreme conditions – The *IESO* may issue an extreme conditions advisory notice one day in advance of extreme conditions. The notice will notify the market of:

- the conditions or expected conditions in the forecast; and
- the action(s) the *IESO* is taking, or may take, should forecasted conditions materialize.

IESO actions in advance of declaration – Forecasted extreme conditions may require action(s) in advance of a *high-risk operating state*, *conservative operating state*, or *emergency operating state*.

Examples of IESO actions – Table 2-2 provides examples of conditions that may require the *IESO* to take control actions, as well as examples of the potential actions, when the *IESO* anticipates or is experiencing extreme conditions.

Table 2-2: IESO Actions to Manage Extreme Conditions

| If ... | Then... |
|---|--|
| The <i>IESO</i> experiences, or expects conditions such as: <ul style="list-style-type: none"> • extreme weather • forest fires | The <i>IESO</i> may: <ul style="list-style-type: none"> • commit additional generators or <i>electricity storage units</i>; • reject or revoke <i>planned outages</i>; or • take other actions appropriate for the circumstances. |

2.4.2 System Flexibility Events

(MR Ch.5 s.1.2.1; MR Ch.7 s.12.1.3A)

Definition – System flexibility is the ability of the system to respond to intra-hour differences between:

- expected supply and actual production; and/or
- expected *demand* levels and actual consumption.

System flexibility events occur when conditions are such that there is increased risk for material differences between supply and *demand* in future hours.

Examples of IESO actions – Table 2-3 provides examples of conditions that may require the *IESO* to take actions when we anticipate or are experiencing a system flexibility event.

Notice of system flexibility events – The *IESO* may issue an advisory notice in advance of or during a system flexibility event as appropriate. The advisory notice will notify the market of:

- a system flexibility event is expected or in progress; and
- the action(s) the *IESO* is taking.

Table 2-3: IESO Actions to Manage Variable Generation Events

| If... | Then... |
|---|--|
| <p>The <i>IESO</i> experiences or expects conditions that may require additional system flexibility to address, such as:</p> <ul style="list-style-type: none"> • material differences between forecasted and actual <i>variable generation</i> output; or • significant <i>variable generation</i> ramp events; or • material differences between forecasted and actual Ontario <i>demand</i>⁵ | <p>The <i>IESO</i> may:</p> <ul style="list-style-type: none"> • adjust the 30<i>thirty-minute operating reserve</i> requirement to indicate the system flexibility need; • manually adjust the <i>variable generation</i> forecast to align it with expected <i>variable generation</i> output; • commit/constrain on/constrain off <i>dispatchable resources</i>; • curtail export⁶ transactions mid-hour; or • take other actions appropriate for the circumstances. |

⁵ Differences between forecasted and actual *demand* may be exacerbated by embedded generation output, which is reflected through Ontario *demand*.

⁶ Except for capacity exports, unless the backing generator *resource* that has committed its capacity has not been scheduled or is not generating to the full amount of the capacity export, at which point the capacity export may be curtailed to the lower of the *resource's* schedule or output.

2.4.3 Degraded Transmission System Performance

(MR Ch.5 s.1.2.1; MR Ch.7 s.12.1.3A)

Definition – There may be times when some portion of the *transmission system* is showing a recent history of degraded performance. These situations are identified when there is:

- higher than average *forced outage* rates; or
- unanticipated tripping; or
- unanticipated failures to trip.

Risk assessment – The *IESO* will assess the risk level associated with degraded *transmission system* performance. These risk levels are as follows:

- **Elevated:** There have been a number of related issues with transmission equipment in the same transmission yard over the past few months.
- **Severe:** There have been a number of related issues with transmission equipment in the same yard over the past week, and the situation continues to deteriorate.

Examples of IESO actions – Table 2-4 provides examples of conditions that may require the *IESO* to take control actions associated with the risk level, as well as examples of the potential actions, when the *IESO* anticipates or experiences a degraded *transmission system* performance event. Where time permits, the *IESO* will discuss control actions with the applicable *transmitter* before implementation.

Notice of degraded transmission system performance events – The *IESO* may issue an advisory notice in advance of or during a degraded *transmission system* performance event as appropriate. The advisory notice will notify the market of:

- the type of degraded *transmission system* performance event expected or in progress; and
- the action(s) the *IESO* is taking.

Table 2-4: IESO Actions to Manage Degraded Transmission System Performance

| If the IESO... | The IESO may... |
|----------------------------------|---|
| Declares an Elevated risk | <ul style="list-style-type: none"> • limit the number of critical elements that are out-of-service; • revoke or reject <i>planned outages</i>; • prepare limits that are reflective of more severe contingencies; • adjust use of <i>RASs</i> to reduce operation of affected <i>transmission system</i> elements; or |

| If the IESO... | The IESO may... |
|---|---|
| | <ul style="list-style-type: none"> • instruct <i>market participants</i> to staff switch yard for planned switching. |
| Declares a Severe risk (or increases an Elevated risk to Severe) | <ul style="list-style-type: none"> • further restrict the number of critical elements that are out-of-service; • recall other critical elements that are out-of-service in the area; • respect limits that are reflective of more severe contingencies; or • instruct <i>market participants</i> to staff switch yard around the clock. |
| Decreases the risk level, or declares that there is no longer a risk | Instruct <i>market participants</i> to return to normal staffing of switch yards. |

– End of Section –

3 Communication: General Requirements

(MR Ch.5 ss.3.5.1.2, 3.6.1.3, 3.8.1.3, 6.3.5 and 12)

Sections 3 through 6 of this *market manual* outline the minimum conditions, developments and items that must be communicated to ensure reliable operation of the *IESO-controlled grid*, and by extension, support market operations. Appropriate performance standards for communications are included where practical. In the absence of explicit standards, *market participants* are to act in accordance with *good utility practice*.

3.1 IESO Requirements

3.1.1 Internal Post-contingency Communication

(MR Ch.5 ss.12.1 – 12.4)

Direct communication – The *IESO* will, following contingencies or system events, communicate directly with the staff who exercise direct physical control of the affected *facilities* in accordance with applicable agreements or procedures. This direct communication is essential so that the appropriate corrective action can be formulated and initiated promptly, based on first-hand information provided to the *IESO*.

3.2 Market Participant General Requirements

(MR Ch.5 s.12.4.1)

Standard operating terms – For the purposes of **MR Ch.5 s.12.4.1, MM7.6:** Glossary of Standard Operating Terms sets out the approved standard operating terms, abbreviations, and definitions for communications between the *IESO* and *market participants*.

3.2.1 Communication Facilities

(MR Ch.2 App.2.2)

General requirements – Each *market participant* must provide communications facilities in accordance with **MR Ch.2 App.2.2**. If these facilities fail, the *IESO* and the affected *market participant* shall expeditiously re-establish contact via any other feasible medium (cell phone, satellite phone, e-mail, etc.).

Communication in normal and abnormal conditions – Each *market participant* shall identify their *dispatch* or *control centre*, *authority centre*, *facility* location operator and their controlled equipment to the *IESO*. In the *normal operating state*,

communication between the *IESO* and a *market participant* will be through the *market participant's authority centre*. In abnormal conditions (refer to section 5), including *emergency* situations, or during a failure of normal communication channels, the *IESO* will typically communicate directly with the relevant *facility* location operator. After the situation has stabilized, subsequent calls may be directed to, or include the *authority centre*. Unless stated otherwise, communication is assumed to be between *IESO* control room operating personnel and the control room operating personnel of the relevant *market participants*.

3.2.2 Registration Data Updates

(MR Ch.1 s.11.3.1)

Contact information – Each *market participant* shall update its registration data with any changes to relevant contact information.

3.3 Operating Instructions

(MR Ch.5 ss.3.2.2, 3.4.2, 3.5.3, 3.6.2, 3.7.2 and 3.8.2)

Three-part communication – All operating instructions issued by, or received by, the *IESO* will be communicated and processed in accordance with the requirements of *NERC* standard COM-002: Operating Personnel Communications Protocols.⁷

Three-part communication shall be used for issuing and receiving operating instructions. Three-part communication consists of:

1. The issuer issues the operating instruction in a clear, concise, and definitive manner.
2. The recipient repeats the operating instruction (not necessarily verbatim).
3. The issuer confirms whether the response is correct. If the response was not correct, re-issue the operating instruction with additional clarity. If the response was not received or if the operating instruction was not understood by the receiver, then take an alternative action.

3.3.1 Operating Instructions to Generators and Electricity Storage Participants

(MR Ch.5 ss.3.6.1.6 and 3.8.1.6)

Controlled change in output – If a controlled change of output is required for *reliability* concerns pursuant to **MR Ch.5 ss.3.6.1.6** or **3.8.1.6**, then the *generation unit* or *electricity storage unit's* output change must be completed promptly. The *generator* or *electricity storage participant* will implement the change of output in a

⁷ "Operating instruction" has the meaning ascribed to it in *NERC Reliability Standards*.

manner that supports the safe and secure operation of the *generation resource* or *electricity storage resource*, respectively.

Removal from service – If an immediate reduction is required, or if a requested controlled reduction cannot be completed by the specified time, the *IESO* will direct the *generation units* or *electricity storage units* to be immediately removed from service pursuant to **MR Ch.5 ss.3.6.1.6** or **3.8.1.6** respectively. The *facility location operator* will proceed to remove the specified *generation unit(s)* or *electricity storage unit(s)* from service immediately in a safe and secure manner.

3.3.2 Operating Instructions to Transmitters and Distributors

(MR Ch.5 ss.3.4.1.5, 3.7.1.5, 4.6.3, 8.1.2 and 10.3.3)

Prompt compliance – Load transfers, voltage reductions, load shedding, *RAS* arming and single element removal from service are expected to be done promptly when directed by the *IESO*.

Direction in advance of contingency – *Transmitters* and *distributors* shall promptly inform the *IESO* if any control action cannot be completed promptly. In those instances, the *IESO* may direct that the control action be executed in advance of any contingency.

Removing or restoring equipment – Switching procedures to remove or restore equipment in connection with *planned outages*, or following limited contingencies are specified in the relevant *operating agreements*.

– End of Section –

4 Communication: Normal Operating State

4.1 IESO Communication

(MR Ch.5 s.3.2.1)

Proactive communication – The *IESO* will communicate promptly with *generators, electricity storage participants, transmitters, distributors* and *connected wholesale customers* on matters of *IESO-controlled grid* operation that affect areas under their jurisdictions.

Direct communication where required – Communications from the *IESO* to *market participants* will normally be to their *authority centre*, in accordance with the *market rules*. However, the *IESO* will communicate directly with the *facility* location operator, where required, for matters relevant to the *reliability* of the *IESO-controlled grid*.

4.2 Market Participant Communication

4.2.1 Transmitters

(MR Ch.5 s.3.4.1.4)

Notice to IESO – *Transmitters* should promptly report adverse operating conditions or unusual occurrences to the *IESO*. In addition, the *transmitter* shall advise the *IESO* if another operating authority (for example, an agent) has an assigned responsibility for part or all of the equipment.

Content and timing of reports for change of status – *Transmitters* must report to the *IESO* any actual or planned change in status of any of their *facilities* that are included in the *IESO-controlled grid* pursuant to **MR Ch.5 s.3.4.1.4**. These reports shall include times and shall be made as soon as possible. Examples include: planned switching, planned periods of unavailability of equipment, expected return to service times from *outage*, etc. Detailed reporting procedures are normally contained in the relevant *operating agreement*.

Where transmitter is also distributor – *Transmitters* that have operating control of portions of *distribution systems* shall abide by any communications requirements specified for *distributors* under **MR Ch.5 s.3.7** and any other applicable obligations.

Telephone – All communication by the *transmitter* shall be made by telephone to the *IESO* control room staff.

4.2.2 Generators

(MR Ch.5 ss.3.6.1.3 and 3.6.1.4; MR Ch.7 ss.11.2 and 11.3)

Telephone – Communication to the *IESO* by *generators* connected to the *IESO-controlled grid*, or *embedded generators* designated by *IESO* as having an impact⁸ on the *reliability* of the *IESO-controlled grid*, pursuant to **MR Ch.5 ss.3.6.1.3** and **3.6.1.4** shall be made by telephone to the *IESO* control room staff.

Matters requiring reporting – Matters that require prompt reporting to the *IESO* pursuant to **MR Ch.5 ss.3.6.1.3** and **3.6.1.4** include *generation units* that are synchronized or separated from the *IESO-controlled grid*, *generation units* that become unavailable while shut down, expected changes in real or reactive capability, planned periods of unavailability of equipment, expected return to service times from *outage*, status of automatic voltage regulators, among other things. These reports shall also include event times.

Switchyards – *Generators* who own a station with all, or part of a switchyard that is operated by another controlling authority, shall request authorization from the *IESO* to have devices operated that are not under their operating control. *Generators* and *transmitters* who are assigned operating control of elements contained in a common switchyard shall advise each other of proposed or actual equipment operations.

ABNO units – *Generators*, upon request, shall promptly report to the *IESO* the unit status information of available but not operating (ABNO) units.

Where generator is also transmitter – *Generators* that operate portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *transmitters* under **MR Ch.5 s.3.6** and any other applicable obligations.

4.2.2.1 Generation Unit Synchronization / Desynchronization

(MR Ch.7 ss.11.2.2A and 11.3.2)

Synchronization where no start-up notice received – **MR Ch.7 s.11.2.2A** governs synchronization procedures for *non-quick start resources* that have not received a *start-up notice*.

Desynchronization where no notice of decommitment received – **MR Ch.7 s.11.3.2** governs desynchronization procedures for *non-quick start resources* that have not received a notice of decommitment.

⁸ Usually because the embedded *generation unit* affects a *security limit*. The designation is included in the registration data.

4.2.2.2 Synchronization / Desynchronization of GOG-eligible Resources

(MR Ch. 7 ss.11.2.2 and 11.3.1A)

Synchronization process depends on receipt of start-up notice – MR Ch.7 s. 11.2.2 governs synchronization procedures for *GOG-eligible resources* that have received a *start-up notice*. *GOG-eligible resources* that have not received a *start-up notice* must use the synchronization procedures set out in **MR Ch.7 s.11.2.2A**.

Desynchronization process depends on receipt of notice of decommitment – MR Ch.7 s.11.3.1A governs desynchronization procedures for *GOG-eligible resources* that have received a notice of decommitment. *GOG-eligible resources* that have not received a notice of decommitment must use the desynchronization procedures set out in **MR Ch.7 s.11.3.2**.

4.2.2.3 Synchronization / Desynchronization of GOG-eligible Pseudo-Units

(MR Ch.7 ss.11.2.2, 11.2.2A, 11.3.1A and 11.3.2)

Synchronization procedure – *Pseudo-units* that are operating in combined cycle mode will have their corresponding notification of a commitment in the form of a *start-up notice* issued to their associated combustion turbine unit, and where a *start-up notice* does not already apply, a separate notification *start-up notice* for their steam turbine unit. The process for acknowledging the commitment notification and issuing their notification of synchronization, for each respective physical unit, follows the process outlined in section 4.2.2.2.

Desynchronization procedure – *Pseudo-units* that are operating in combined cycle mode will have their decommitment notification issued to the associated combustion turbine unit when the *pre-dispatch process* schedules the *pseudo-unit* below *minimum loading point* in the following hour. The steam turbine unit will only receive a decommitment notification when the last associated *pseudo-unit* operating in combined cycle mode is scheduled below *minimum loading point* in the following hour. The process for acknowledging the decommitment notification for each respective physical unit, follows the process outlined in section 4.2.2.2.

4.2.2.4 Synchronizing and Desynchronizing of Quick Start Resources

(MR Ch.7 ss.11.2.1 and 11.3.1)

MR Ch.7 ss.11.2.1 and **11.3.1** govern synchronization and desynchronization procedures, respectively, for *quick start resources*.

4.2.3 Distributors and Connected Wholesale Customers

(MR Ch.5 ss.3.7.1.2 and 3.7.1.3)

Telephone – Communication to the *IESO* by a *distributor* or *connected wholesale customers* pursuant to **MR Ch.5 ss.3.7.1.2** or **3.7.1.3** shall be made by telephone to the *IESO* control room staff.

Matters requiring reporting – Matters that require prompt reporting to the *IESO* pursuant to **MR Ch.5 ss.3.7.1.2** and **3.7.1.3** include status of low voltage static capacitors of 15 MVAR or larger nominal capacity that are *dispatchable* by the *IESO* for areas electrically South of Essa in Barrie, status of low voltage static capacitors of 10 MVAR or larger nominal capacity that are dispatched by the *IESO* for areas electrically North of Essa in Barrie, status of a distribution line that affects the output of an *embedded generator* or *embedded electricity storage facility* of 20 MW or greater, planned unavailability and return to service times of equipment included in the *IESO-controlled grid*, etc. These reports shall include event times.

Advance notice required – Pursuant to **MR Ch.5 s.3.7.1.2**, the *IESO* must be informed, in advance, of any unusual planned single-point load pickup greater than 100 MW on the *IESO-controlled grid*, or greater than 50 MW on the *IESO-controlled grid* that is electrically North of Essa in Barrie. This does not include large industrial loads that routinely change their *demand* by amounts that exceed these levels where the *IESO* is previously aware of this fact.

Where distributor is also transmitter – *Distributors* that operate portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *transmitters* under **MR Ch.5 s.3.4.1** and any other applicable obligations.

Multiple connection points – If a *distributor* or *connected wholesale customer* has more than a single *connection point* to the *IESO-controlled grid*, for example a dual element spot network (DESN) transformer installation, the status of the breakers that can affect a parallel between the multiple *connection points* must be reported to *IESO*, as well as any planned operation of them, pursuant to **MR Ch.5 s.3.7.1.2**. *Distributors* are not required to notify the *IESO* when a DESN transformer is required off-load for less than 15 minutes to perform switching on the *distribution system*.

4.2.4 Electricity Storage Participants

(MR Ch.5 ss.3.8.1.3 and 3.8.1.4; MR Ch.7 ss.11.2 and 11.3)

Telephone – Communication to the *IESO* by the *electricity storage participant* pursuant to **MR Ch.5 ss.3.8.1.3** and **3.8.1.4** shall be made by telephone to the *IESO* control room staff.

Matters requiring reporting – Matters that require prompt reporting to the *IESO* pursuant to **MR Ch.5 ss.3.8.1.3** and **3.8.1.4** include *electricity storage units* that are synchronized or separated from the *IESO-controlled grid*, *electricity storage*

units that become unavailable while shut down, expected changes in real or reactive capability, planned periods of unavailability of equipment, expected return to service times from *outage*, status of *automatic voltage regulation (AVR)*, etc. These reports shall also include event times.

Synchronization and desynchronization procedure – *Electricity storage participants* that intend to synchronize or desynchronize shall follow the protocols in section 4.2.2.1 and 4.2.2.3 above, as applicable.

Switchyards – *Electricity storage participants* who own a station with all, or part of a switchyard that is operated by another controlling authority, shall request authorization from the *IESO* to have devices operated that are not under their operating control. *Electricity storage participants* and *transmitters* who are assigned operating control of elements contained in a common switchyard shall advise each other of proposed or actual equipment operations.

ABNO Units – *Electricity storage participants*, upon request, shall promptly report to the *IESO* the unit status information of ABNO units.

Where electricity storage participant is also transmitter – *Electricity storage participants* that operate portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *transmitters* under **MR Ch.5 s.3.6** and any other applicable obligations.

4.2.5 All Market Participants

(MR Ch.5 ss.3.3.2, 3.3.3, 14.1.2 and 14.1.3)

Matters outside the scope of commercial operations that could impact reliability – All *market participants* should promptly inform the *IESO* of any matters that could affect the reliable operation of the *IESO-controlled grid*, including any matters outside the scope of commercial operations on the *IESO-controlled grid*.

4.3 Normal Operating State Diagram

Communications for **Normal** Conditions

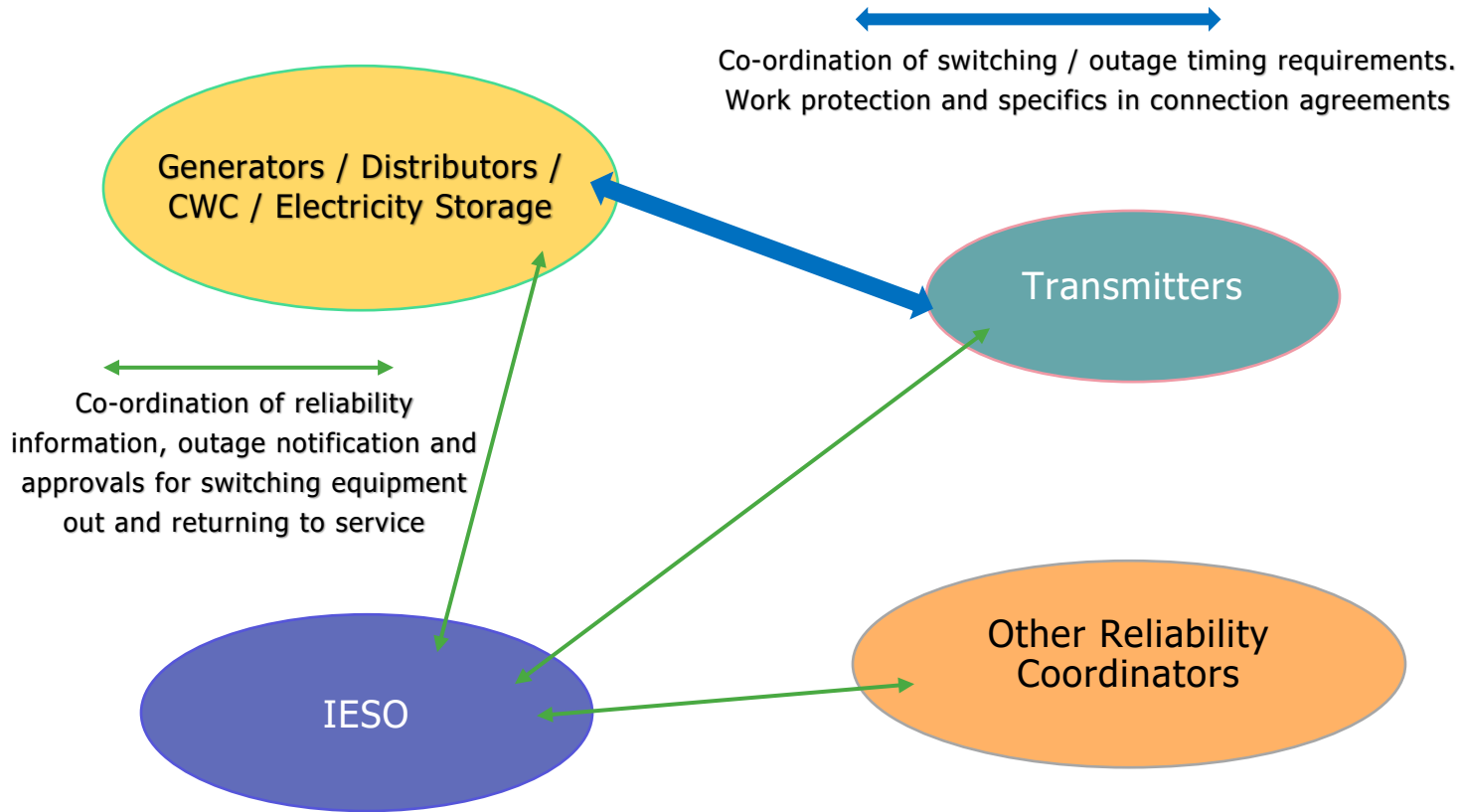


Figure 4-1: Communications for Normal Conditions

– End of Section –

5 Communication: Abnormal Conditions

Abnormal conditions include both *high-risk* and *emergency operating states*, as well as any unusual behaviour of equipment or *loads*.

5.1 IESO Communication

(MR Ch.5 ss.2.4.3, 3.2.2, 3.4.2, 3.5.3, 3.6.2, 3.7.2, 3.8.2 and 7.7.7)

IESO directions – During abnormal conditions, the *IESO* will issue operating instructions (and, as necessary *reliability* directives) to direct the actions that are required by each *market participant* (refer to section 3.3).⁹

More than two parties – If more than two parties are involved in the conversation, the *IESO* will lead the discussion. The *IESO* shall direct a party to leave the conversation if a commercial advantage could be obtained by the party's presence, if matters of a confidential nature relating to another party are being discussed, or if, in the opinion of *IESO*, the party's presence is impeding the process.

Power system events – The *IESO* will notify affected *market participants* of power system events or other situations that could affect the operation of the *IESO-controlled grid* using advisory notices pursuant to **MR Ch.5 s.7.7.7**. Examples of power system events include: declaration of a *high-risk operating state*, capacity or *energy* shortfalls, periods of reduced system *reliability*, weather and environmental advisories, etc.

Emergency Operating State Control Actions (EOSCA) – In instances where the system conditions indicate that Emergency Operating State Control Actions (refer to Appendix B) may be required to mitigate *operating reserve* deficiency and/or *energy* deficiency, the principal medium for *reliability* related information from the *IESO* to *market participants* will be through advisory notices issued pursuant to **MR Ch.5 s.7.7.7**. The *market participant* will be informed of the anticipated system conditions and possible implementation of EOSCA. This is carried out through the *IESO* website, supplemented by the use of a pre-recorded broadcast telephone message.

Status updates and extra-provincial contingencies – The *IESO* will use advisory notices to inform *market participants* of any changes in the status of power system events, or of any relevant contingencies in other jurisdictions.

Restrictions to auxiliaries and equipment – When aware of declared restrictions of equipment and auxiliaries that have been removed from service in

⁹ "Operating instruction" has the meaning ascribed to it in *NERC Reliability Standards*.

other jurisdictions, the *IESO* will inform the affected *market participants* by telephone.

5.2 Market Participant Communication

(MR Ch.5 ss.3.4.1.4, 3.6.1.3, 3.6.1.4, 3.7.1.2, 3.7.1.3, 3.8.1.3 and 3.8.1.4)

Contact IESO immediately – When contingencies that meet the reporting requirements identified in the following sections occur, the *facility* location operator suffering the contingency shall contact the *IESO* prior to contacting either the *transmitter* or its own *authority centre*. Once contact is established with the *IESO*, the *IESO* will establish contact with the *transmitter* and/or *authority centre*, as necessary, and involve these parties in multi-party discussions with the local operator of the *facility* suffering the contingency, as required to return the *IESO-controlled grid* to a *normal operating state*.

5.2.1 Transmitters

(MR Ch.5 s.3.4.1.4)

Default communication process – The relevant *operating agreement* will normally define the communication process between a *transmitter* and the *IESO* after a contingency. Otherwise, the following will apply:

- Following a contingency, immediate communication shall be initiated from the relevant *facility* location operator to the *IESO* and, at the *transmitter's* option, simultaneously to the *transmitter's authority centre*.
- Contact with the *IESO* must not be delayed if the *transmitter's authority centre* is not immediately available.
- The *IESO* will formulate a planned response to the contingency and will lead the conversations necessary to do so.

Matters requiring reporting – *Transmitters* shall report the following contingencies/conditions pursuant to **MR Ch.5 s.3.4.1.4**:

- automatic operations of all circuit breakers that form part of the *IESO-controlled grid*;
- operation of power system auxiliaries such as RASs and under-frequency protection;
- degradation of auxiliary equipment (refer to [Defined Terms](#)), control equipment, or staffing that reduces *security* of the *IESO-controlled grid*;
- degradation of switchyard auxiliaries, such as air compressors and station service transformers, that could affect the *reliability* of the *IESO-controlled grid*;

- any indication of a power system event, such as, oscillations of real or reactive power, voltage declines of 10% or greater, operation of disturbance recorders, etc.;
- loss of reactive power capability or *resources* of 15 MVAR or greater for areas electrically South of Essa in Barrie, or 10 MVAR or greater for areas electrically North of Essa in Barrie; and
- when frequency drops below 59.8 Hz (refer to section 9.1.2).

Extraneous factors – *Transmitters* will inform the *IESO* pursuant to **MR Ch.5 s.3.4.1.4** of restrictions on equipment in the *IESO-controlled grid* and of any extraneous factors that may affect the operation of the *IESO-controlled grid*, such as inclement weather, forest fires, or directions from civil authorities (i.e. fire or police). *Transmitters* must also report any change in such conditions.

Telephone – Communication by the *transmitter* shall be made by telephone to the *IESO* control room staff.

5.2.2 Generators

(MR Ch.5 ss.3.6.1.3 and 3.6.1.4)

Matters requiring reporting – The operator of *generation units* connected to the *IESO-controlled grid*, or of *embedded generation units* that are designated by the *IESO* to have an impact on the *reliability* of the *IESO-controlled grid* shall report the following contingencies promptly and directly to the *IESO* pursuant to **MR Ch.5 ss.3.6.1.3** or **3.6.1.4**:

- unscheduled step changes in a *generation unit's* output of greater than 50 MW or 10 MVAR;
- deratings in a *generation unit's* output of greater than 50 MW or 10 MVAR;
- automatic removal from service of generation, or *generation resources* of 20 MW nominal capacity or greater;
- degradation of auxiliary equipment (refer to Defined Terms) that reduces *IESO-controlled grid reliability*;
- operation of power system auxiliaries such as *RASs*;
- unavailability of any *generation units* that are included in *operating reserve*; and
- frequency outside the range of 59.8 Hz to 60.2 Hz (refer to section 11.2).

Telephone – Communication by the *generator* shall be made by telephone to the *IESO* control room staff. For *reliability* purposes, conversations will directly involve the appropriate *control centre*. Normal conversations may involve the appropriate *authority centres*.

Restrictions and breakers – *Generators* will inform the *IESO* of restrictions on equipment in the *IESO-controlled grid*. If *generation unit* breakers are within the jurisdiction of another *market participant*, the generator shall also advise that *market participant* as soon as conditions permit.

Extraneous factors – Pursuant to **MR Ch.5 ss.3.6.1.3** and **3.6.1.4**, *generators* shall advise the *IESO* of any extraneous factors that may affect the operation of the *IESO-controlled grid*. Examples include but are not limited to:

- inclement weather;
- environmental factors such as air pollution advisories/control orders;
- depleted fuel inventories, or unavailability of fuel switching capabilities;
- abnormal water flow conditions, loss of water control and/or dam safety concerns;
- forest fires; or
- received directions from civil authorities (i.e. fire or police).

Generators shall also communicate any change in such conditions.

ABNO units – *Generators*, upon request, shall promptly report to the *IESO* the unit status information of available but not operating (ABNO) units.

Where generator is also transmitter – *Generators* who have operating control of portions of the *IESO-controlled grid* shall abide by any communications requirements specified for *transmitters* pursuant to **MR Ch.5 s.3.4.1.4** and any other applicable obligations.

5.2.3 Distributors

(MR Ch.5 ss.3.7.1.2 and 3.7.1.3)

Communication process – Following a contingency on the *distribution system*, the *distributor* shall pursuant to immediately communicate from the relevant *facility* location operator to the *IESO* and, at the *distributor's* option, simultaneously to the *distributor's authority centre*. However, contact with the *IESO* must not be delayed if the *distributor's authority centre* is not immediately available. The *IESO* will lead these conversations. Such communication by the *distributor* shall be made by telephone to the *IESO* control room staff.

Matters requiring reporting – The *facility* location operator shall report promptly and directly to the *IESO* after the following contingencies pursuant to **MR Ch.5 ss.3.7.1.2** and **3.7.1.3**:

- any automatic loss or forced manual interruption of *load* greater than 100 MW, or 50 MW electrically north of Essa TS in Barrie;

- automatic removal from service of reactive capability of 15 MVAR or greater for areas electrically south of Essa in Barrie, or 10 MVAR or greater for areas electrically north of Essa in Barrie;
- operation of power system auxiliaries (refer to Defined Terms) such as RASs and under-frequency protection;
- degradation of power system auxiliaries that reduces *security* of the *IESO-controlled grid*; and
- loss of any distribution line(s) that affects the output of *embedded generation facilities* totalling 20 MW or greater in nominal capacity.

Exception – An exception to the above communication requirement is as follows:

- after an automatic operation of step-down transformer low voltage breakers and bus tie breakers, where this type of contingency is:
 - solely due to a low tension problem and there is no indication of a problem on the *transmission system*; and
 - the loss of customer load is not greater than 100 MW (or 50 MW electrically north of Essa TS in Barrie);

the *distributor* should attempt to restore the *load* from its normal supply before contacting the *IESO*. This is to avoid prolonging customer interruptions in these circumstances. The *IESO* should be informed of the success or failure of the attempt.

Restrictions and removals – Pursuant to **MR Ch.5 s.3.7.1.2**, *distributors* will advise the *IESO* of any operating restrictions or equipment removed from service as this could affect the *reliability* of the *IESO-controlled grid*.

Extraneous factors – Pursuant to **MR Ch.5 s.3.7.1.3**, *distributors* will inform the *IESO* of any extraneous factors that may affect the operation of the *IESO-controlled grid*, including but not limited to, inclement weather, forest fires, or directions from civil authorities (i.e., fire or police). *Distributors* shall also communicate any change in such conditions to the *IESO*.

Where distributor is also transmitter – *Distributors* that control portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *transmitters* pursuant to **MR Ch.5 s.3.4.1.4** and any other applicable obligations.

5.2.4 Connected Wholesale Customers

(MR Ch.5 s.3.5.1.2)

Communication process – Following a contingency, the *connected wholesale customer* shall immediately communicate from the relevant *facility* location operator to the *IESO* and, at the *connected wholesale customer's* option, simultaneously to

the *connected wholesale customer's authority centre*. However, contact with the *IESO* must not be delayed if the *connected wholesale customers's authority centre* is not immediately available. The *IESO* will lead these conversations. Such communication by the *connected wholesale customers* shall be made by telephone to the *IESO* control room.

The *facility* location operator shall report promptly and directly to the *IESO* after the following contingencies pursuant to **MR Ch.5 s.3.5.1.2**:

- any automatic loss or forced manual interruption of load greater than 100 MW, or 50 MW electrically north of Essa TS in Barrie;
- automatic removal from service of reactive capability of 15 MVAR or greater that are *dispatchable* by the *IESO* for areas electrically south of Essa in Barrie, or 10 MVAR or greater that are dispatchable by the *IESO* for areas electrically north of Essa in Barrie;
- operation of power system auxiliaries (refer to Defined Terms) such as *RASs* and under-frequency protection;
- degradation of power system auxiliaries that reduces *security* of the *IESO-controlled grid*; and
- loss of any internal distribution line(s) that affects the output of *embedded generation facilities* totalling 20 MW or greater in nominal capacity or *dispatchable load*.

Exception – An exception to the above communication requirement is as follows:

- after an automatic operation of step-down transformer low voltage breakers and bus tie breakers, where this type of contingency is:
 - solely due to a low tension problem and there is no indication of a problem on the *transmission system*; and
 - the loss of load is not greater than 100 MW (or 50 MW electrically north of Essa TS in Barrie),

the *connected wholesale customers* should attempt to restore the load from its normal supply before contacting the *IESO*. This is to avoid prolonging interruptions in these circumstances. The *IESO* should be informed of the success or failure of the attempt.

Restrictions and removals – Pursuant to **MR Ch.5 s.3.5.1.2**, *connected wholesale customers* will advise the *IESO* of any operating restrictions or equipment removed from service that could affect the *reliability* of the *IESO-controlled grid*.

Extraneous factors – Pursuant to **MR Ch.5 s.3.5.1.2**, *connected wholesale customers* will inform the *IESO* of any extraneous factors that may affect the operation of the *IESO-controlled grid*, including but not limited to, inclement

weather, forest fires or directions from civil authorities (i.e. fire or police). Any change in such conditions shall also be communicated to the *IESO*.

Where connected wholesale customer is also transmitter – *Connected wholesale customers* that control portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *transmitters* pursuant to **MR Ch.5 s.3.4.1.4** and any other applicable obligations.

5.2.5 Embedded Market Participants

(MR Ch.5 ss.3.6.1.3, 3.6.1.4, 3.8.1.3 and 3.8.1.4; MR Ch.2 App. 2.2)

Matters requiring reporting – *Embedded market participants* shall notify the *IESO* of any loss of load greater than 100 MW (50 MW electrically north of Essa TS in Barrie) or generation in excess of 20 MW. Such communication by the *embedded market participant* shall be made by telephone to the *IESO* control room staff.

Where embedded market participant is also distributor – *Embedded market participants* that control portions of the *IESO-controlled grid* shall abide by any communications requirements that apply to *distributors* under **MR Ch.5 ss.3.7.1.2** and **3.7.1.3** and any other applicable obligations.

5.2.6 Electricity Storage

(MR Ch.5 ss.3.8.1.3 and 3.8.1.4)

Matters requiring reporting – The operator of *electricity storage units* connected to the *IESO-controlled grid*, or of embedded *electricity storage units* that have been designated by the *IESO* as having an impact on the *reliability* of the *IESO-controlled grid* shall report the following contingencies promptly and directly to the *IESO* pursuant to **MR Ch.5 ss.3.8.1.3** and **3.8.1.4**:

- unscheduled step changes in an *electricity storage unit's* injection of greater than 50 MW or 10 MVAR;
- deratings in an *electricity storage unit's* injection capability of greater than 50 MW or 10 MVAR;
- any automatic loss or forced manual interruption of withdrawal greater than 100 MW, or 50 MW electrically north of Essa TS in Barrie;
- automatic removal from service of *electricity storage facilities*, with an *electricity storage facility* size of 20 MW nominal capacity or greater;
- degradation of auxiliary equipment that reduces *IESO-controlled grid reliability*;
- operation of power system auxiliaries such as *RASs* and underfrequency protection;

- unavailability of any *electricity storage units* that are included in *operating reserve*; and
- frequency outside the range of 59.8 Hz to 60.2 Hz (refer to section 12.2).

Telephone – Such communication by the *electricity storage participant* shall be made by telephone to the *IESO* control room staff. For *reliability* purposes, conversations will directly involve the appropriate *control centre*. Normal conversations may involve the appropriate *authority centres*.

Restrictions and breakers – Pursuant to **MR Ch.5 s.3.8.1.3**, *electricity storage participants* will inform the *IESO* of restrictions on equipment in the *IESO-controlled grid*. If *electricity storage unit* breakers are within the jurisdiction of another *market participant*, the *electricity storage participant* shall also advise that *market participant* as soon as conditions permit.

Extraneous factors – Pursuant to **MR Ch.5 s.3.8.1.3**, *electricity storage participants* shall advise the *IESO* of any extraneous factors that may affect the operation of the *IESO-controlled grid*. Examples include but are not limited to:

- inclement weather
- environmental factors such as air pollution advisories/control orders
- depleted fuel inventories
- abnormal water flow conditions, loss of water control and/or dam safety concerns
- forest fires
- received directions from civil authorities (e.g. fire or police).

Electricity storage participants shall also communicate any change in such conditions.

ABNO units – *Electricity storage participants*, upon request, shall promptly report to the *IESO* the unit status information of ABNO units.

Where electricity storage participant is also transmitter – *Electricity storage participants* who have operating control of portions of the *IESO-controlled grid* shall abide by any communications requirements specified for *transmitters* under **MR Ch.5 s.3.4.1.4** and any other applicable obligations.

5.2.7 Any Market Participant

Commercially-induced load curtailments – Any *market participants* participating in commercially-induced load *curtailments* will promptly advise the *IESO* of any *curtailments* (e.g. water heaters) that they initiate. *Market participants* should also communicate the amount of the *curtailment* and load restoration times.

5.3 Abnormal Conditions Diagram

Communications for **Abnormal** Conditions

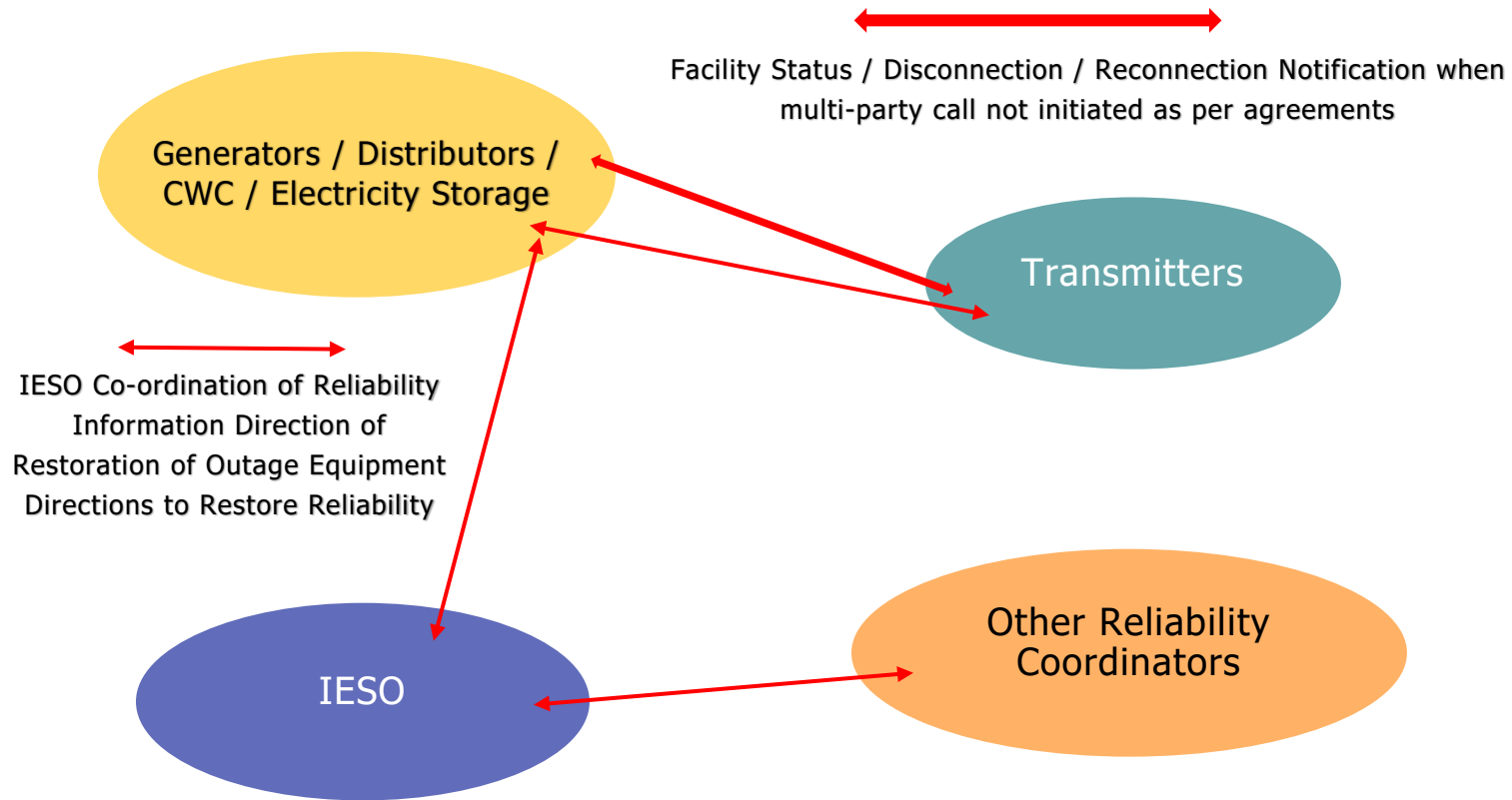


Figure 5-1: Communications for Abnormal Conditions

– End of Section –

6 Communication: Event Reporting

(MR Ch.5 ss.3.2.2, 3.4.2, 3.5.3, 3.6.2, 3.7.2 and 3.8.2)

NERC reporting – In accordance with *NERC Reliability Standards*, the *IESO* and *market participants* must report any event that:

- impacts, or may impact, the reliability of the *IESO-controlled grid*;
- causes a potential or actual market rule violation; or
- meets the reporting criteria defined in:¹⁰
 - *NERC* Standard EOP-004: Event Reporting; or
 - *NERC* standard CIP-008: Cyber Security – Incident Reporting and Response Planning (if applicable to the *market participant*)

The *IESO* and *market participants* shall maintain accurate and complete records for use in preparing reports and for subsequent inquiries and analysis. The intent is to provide a factual account of events, actions taken and data records.

6.1 IESO Reporting Responsibilities

(MR Ch.5 s.3.2.2)

IESO obligations – For actual or potentially reportable events, the *IESO* will do the following:

- report to *NERC*, ~~*NPCC*~~, the Northeast Power Coordinating Council (NPCC), and the *Ontario Energy Board (OEB)* within the timelines identified in the applicable regulations and *reliability standards*;
- depending on the specifics of the event and its relevance to Ontario's electricity market and system operation, communicate the event to *market participants* and neighbouring *reliability* coordinators;
- coordinate the collection of data and information required, within Ontario, to satisfy regulatory and *reliability standard* requirements;
- issue requests to *market participants* for information, such as protection relay settings, equipment descriptions, data records, and specifications;

¹⁰ In its roles as *balancing authority* and *reliability coordinator*, the *IESO* is also subject to the reporting requirements in *NERC* standard EOP-011: Emergency Operations and the [NERC Electric Reliability Organization \(ERO\): Event Analysis Process](#).

- perform event analysis by reviewing the sequence of events and assessing the correctness of factors such as operating procedures, equipment operation, relay settings, and training needs;
- complete an initial review of any potential non-compliance with *NERC* standards or *market rules* by a *market participant*, and (if necessary) refer to the *IESO* Market Assessment and Compliance Division (MACD) for appropriate action;
- produce required reports and make recommendations to involved parties on corrective actions to prevent recurrence; and
- report physical and cyber *security* events occurring at *IESO* or *market participant facilities* to proper authorities (refer to section 6.3 below).

6.2 Market Participant Reporting Responsibilities

(MR Ch.5 ss.3.4.2, 3.5.3, 3.6.2, 3.7.2, 3.8.2, 14.1.4 and 14.1.5)

Market participant obligations – For actual or potentially reportable events, *market participants* will do the following:

- provide the *IESO* with data, information and reports as required by regulatory entities, standards authorities, and/or the *IESO* in order for an event analysis to be performed, and reports to be prepared by the *IESO*;
- provide the *IESO* with event monitoring equipment data as requested by the *IESO*;
- promptly notify the *IESO* of any event monitoring equipment failure, malfunction, or cyber incident that could affect the timely collection and reporting of event data;
- when requested by the *IESO*, provide a preliminary report to the *IESO* for a *NERC*-reportable event or any resulting in a *reliability* concern, within the timeline specified by the *IESO* in the request;
- when requested by the *IESO*, provide a detailed final report of the event to the *IESO* at a timeline agreed to between the *market participant* and the *IESO*;
- promptly notify the *IESO* Shift Control Specialist (SCS) by telephone when a confirmed and reportable cyber security incident (as per CIP-002 or as identified in the BES Cyber Security Incident Response Plan) occurs. The SCS will escalate the call as necessary and report the event to the appropriate authorities and to the *IESO* Information Security team (refer to section 6.3);
- if subject to CIP-008 compliance, develop and maintain a BES Cyber Security Incident Response Plan that meets all CIP-008 criteria; and

- promptly notify the *IESO* Control Room Manager – Operations by telephone of any physical *security* events. The Manager – Operations will escalate the call as necessary. The *IESO* will report the event to the appropriate authorities on behalf of the *market participant* (refer to section 6.3 below).

6.3 Physical and Cyber Event Reporting

(MR Ch.3 s.5.3; MR Ch.5 s.3.2.2)

IESO reporting – The *IESO* reports physical and confirmed¹¹ cyber security incidents to the *NERC* Electricity Information Sharing and Analysis Centre (E-ISAC), and, as appropriate, the Canadian Centre for Cyber Security (CCCS), the Royal Canadian Mounted Police (RCMP), Ontario Ministry of Energy (MOE), local law enforcement agencies, and other operating authorities, in compliance with **MR Ch.3 s.5.3**.

6.3.1 NERC E-ISAC Reporting

(MR Ch.5 ss.3.2.2, 3.4.2, 3.5.3, 3.6.2, 3.7.2 and 3.8.2)

Sixty-minute reports – The *IESO* reports confirmed cyber *security* incidents occurring at a BES cyber asset owned *facility* to E-ISAC within 60 minutes of confirming the event. The *IESO* also reports incidents that have, could have, or are expected to have a material and detrimental impact on the *reliability* of the *IESO-controlled grid* to *NERC* E-ISAC when determined necessary.

Role of E-ISAC – E-ISAC serves the electricity sector 24/7 by facilitating communication between sector entities, U.S. and Canadian federal governments, and other critical infrastructure sectors. The E-ISAC promptly disseminates threat indications, analysis, and warnings to assist sector entities to evaluate the situation and take appropriate actions.

Reporting encouraged – *Market participants* are encouraged to report to the *IESO* any cyber security incident that is known or expected to have a material and detrimental impact on the *IESO-controlled grid*.

– End of Section –

¹¹ Cyber security incidents shall be considered confirmed if they are attested to be as such by either the reporting *market participant* and/or a supporting cyber security expert/agency acting on behalf of or in conjunction with the *market participant* in the context of the incident(s) in question.

7 Grid Control Actions: Readiness Programs

(MR Ch.5 s.11.7)

Testing or simulation of *emergency* procedures are performed to keep relevant staff familiar with the procedures, and to identify any deficiencies in the procedures so that they can be corrected. Readiness program policy information can be found in **MM 7.4 s.2.7.2**.

7.1 Voltage Reduction Test

(MR Ch.5 ss.11.7.1, 11.7.2 and 11.7.4)

Scope and terminology – For the purpose of this section, *transmitters* and connected *distributors* with directly connected loads of 20 MVA and greater who have control of their own voltage reduction *facilities* (i.e. ULTC step-down transformers) are referred to as test participants.

7.1.1 Purpose

(MR Ch.5 ss.11.7.1, 11.7.2 and 11.7.4)

Actual reductions – Tests of voltage reduction procedures will not be simulations. Actual voltage reductions will be implemented. The purpose of these tests is to:

- identify any equipment problems and customer concerns of test participants due to reduced voltage so that corrective action may be taken;
- measure the total amount of load reduction that is attainable; and
- measure the relationship between the magnitude of the voltage reduction and the amount of the *load* reduction.

7.1.2 Scheduling and Responsibilities

(MR Ch.5 ss.11.7.4 and 11.7.5)

Every 18 months – Province-wide tests are normally scheduled about every 18 months. If there has been an actual use of voltage reduction in that period that delivered similar information, the normally scheduled test may be postponed or cancelled. Additional local or province-wide tests may be scheduled if the *IESO* and the affected *market participants* so agree. The *IESO* will set the date for the test and will schedule it through the *outage* management process.

Meetings – As necessary, voltage reduction test meetings will be held with test participants before and after each scheduled test.

Customers – Each test participant will maintain a plan to initiate customer notification, handling of customer concerns during reductions procedures, and follow up on correction of customer problems after reduction termination.

Abnormal set-ups – Test participants will examine conditions in their respective areas for abnormal set-ups, which could result in intolerable voltage conditions during the test period.

7.1.3 Notification

(MR Ch.5 ss.11.7.1 – 11.7.5)

Timing and content – The *IESO* will notify test participants at least four weeks in advance of the test. This notice will normally align with the voltage reduction meeting that is held before and after each scheduled test. The *IESO* notification shall specify the times, duration, and percent voltage reduction of each exercise. The test may include a 3% reduction, a 5% reduction, or both.

IESO website – The *IESO* will post notification of the voltage reduction tests on the *IESO* website. Additional notification will also be included through an advisory notice, posted one week in advance of the test.

Customers – Each test participant required to participate in the test is responsible for notifying their customers of the voltage reduction test as they deem necessary. This customer notification should be in addition to the *IESO* notifications.

Joint communications – To facilitate the aforementioned notification requirements, the *IESO* and test participants' communication departments may consider a joint communication notification where possible.

7.1.4 Reporting

(MR Ch.5 ss.11.7.1 and 11.7.4)

Content – *Distributors* and *transmitters* involved in the exercise will report the following on the load that they control:

- test participant name;
- amount of load (MW) excluded prior to the commencement of the voltage reduction test, the location of the load and the reason for the exclusion request;
- amount of load (MW) excluded after commencement of the voltage reduction test, the location of the load and the reason for the exclusion request; and
- any comments, complaints or relevant observations identified during the voltage reduction test.

Form – The required data will be provided electronically in a table format specified by the *IESO* as set out in Appendix A or in another format as agreed to by the *IESO*.

Timing – Within one week of the exercise, data from the test participants shall be forwarded to the *IESO*, along with a plan that details corrective actions to be implemented to minimize the need to exclude *load* in subsequent tests.

Data collection requirements – The *IESO* relies on its own data to determine the official voltage reduction amounts. Therefore, voltage reduction *facilities* do not need to send MW readings to the *IESO*. However, voltage reduction *facilities* are still required to collect data as the *IESO* may request that data if further analysis is required for specific issues.

The following data will be collected:

- amount of load (MW) subjected to a 3% or 5% reduction test;
- amount of load (MW) reduced (by transformer or transformer pair) as a result of the test; and
- amount of load (MW) restored (by transformer or transformer pair) at the conclusion of the test.

Where metering readings necessary – If the voltage reduction *facilities* do not have automated data collection and archiving capability, they are required to take megawatt readings for each scheduled exercise. All readings should be taken as close as possible to the scheduled reduction times and restoration times. We suggest that the readings be taken in the three or four-minute period immediately before and after the voltage reduction, and again in the three or four-minute period immediately before and after the voltage restoration. In either case, the voltage reduction *facility* will keep the data for at least one month after the exercise has been completed.

7.1.5 Requests for Exclusion from Voltage Reduction Test

(MR Ch.5 ss.11.7.1 – 11.7.5)

Process for making requests – Test participants should submit all requests for exclusion from voltage reduction tests to the *IESO* using the *outage* management process. All requests should be received no later than 10:00 AM EST three *business days* prior to the scheduled day for the voltage reduction test.

Decision criteria – The *IESO* will approve or reject exclusion requests based on the decision criteria below and advise the test participant making the exclusion request within two *business days* prior to the test. The following decision criteria will be used by the *IESO* and the test participant in determining whether to approve requests for exclusion from the voltage reduction test. The same criteria will be applied to requests made while the test is in progress:

- safety of the employees or the public;

- damage to equipment;
- loss of production; and
- violation of any *applicable law*.

Requests from embedded customers – During a voltage reduction test, customers connected to or embedded in a test participant are expected to notify their test participant and request an exclusion to mitigate the risks described above. The test participant will promptly restore the voltage of the transformer station from which the entity is supplied and notify the *IESO* by telephone. In the event that the *IESO* receives a customer exclusion request directly, the *IESO* will promptly direct the affected test participant to take the appropriate mitigating action.

Responsibility for customers – As outlined in this instruction, each test participant is responsible for customer notification and handling of customer concerns, both during and after the exercise.

7.2 Simulation of Load Shedding

(MR Ch.5 ss.11.7.1 – 11.7.5)

Simulation – This exercise is a simulation. No load will actually be shed.

Scheduling – Load shedding is usually simulated during two periods each year. The following practices are conducted during each period, and scheduled to obtain maximum operating staff exposure. Communication will occur directly between the *IESO* and the relevant *facility* location operators of *transmitters, distributors* and *connected wholesale customers* since that would be the path in a real situation. No significant advanced warning will be given for the exercise.

IESO obligations – The *IESO* control room staff shall:

1. Select an amount of load (MW) to be simulated shed in each electrical area of the *IESO-controlled grid*.
2. Notify each operator, in advance, of the time that the simulation of load shedding is to occur. The notification shall include the amount of load reduction that the *transmitters, distributors* and *connected wholesale customer* is expected to simulate, the electrical area in which the simulation is to be conducted, and whether or not RAS load rejection is to be excluded.
3. Instruct the operators at the time of the exercise to simulate load shedding.
4. Order simulated load restoration.

Market participant obligations – The involved operators shall:

1. Simulate and record the operation of specified feeder breakers.

2. Record the times and amounts (MW) of load that was simulated shed and/or restored at each step in the exercise.
3. Report all actions and conditions to the *IESO* and respond as though the simulation were an actual event.

7.2.1 System Restoration

Restoration testing – Testing the various aspects of system restoration are covered in [Market Manual 7.8: Ontario Power System Restoration Plan](#).

7.3 Unit Readiness Program

(MR Ch.5 ss.1.2.1, 2.3.2 and 3.2.2; *NERC* standard EOP-011: Emergency Operations)

Start-up exercises – In accordance with *NERC Reliability Standards*, the *IESO* conducts the unit readiness program in order to ensure a set of plans are available to mitigate operating *emergencies* for insufficient generating capacity. The *IESO* may request *dispatchable*, non-quick start *generation resources* to start up in order to exercise their readiness. These exercises could occur any time in the calendar year and would generally involve units that have not been on for the previous 31 days or more, or have had a history of start-up problems.

Process – The exercises would be conducted as follows:

- at least five (5) *business days* in advance of any exercise, a message indicating that the seasonal readiness program may be occurring will be communicated via an advisory notice;
- at least three (3) *business days* in advance of any exercise, specific *generators* will be contacted by the *IESO* for exercise details;
- in the day-ahead timeframe, *GOG-eligible resources* will have a constraint applied to generate at least to their *minimum loading point* (MLP) for the duration of at least their *minimum generation block run time* (MGBRT), after the completion of the *day-ahead market*;
- the *registered market participant* for the *resource* must ensure that all *dispatch data* has been submitted related to the exercise; and
- if a *generation resource* being exercised reaches at least the constrained value for the constrained period, the exercise will be deemed a success.

Failure and cost recovery – Failure of the unit readiness exercise will require a follow-up phone call to the *IESO* control room with a status update from the *market participant* as per the current *outage* reporting protocols detailed in [MM 7.3: Outage Management](#). The exercise may be conducted again as conditions allow. Cost

recovery for these exercises shall be consistent with the day-ahead make-whole payment settlement process.

– End of Section –

8 Grid Control Actions: Voltage Control / Voltage Reduction

The *IESO* is responsible for maintaining voltage levels in order to ensure *security* of the *IESO-controlled grid*. This section includes the procedures for voltage control and voltage reduction.

8.1 Voltage Control

Additional provisions – Policy information for voltage control can be found in **MM 7.4 s.2.7.5**.

8.1.1 Transformer Taps

(MR Ch.5 ss.9.2.1 and 9.3.1)

Equipment and system limitations – The *IESO* and *market participants* shall give due consideration to equipment and power system limitations when specifying fixed taps or when operating ULTCs.

Step-up transformers – The *IESO* will specify tap positions on *generation unit* and *electricity storage unit* step-up transformers that are connected to the *IESO-controlled grid*.

Autotransformers above 50 kV – The *IESO* will determine the fixed tap settings of autotransformers rated above 50 kV. The *IESO* will direct the operation of ULTCs on these transformers.

Step-down transformers – *Transmitters, distributors* and *connected wholesale customers* will determine fixed tap settings on their step-down transformers and obtain approval from the *IESO* before making any changes.

Interconnection transformers – The *IESO* will obtain agreement with neighbouring *security coordinators* for any changes to tap settings on *interconnection* transformers. The owner of the transformer will implement any changes.

8.1.2 Related Generation Unit and Electricity Storage Unit Equipment

(MR Ch.4 ss.5 and App.4.2)

Performance requirements – Performance requirements for automatic voltage regulators, excitation limiters, and power system stabilizers, as applicable, will be specified by the *IESO* for all *generation units* and *electricity storage units* that affect the *IESO-controlled grid*.

Settings – *Generators and embedded generators, electricity storage participants and embedded electricity storage participants* shall implement settings within the time specified by the *IESO* and will confirm the performance of the equipment immediately following any change in settings

IESO approval – Any settings must not be changed without the prior approval of the *IESO*.

Performance retesting – Performance retesting will be conducted as frequently as required by the applicable *NERC* Modeling, Data, and Analysis (MOD) standard- or at shorter intervals if specified by the *IESO*.

Reactive power dispatch – The *IESO* is responsible for dispatching VARs on *generators and electricity storage participants* connected to the *IESO-controlled grid* in order to ensure reliable operation of the *IESO-controlled grid*.

Operation above rating – A *generator or electricity storage participant* operating its *facility* at a MW output above its rated:

- maximum output (for *generators*); or
- rated maximum injection or withdrawal output (for *electricity storage facilities*)

must independently reduce its MW output in order to be able to achieve Q max and Q min values corresponding to rated maximum power, unless instructed otherwise by the *IESO*.

8.1.3 Static Reactive Resources

(MR Ch.4 s.5 and App.4.2)

Continuously variable reactive resources – The *IESO* shall specify settings for continuously variable reactive *resources* such as synchronous condensers and static VAR compensators that are connected to the *IESO-controlled grid*.

Switched capacitors and reactors – The *IESO* shall specify delay times and voltage levels for automatically switched capacitors and reactors that can affect the *IESO-controlled grid*. Due regard will be given to limitations on equipment and on customer voltage levels.

IESO accountability – The *IESO* is accountable for the deployment of reactive resources directly connected to the *IESO-controlled grid* and low tension (LT) resources >10 MVAR north of Essa, >15 MVAR south of Essa to maintain acceptable voltage levels to ensure reliable operation of the *IESO-controlled grid*.

8.2 Voltage Reduction

(MR Ch.5 ss.10.2 and 10.3)

Additional provisions – Policy information for voltage reduction can be found in **MM 7.4 s.2.7.7**.

IESO-directed voltage reduction – The *IESO* may pursuant to **MR Ch.5 s.10.3.1** direct *transmitters* and *distributors* to reduce voltage by 3% or 5% to prevent or mitigate operating conditions that cannot be resolved by market mechanisms. These operating conditions include, but are not limited to:

- equipment limitations
- SOL exceedance
- activation of reserve
- load/generation balance

Direct operational control – The *IESO* will instruct the entity that has direct operational control of the *facilities* to execute the voltage reduction. This entity will be identified by *market participants* during the registration process and updated as required.

Distributor-initiated voltage reduction – *Distributors* may institute voltage reductions to reduce *demand* within their service areas in accordance with **MR Ch.5 s.10.2**. *Distributors* must notify the *IESO* via the *outage* management process in accordance with procedures in **MM 7.3**.

Remote supervisory control – *Distributors* that have remote supervisory control of the regulating transformers downstream of the location at which a voltage reduction was implemented, must block the action of these regulators during a voltage reduction ordered by the *IESO*.

Advisory notice – The *IESO* will notify *market participants* that voltage reductions are anticipated or are occurring via an advisory notice pursuant to **MR Ch.5 s.7.7.7**.

Data format – After a voltage reduction, *market participants* shall provide the post-voltage reduction data, required pursuant to **MR Ch.5 s.10.2.3.5**, electronically in a table format specified by the *IESO* as set out in [Appendix A](#) or in another format as agreed to by the *IESO*.

- End of Section -

9 Grid Control Actions: Non-Dispatchable Load Shedding

(MR Ch.5 s.10)

It may be necessary to interrupt *non-dispatchable load* to alleviate:

- a global or local capacity or energy deficiency;
- an equipment limitation; or
- a system operating limit (SOL) exceedance.

Load shedding will be undertaken in accordance with the policies outlined in **MM 7.4 s.2.7.8**. In some instances, load shedding will be automatic through under-frequency protection (refer to section 12.3) or *RASs*. In other instances, manual intervention and customer appeals will be required.

9.1 Non-Dispatchable Load Shedding via Manual Intervention

(MR Ch.5 ss.10.2 – 10.3)

Who may initiate – Manual load shedding may be initiated by:

- a *market participant* to reduce *demand* within their service area;
- the *IESO* as an *emergency* control action ([refer to Appendix B](#)); or
- a *transmitter* or *distributor* as an independent action.

9.1.1 Non-Dispatchable Load Shedding Initiated by IESO

(MR Ch.5 s.10.3)

Directions – The *IESO* will direct *emergency* load shedding. The *IESO* direction will include either the MW of relief to *transmitters* and large connected *distributors* or the percentage of prevailing load relief to small connected *distributors* and small *connected wholesale customers* and the electrical area(s) impacted (if relevant). Load shedding should not take place in an area where prevailing transmission conditions prevent it from alleviating the *reliability* concerns.

Rotation – The *market participant* shall migrate into their rotational load shedding schedule from the *emergency* load block shed if the conditions are likely to be sustained for a period of time. When rotating the load shed, the next block shall be shed before reloading a block.

Direct operation control – The *IESO* will communicate with the entity that has direct operational control of the *facilities* used to execute load shedding. The *IESO* will communicate directly with *transmitters*, large connected *distributors*, and large *connected wholesale customers*. The *IESO* will communicate via an automated messaging *facility* to small connected *distributors* and small *connected wholesale customers*.

Advisory notice – The *IESO* will notify all *market participants* that load shedding is anticipated or is occurring via an advisory notice pursuant to **MR Ch.5 s.7.7.7**. Upon returning to a *normal operating state*, the *IESO* shall release an advisory notice to all *market participants*, providing an estimate of the aggregate load curtailed (**MR Ch.5 s.10.3.7**).

9.1.2 Non-Dispatchable Load Shedding ~~for~~For Frequency

(MR Ch.5 ss.10.4.3 and 10.4.8; MR Ch.4 App.4.15 and 4.16)

Manual actions – If automatic under-frequency load shedding (UFLS) (refer to section 12.3) fails to maintain frequency at an acceptable value, manual control actions may be required. The magnitude of the frequency deviation determines whether the action is directed by the *IESO* or done independently by *transmitters*.

- *Transmitters* shall have annunciation of under-frequency set at 59.8 Hz.
- For frequencies 59.0 Hz and above, the *IESO* shall direct the actions.
- For frequencies between 59.0 Hz and 58.5 Hz, *transmitters* shall shed 25% of their controlled load.
- For frequencies below 58.5 Hz, *transmitters* shall shed load until the frequency returns to 59.0 Hz, or as close to 60 Hz as practical if an island is known to have formed within the *IESO-controlled grid*.
- *Market participants* shall ensure that frequency metering is available to the entity that has operating control of their feeder breakers.
- No load that has been shed to correct low frequency shall be restored without the approval of the *IESO*.

9.1.3 Non-Dispatchable Load Shedding Schedules: Transmitters and Connected Distributors

(MR Ch.5 s.10.3.6)

Blocks – The *IESO* has identified electrical areas defined by system operating limits. Each *transmitter* and connected *distributor* shall maintain up-to-date load shedding schedules for any such areas within its jurisdiction. These schedules should divide the load into approximately equal blocks; indicate the approximate percentage of the load in each block, and the approximate MW in each block at any

time. *Transmitters* and connected *distributors* shall ensure equitable treatment of different loads within the schedules. Priority customer loads as defined by **MM 7.8** are to be excluded from rotational load schedules. To the extent practical, load being shed by *RASs* should also be excluded. Exclusion from manual load shedding schedule should be kept to a minimum to facilitate rapid load shedding.

Varying load profiles – Because of the varying load profiles, each *transmitter* and connected *distributor* operating staff is responsible for determining where cuts can be made at any given time during the shift.

Non-interference – Load shedding should be such that it does not interfere with *emergency* services deployed in the vicinity of a disaster.

9.1.4 Non-Dispatchable Load Shedding Schedules: Connected Wholesale Customers

(MR Ch. 5 ss.10.2 – 10.3)

Blocks – Each *connected wholesale customer* is encouraged to prepare a manual load shedding schedule that divides its load into at least two blocks and prioritizes the blocks for shedding. The size of each block, in MW, should be known and kept up to date. This will facilitate protecting loads that affect human and environmental safety and sensitive industrial processes to the extent possible.

9.1.5 Non-Dispatchable Load Shedding via Local Appeals

(MR Ch.5 s.10.2)

Conditions – Transmitters or *distributors* may encounter situations in which equipment *reliability* is compromised. An example might be an overloaded transformer that feeds radial loads and there is no ability to transfer enough of the load to alleviate the transformer overload. In such situations, *transmitters* and/or *distributors* may, after notifying the *IESO*, initiate local appeals for voluntary load reduction in the relevant area.

Public communication – The *transmitter* or *distributor* who wishes to implement the local appeal shall handle the public communication required to initiate, and subsequently, cancel the local appeal when the need has disappeared.

9.1.6 Non-Dispatchable Load Shedding via Global Appeals

(MR Ch.5 s.10.3)

Conditions – If the market response is expected to leave all, or significant portions of, the *IESO-controlled grid* deficient of generation, the *IESO* may initiate warnings via public appeals to encourage customers to reduce electricity consumption voluntarily.

- End of Section -

10 Grid Control Actions: Nuclear Manoeuvres Forecasted or Occurring

(MR Ch.7 s.12.2.1)

Nuclear manoeuvres – If the *IESO* determines that the *pre-dispatch calculation engine* has forecast a nuclear manoeuvre in future hours, or if a nuclear manoeuvre is imminent in real-time operations, the *IESO* will ensure the nuclear reductions are managed in a manner that respects the characteristics of the nuclear *generation resource* while simultaneously satisfying the *IESO* requirement to balance the power system.

Pre-dispatch actions –The actions listed in Table 10-1 are executed in the pre-dispatch time frame to prevent or minimize nuclear reductions:

Table 10-1: Grid Control Actions: Nuclear Manoeuvres Forecasted or Occurring

| Condition | IESO Response to Condition |
|---|---|
| An <i>IESO</i> Control Room Operator (CRO) determines that the use of average <i>demand</i> forecasting will mitigate nuclear generation manoeuvres | The <i>IESO</i> will use the average <i>demand</i> forecast instead of the peak <i>non-dispatchable load demand</i> forecast for any or all of the <i>IESO</i> Ramp Hours. ¹² |
| The two-hour out pre-dispatch identifies nuclear units are being dispatched down by more than 50 MW | <p>The <i>IESO</i> may issue an advisory notice opening the mandatory window for <i>bids</i> and <i>offers</i>.</p> <p>The <i>IESO</i> may expand the Net Interchange Scheduling Limit (NISL) to 1000 MW and issue an advisory notice indicating the NISL expansion.</p> <p>Note: The <i>IESO</i> will only take these actions if they are likely to provide assistance in managing the SBG event.</p> |
| One hour out, the <i>pre-dispatch schedule</i> identifies nuclear units are being dispatched down by more than 50 MW | The <i>IESO</i> will curtail import transactions (including inadvertent payback) equal to the total MW reduction amount. Imports that are cut for this purpose will be tagged with ADQh-MAX. ¹³ |

¹² IESO Ramp Hours are defined as any hour in which the peak demand forecast exceeds the average demand forecast by at least 300 MW.

¹³ **ADQh-MAX** is the code applied to transactions curtailed for IESO Adequacy (Surplus or Deficiency) Actions. For transactions coded with **ADQHx**, refer to **MM 4.3** regarding eligibility for make-whole payments or exemption from real time failure charges.

| Condition | IESO Response to Condition |
|--|--|
| <p>The <i>dispatch</i> of a nuclear unit is not for the full amount of its maneuverable capability, or</p> <p>The nuclear unit cannot operationally respond to the instruction</p> | <p>Note: All imports will be cut economically on a reasonable effort basis.</p> <hr/> <p>The <i>IESO</i> may manually adjust its schedule, requiring other <i>generators</i> (including variable) and/or <i>electricity storage participants</i> to respond in its place.</p> <p>Note: The manual adjustment may be to maintain the nuclear unit at its current output or to <i>over-dispatch</i> the nuclear unit for the full amount of its maneuverable capability.</p> <p>Manual adjustments to <i>generator</i> or <i>electricity storage participant</i> schedules are for the hour-at-hand and the next hour only. If adjustments were to extend further into the future, it is likely that pre-dispatch would schedule actions interfering with our management of the SBG event. For example, a constrained-off nuclear unit may result in pre-dispatch scheduling fewer export transactions in future hours.</p> <p><i>Response</i> from other <i>generators</i> or <i>electricity storage participants</i> will result from an automatic <i>dispatch</i> from the Dispatch Scheduling and Optimization (DSO) tool.</p> |
| <p>Prior to the last run of pre-dispatch for the <i>dispatch</i> hour, the <i>pre-dispatch schedule</i> indicates that nuclear units are being shut down</p> | <p>Include incremental export transactions beyond two hours before the <i>dispatch hour</i>. This action will allow additional export transactions to be scheduled.</p> <p>Note: A system advisory will be issued to notify the market place prior to this action.</p> <p>Approximately two hours before the <i>dispatch hour</i>, the <i>IESO</i> will curtail linked wheel-through transactions to satisfy the total MW reduction amount required to avoid nuclear unit shutdown.</p> <p>Note: The <i>IESO</i> will issue an advisory notice stating that the <i>IESO</i> may curtail transactions for <i>reliability</i> during HEXX - HEXX.</p> <p>Note: Such curtailments are tagged TLRe MAX. All linked wheel-through transaction curtailments will be made pro-rata on a reasonable effort basis.</p> |
| <p>All flexible <i>responses</i> from baseload generation are exhausted</p> | <p>The <i>IESO</i> may implement nuclear unit shutdowns.</p> |

| Condition | IESO Response to Condition |
|-----------|--|
| | Note: The <i>IESO</i> will issue an Advisory Notice stating that a shutdown is in progress. |

Real-time actions – In the event the *IESO* determines that the nuclear units are being *dispatched* down in real-time, the *IESO* may take one or more of the following control actions, which may be performed in any order:

Table 10-2: Grid Control Actions when Nuclear Units are being Dispatched Down in Real-Time

| Condition | IESO Response to Condition |
|---|--|
| Nuclear units are being dispatched down by more than 50 MW (possibly as a result of export failures) | The <i>IESO</i> may curtail import transactions (including inadvertent payback) equal to the total MW reduction amount. Note: Imports cut for this purpose will be tagged with ADQh-MAX. All imports will be cut economically on a reasonable effort basis. |
| The <i>dispatch</i> of a nuclear unit is not for the full amount of its maneuverable capability, or The nuclear unit cannot operationally respond to the instruction | The <i>IESO</i> may manually adjust its schedule, requiring other <i>generators</i> (including variable) and/or <i>electricity storage participants</i> to respond in its place. Note: The manual adjustment may be to maintain the nuclear unit at its current output, or to <i>over-dispatch</i> the nuclear unit for the full amount of its maneuverable capability. Manual adjustments to <i>generator</i> or <i>electricity storage participant</i> schedules are for the hour-at-hand and the next hour only. If adjustments were to extend further into the future, it is likely that <i>pre-dispatch</i> would schedule actions interfering with our management of the SBG event. For example, a constrained-off nuclear unit may result in pre-dispatch scheduling fewer export transactions in future hours. <i>Response</i> from other <i>generators</i> or <i>electricity storage participants</i> will be an automatic <i>dispatch</i> from the DSO tool. |
| All flexible <i>responses</i> from baseload generation are exhausted | The <i>IESO</i> may implement nuclear unit shutdowns. Note: The <i>IESO</i> will issue an advisory notice stating that a shutdown is in progress. |

- End of Section -

11 System Security: Automatic Reclosure

(MR Ch.4 App.4.4)

Additional provisions – Policy information for automatic reclosure can be found in **MM 7.4 s.4.3.11**.

Settings – The *IESO* will review automatic reclosure settings that are recommended by *transmitters*, and, if necessary for the *reliability* of the *IESO-controlled grid*, request changes in those settings or capabilities. The *IESO* will specify all automatic reclosure settings for all circuits on the *IESO-controlled grid*.

Process for requests – Requests to have automatic reclosure blocked (hold-offs) on specific circuits (during planned work in a station, for example) are processed through the normal *outage* management system and in real-time as required.

- End of Section -

12 System Security: Frequency Regulation

12.1 Generation and Electricity Storage Units

(MR Ch.4 s.5 and App.4.2)

Performance requirements – Performance requirements, as applicable, for governors or equivalent devices that regulate active power output based on frequency will be specified by the *IESO* for all *generation units* and *electricity storage units* that affect the *IESO-controlled grid*.

Settings – *Generators, electricity storage participants, embedded generators and embedded electricity storage participants* shall implement settings within the time specified by the *IESO* and will confirm the performance of the equipment immediately following any change in settings.

IESO approval – Any settings must not be changed without the prior approval of the *IESO*.

Performance retesting – Performance retesting will be conducted as required by applicable standards, or at shorter intervals if specified by the *IESO*.

12.2 Generators and Electricity Storage Participants Experiencing Abnormal Frequency

(MR Ch.5 ss.10.5 and 10.5A)

Abnormal frequency – For the purposes of **MR Ch.5 ss.10.5** and **10.5A**, abnormal frequency is anything outside the normal range of 59.98 – 60.02 Hz.

Frequency restoration actions – Pursuant to **MR Ch.5 ss.10.5.2** and **10.5A.2**, all *generators* and *electricity storage participants*, respectively, must take actions at the frequency trigger-points shown below in Figure 12-1. During periods of abnormal frequency, unit voltage should be maintained within normal ranges with the automatic voltage regulator kept in service where possible.

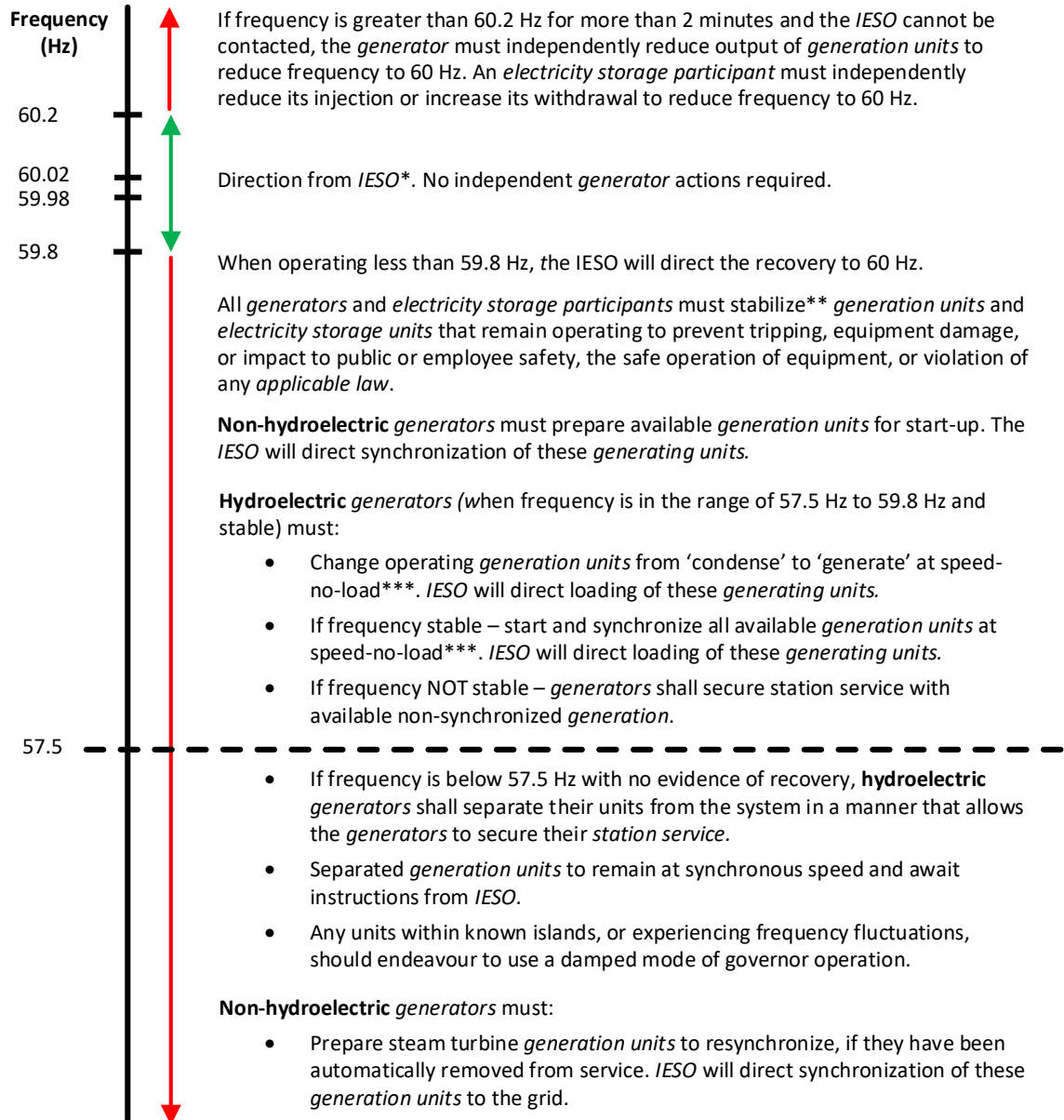


Figure 12-1: Generator and Electricity Storage Participant Actions During Abnormal Frequency

* For frequencies in the range of **59.8 Hz to 60.2Hz**, *generators* and *electricity storage participants* shall not act without instructions from the *IESO*, except for the purpose of protecting the safety of its equipment, its employees, or the public, or to prevent the violation of any *applicable law*. If a *generator* or *electricity storage participant* cannot maintain frequency within this range, the *IESO* should be notified prior to taking any corrective action that would alter the electrical output of the unit. Unit operators shall take all necessary measures to prevent units from tripping, while observing operating restrictions. If the unit operator must take immediate and independent action, the *IESO* should be contacted as soon as possible after.

**Stabilize in this context means to take action to adjust plant processes and parameters to enable steady, sustained operation while remaining synchronized to the grid.

***Speed-no-load means the *generation unit* is in service, running at synchronous speed with its unit breaker closed without any appreciable load on the unit. Some *resources* are pre-set to automatically *load restarted generation units* with certain in-house loads, which is acceptable during restoration, since the unit is not synchronized to an island. This configuration must be documented in a *Restoration Participant Attachment*. Refer to [MM 7.8: Ontario Power System Restoration Plan \(OPSRP\)](#).

12.3 Automatic Under-Frequency Load Shedding

(MR Ch.5 s.10.4.6)

Additional provisions – Policy information for automatic UFLS can be found in **MM 7.4 s.4.3.10**.

UFLS relays – Automatic UFLS is intended to improve system *reliability* by mitigating the risk of loss of generating units via their under-frequency protection. **MR Ch.5 s.10.4.6** requires at least 30% of load to be connected to automatic UFLS relaying for this purpose.

Relay connect requirement – To ensure that at least 30% of load is automatically shed during a low frequency event, the *IESO* requires that 35% of the total peak *load of connected wholesale customers and distributors* be connected to automatic UFLS relays. The additional 5% above requirement provides flexibility to accommodate UFLS feeder and relay *outages*, as well as *generation units* that trip for low frequencies above the curve specified in **MR Ch.4 App.4.2, Category 1**.

UFLS stages – Automatic UFLS must be done in stages as specified in applicable standards.

- a) For the purpose of UFLS implementation, the province of Ontario is divided into five UFLS areas, (Northwest, Northeast, West, East, and Central). The boundaries of those areas are listed in Table 12-1.

Table 12-1: Under-Frequency Load Shedding Areas

| UFLS Area | Boundaries |
|-----------|--|
| Northwest | Bounded by the Manitoba and Minnesota <i>interconnections</i> and west of the East-West interface. |
| Northeast | Bounded by east of the East-West interface and north of the Flow South interface. |
| West | Bounded by the Michigan <i>interconnection</i> and west of the BLIP interface. |

| UFLS Area | Boundaries |
|-----------|---|
| East | Bounded by the New York <i>interconnection</i> at St Lawrence and east of Cherrywood and Bowmanville. |
| Central | All of Ontario, excluding the Northwest, Northeast, West, and East areas. Bounded by the North-South interface, the BLIP interface, and Cherrywood and Bowmanville. |

- b) In all automatic UFLS areas, there must be at least 30% of area load connected to under-frequency relays. In order to ensure at least 30% of area load shedding is achieved while taking into account UFLS relay and feeder outages as well as *generation units* that trip prematurely for low frequencies, 35% of the load of those *distributors* and *connected wholesale customers* with a peak load of 25 MW or greater must be connected to UFLS relays. *Distributors* and *connected wholesale customers* with a peak load less than 25 MW are not required to provide UFLS. *Distributors* whose load spans more than one UFLS area must ensure that the required amount of UFLS is provided for their load in each UFLS area.
- c) Each *distributor* and *connected wholesale customer* shall select load for UFLS based on their load *distribution* at a date and time specified by the *IESO* that approximates system peak.
- d) The discrete load shedding requirements are given in (e), (f), and (g). Each *distributor* and *connected wholesale customer*, in conjunction with the relevant *transmitter*, shall submit to the *IESO* their proposed implementation plan for meeting their UFLS requirements within the time set by the Ontario UFLS Program Implementation Plan.
- e) For *distributors* and *connected wholesale customers* with a peak load of 100 MW or greater, the UFLS relay *connected* loads shall be set to achieve the amounts to be shed stated in Table 12-2.

Table 12-2: UFLS Relay Connected Loads for Peak Loads \geq 100 MW

| UFLS Stage | Frequency Threshold (Hz) | Total Nominal Operating Time(s) | Load Shed at stage as % of MP Load | Cumulative Load Shed at stage as % of MP Load |
|------------|--------------------------|---------------------------------|------------------------------------|---|
| 1 | 59.5 | 0.3 | 7 - 9 | 7 - 9 |
| 2 | 59.3 | 0.3 | 7 - 9 | 15 - 17 |
| 3 | 59.1 | 0.3 | 7 - 9 | 23 - 25 |
| 4 | 58.9 | 0.3 | 7 - 9 | 32 - 34 |

| UFLS Stage | Frequency Threshold (Hz) | Total Nominal Operating Time(s) | Load Shed at stage as % of MP Load | Cumulative Load Shed at stage as % of MP Load |
|------------|--------------------------|---------------------------------|------------------------------------|---|
| Anti-Stall | 59.5 | 10.0 | 3 - 4 | 35 - 37 |

- f) For *distributors* and *connected wholesale customers* with a peak load of 50 MW or more and less than 100 MW, the UFLS relay connected loads shall be set to achieve the amounts to be shed stated in Table 12-3.

Table 12-3: UFLS Relay Connected Loads for Peak Loads 50 MW - 99 MW

| UFLS Stage | Frequency Threshold (Hz) | Total Nominal Operating Time(s) | Load Shed at stage as % of MP Load | Cumulative Load Shed at stage as % of MP Load |
|------------|--------------------------|---------------------------------|------------------------------------|---|
| 1 | 59.5 | 0.3 | ≥ 17 | ≥ 17 |
| 2 | 59.1 | 0.3 | ≥ 18 | ≥ 35 |

- g) For *distributors* and *connected wholesale customers* with a peak load of 25 MW or more and less than 50 MW, the UFLS relay connected *loads* shall be set to achieve the amounts to be shed stated in Table 12-4.

Table 12-4: UFLS Relay Connected Loads for Peak Loads 25 MW - 49 MW

| UFLS Stage | Frequency Threshold (Hz) | Total Nominal Operating Time(s) | Load Shed at stage as % of MP Load | Cumulative Load Shed at stage as % of MP Load |
|------------|--------------------------|---------------------------------|------------------------------------|---|
| 1 | 59.5 | 0.3 | ≥ 35 | ≥ 35 |

- h) *Distributors* and *connected wholesale customers*, in conjunction with the relevant *transmitter* shall also shed those capacitor banks *connected* to the same station bus as the load to be shed by the UFLS *facilities*, at 59.5 Hz with a time delay of three seconds.
- i) Any electrical area in Ontario that may become isolated from the rest of the *IESO-controlled grid* but remain *connected* to a neighboring system during a disturbance, must contain sufficient automatic UFLS capability so that the recovery of the neighboring system will not be prejudiced.
- j) Inadvertent operation of a single under-frequency relay during the transient period following a System Disturbance should not lead to further system instability. For this reason, the maximum amount of load that can be *connected* to any single under-frequency relay is 150 MW.

Annual review – The *IESO* will review the requirements annually, and inform the relevant *market participants (transmitters, distributors, and connected wholesale customers)* of their automatic UFLS obligations.

– End of Section –

Appendix A: Voltage Reduction Test Form

| Voltage Reduction Test / Event Reading Sheet | | | | | | | | |
|--|--|-------------------|---------------|-------------------|---------------|----------------------|--|--|
| Market Participant: | | | | | | | | |
| Date (YYYY/MM/DD): | | | | | | | | |
| | | | | | | | | |
| | | 3% Test Load (MW) | | 5% Test Load (MW) | | Reason for Exclusion | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | 3% Test | | 5% Test | | Reason for Exclusion | | |
| | | From (hh:mm) | To (hh:mm) | From (hh:mm) | To (hh:mm) | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

Please add/delete rows and space for comments as required.

NOTES:

Figure A-1: Voltage Reduction Test Form

– End of Appendix –

Appendix B: Emergency Operating State Control Actions

(MR Ch.5 ss.2.3 and 5.8)

The following tables set out the control actions available to the *IESO* leading up to and during an “*emergency operating state*”.

- Table B.1 lists the control actions that may be initiated in advance of or during an *emergency operating state* where only the *IESO Control Area* is deficient.
- Table B.2 lists the control actions that may be initiated where the *IESO* and an external *control area* are both faced with generation deficiency.

While the tables provide the anticipated order of control actions, **the *IESO* may initiate control actions at any point in the hierarchy depending on the specific circumstances and conditions of the *IESO* or external *control area*.** In addition, the *IESO* may alter the order in which the control actions are implemented to respond to *reliability* concerns.

The *IESO* will not take control actions unless they provide a **net** benefit to the operating condition.

NERC standards require simultaneous *curtailment* of *energy* injections and withdrawals associated with a linked wheeling transaction. Where injections and withdrawals are simultaneously curtailed there is no benefit to supply *adequacy*. Therefore, the *IESO* will not curtail linked wheeling transactions to support the overall supply *adequacy* of the *IESO-controlled grid*. The *IESO* may, however, curtail a linked wheeling transaction where the transaction was contributing to transmission *security* concerns or overloads which are causing either global or local *reliability* concerns.

Legend applied to the last four columns of the table, indicating the status of the *IESO-controlled grid* associated with each control action:

- A** ~~30~~thirty-minute operating reserve, ~~10~~ten-minute operating reserve and regulation reserve maintained
- B** ~~10~~ten-minute operating reserve and regulation reserve maintained
- C** 10-minute synchronized operating reserve and regulation reserve maintained
- D** Regulation reserve maintained

B.1 Actions in Advance of and During the IESO-Controlled Grid Emergency Operating State

Table B-1: Actions in Advance of and During the IESO-Controlled Grid Emergency Operating State

| No. | Action | Description | References | A | B | C | D |
|-----|---|---|---|---|---|---|---|
| 1 | Issue Adequacy Report | These assessments are <i>published</i> 0-34 days out and would identify any forecast capacity and/or <i>energy</i> deficiencies. | MR Ch.5 ss.7.3.1.4 and 7.4.4 MM 7.2 | Y | | | |
| 2 | <i>Outage</i> Management Process – reject <i>outage</i> applications | This rejection applies only to those <i>outages</i> that have not received <i>advance approval</i> . <i>Advance approval</i> is received between one and three <i>business days</i> prior to the start of an <i>outage</i> . | MR Ch.5 s.6.4.4.1 MM 7.3 | Y | | | |
| 3 | Issue advisory for under generation via advisory notice | An advisory notice may be published (0-2 days in advance of real-time) with an under generation advisory, indicating a lack of installed resources. | MR Ch.7 s.12.1.3.2 MM 7.2 | Y | | | |
| 4 | Issue Standby Notification for Hourly Demand Response (HDR) Resources ¹⁴ | This notification can be issued from HE16 day-ahead through HE07 day-at-hand. Notifications can be issued to all participants or regionally based on system need. | <i>IESO</i> internal procedures | Y | | | |
| 5 | Issue an advisory notice for the declaration of a <i>Conservative Operating State</i> | This declaration acknowledges a <i>reliability</i> concern and signals that actions may be required to prevent an <i>emergency operating state</i> . This declaration is made during real-time. The <i>IESO</i> will issue a RCIS message. | MR Ch.5 ss.2.5 and 5.9A MM 7.1 MM 7.4 | Y | | | |
| 6 | Issue General or Public Appeal | This is a public appeal for the general populous to conserve <i>energy</i> and is usually a media based appeal. The <i>IESO</i> will normally issue an appeal under the following conditions: | <i>IESO</i> internal procedures <i>NERC Reliability Standard</i> – EOP-011, Attachment 1 | Y | | | |

¹⁴ When selecting HDR resources as control actions from the EOSCA list, the IESO will adhere to the timelines associated with placing the resources on standby and activating the resources.

| No. | Action | Description | References | A B C D |
|-----------|---|---|---|---------|
| | | <ul style="list-style-type: none"> If the system is strained and requires additional flexibility If the situation is expected to progress to the point of a 3% or a 5% voltage reduction or if the <i>IESO</i> expects to enter EEA-2 | | |
| 7 | Issue advisory for under generation via advisory notice | This report is produced no more than one day in advance and would include the under generation advisory. The report could be issued very close to real-time if needed. In this case the advisory would indicate a lack of <i>offers</i> and <i>bids</i> . | MR Ch.7 s.12.1.3.2 MM 7.2 | Y |
| 8 | <i>Outage</i> Management Process – revoke approved <i>outages</i> | Revoke impactful <i>outages</i> that have received <i>advance approval</i> (from between one and three <i>business days</i> in advance of <i>outage</i> start up to real-time). This may trigger compensation of <i>generators</i> and <i>electricity storage participants</i> that intend to inject. | MR Ch.5 ss.6.4.4.1 and 6.4.9 MM 7.3 | Y |
| 9 | Manage Inadvertent Payback | When inadvertent is owed by the <i>IESO</i> , the <i>IESO</i> may unilaterally or bilaterally payback the inadvertent. To the extent that this payback is contributing to the deficiency, such payback shall be discontinued. If the payback benefits the situation in the <i>IESO control area</i> , it will continue. | <i>IESO</i> internal procedures | Y |
| 10 | Manage Time Error Correction | When time-error correction requires an over-generation of <i>IESO control area</i> resources, time-error correction shall be discontinued. The time error correction monitor will issue a RCIS ¹⁵ message. | <i>IESO</i> internal procedures | Y |

¹⁵ RCIS message: A message on the Reliability Coordinators Information System which allow all *Reliability Coordinators* to be aware of the status of neighbouring *control areas*.

| No. | Action | Description | References | A B C D |
|-----|---|--|--|---------|
| 11 | Outage management process – recall outages or suspend outages and switching | Outages that can be recalled in a timely fashion will be recalled. This may trigger compensation of <i>generators</i> and <i>electricity storage participants</i> that intend to inject. <i>IESO</i> may request participants to suspend outages and switching operations if their work poses a <i>reliability</i> risk to the <i>IESO-controlled grid</i> . | MR Ch.5 ss.6.4.4.1 and 6.4.11 MM 7.3 | Y |
| 12 | Constrain Dispatch of energy limited resources | These control actions, where available and implemented, are intended to <u>avoid the declaration</u> of an <i>emergency operating state</i> . Daily Energy Limited resources would be constrained off at this time to allow for them to run in future deficient hours. | MR Ch.5 ss.1.2.1 and 2.3.2 MR Ch.7 ss.7.2.1A.1, 7.2.5A.1 and 11.3.3 | Y |
| 13 | Discontinue Commissioning Tests | During the commissioning of a <i>generation unit</i> or an <i>electricity storage unit</i> the <i>IESO</i> may be required to carry additional reserve due to the increased likelihood of unit failure. The <i>IESO</i> may request that all commissioning tests halt so that the reserve requirement is returned to normal levels. | MR Ch.5 s.4.5.1.3 | Y |
| 14 | Issue <i>NERC</i> Energy Emergency Alert 1 (EEA-1) | The <i>IESO control area</i> has (or expects to have) all available resources in use. The <i>IESO</i> will issue a RCIS message and an advisory notice. | <i>NERC Reliability Standard</i> – EOP-011, Attachment 1 | Y |
| 15 | Issue an advisory notice to indicate the potential to declare an <i>emergency operating state</i> | The advisory notice will indicate the potential for the declaration of an <i>emergency operating state</i> . | MR Ch.7 s.12.1.3.3 | Y |
| 16 | Include 3 % or 5% voltage reductions as <i>30-minute operating reserve</i> | This action will help to maintain the <i>30-minute operating reserve</i> and will only be included if all available <i>offers</i> for <i>operating reserve</i> are utilized. | | Y |

| No. | Action | Description | References | A | B | C | D |
|--|--|---|---|---|---|---|---|
| 17 | Run short of 30 thirty-minute operating reserve | If the 30 thirty-minute operating reserve shortfall is expected to last less than four hours: Run short of 30 thirty-minute operating reserve | | Y | | | |
| Solve 30 thirty-minute operating reserve shortfall. | | | | | | | |
| The following seven control actions may be used if the 30 thirty-minute operating reserve shortfall is forecasted to last beyond four hours from the time the shortfall was first identified, or if a shortfall is forecasted of any duration beyond a four-hour horizon. | | | | | | | |
| Implement control actions 18 through 24 in a timely manner as to resolve the 30thirty-minute operating reserve shortfall prior to the end of the 4-hour period. | | | | | | | |
| 18 | Constrain Dispatch of Resources on a reasonable effort economic basis. | <p>These control actions, where available and implemented, are intended to <u>avoid the declaration</u> of an <i>emergency operating state</i>.</p> <p>Constrain <i>GOG-eligible resources</i> already scheduled in pre-dispatch where the <i>start-up notice</i> has not yet been issued.</p> <p>This action could include, if not recognized by the pre-dispatch of real time <i>dispatch</i> sequence algorithms:</p> <ul style="list-style-type: none"> • Issue <i>capacity import call</i> to <i>generator-backed capacity import resources</i> • Constraining imports on, which may include <i>system-backed</i> and <i>generator-backed capacity imports</i> • Constraining down <i>dispatchable loads</i> and <i>dispatchable electricity storage facilities</i> that are withdrawing • Constraining linked wheels off only if it frees up available transfer capability • Constraining exports off¹⁶, except for capacity backed exports (provided the | <p>MM 4.3 s.6.8</p> <p>MR Ch.5 ss.1.2.1 and 2.3.2</p> <p>MR Ch.7 ss.7.2.1A.1, 7.2.5A.1 and 11.3.3</p> <p><i>IESO</i> internal procedures</p> | Y | | | |

¹⁶ If a resource has committed its capacity externally, Ontario cannot include that capacity towards Ontario *adequacy* in a planning timeframe, nor for real-time operations under certain real-time circumstances. The *IESO* will not curtail a capacity export for global/local *adequacy* **unless the**

| No. | Action | Description | References | A | B | C | D |
|-----|--|--|------------|---|---|---|---|
| | | backing generation is covering the MW) Note: <i>Operating reserve</i> may be sold as a recallable export in an <i>emergency</i> situation (e.g., to help prevent a neighboring entity from having to shed load). <ul style="list-style-type: none"> • Activate HDR <i>resources</i> Note: This activation can be issued to any HDR <i>resource</i> that was previously sent a standby notification. Resources must be activated approximately 2.5 hours in advance of their expected load curtailment time. The use of Daily Energy Limited <i>resources</i> may be used at this time provided adequate <i>resources</i> are available for future hours. | | | | | |
| 19 | Solicit <i>Bids/Offers</i> | The <i>IESO</i> will solicit <i>bids</i> and <i>offers</i> at this time. The <i>IESO</i> will open the <i>offer / bidding</i> window and issue an advisory notice. | | | | | Y |
| 20 | Reconfigure <i>Transmission system</i> | Where an evaluation has deemed it beneficial to do so, the <i>IESO</i> will reconfigure the <i>transmission system</i> to avoid the declaration of an <i>emergency operating state</i> . | | | | | Y |
| 21 | Include incremental import transactions beyond two hours before the <i>dispatch hour</i> . | This action will allow additional import transactions to be scheduled. A system advisory will be issued to notify the market place prior to this action. | | | | | Y |

backing resource is not scheduled or is not operating to the full amount of the capacity export, at which point the *IESO* can curtail a capacity export to the lower of the schedule or output amount of the resource that has committed its capacity externally.

| No. | Action | Description | References | A | B | C | D |
|--|--|--|--------------------------|---|---|---|---|
| 22 | Issue a reliability declaration ¹⁷ to call on Hydro Quebec capacity (only during summer periods in which Hydro Quebec has committed capacity to the IESO) | A reliability declaration must be made to ensure <i>offers</i> are submitted by Hydro Quebec to provide firm <i>energy</i> . The IESO will issue an advisory notice. | IESO internal procedures | Y | | | |
| 23 | Issue an advisory for the declaration of an <i>emergency operating state</i> | Issue an advisory notice to indicate the <u>declaration</u> of the <i>emergency operating state</i> . The IESO will issue an RCIS message. | MR Ch.7 s.12.1.3.3 | Y | | | |
| 24 | Purchase <i>emergency energy</i> and request <i>emergency assistance</i> | Purchase resources not made available through market mechanisms to eliminate the deficiency. These purchases are made to maintain 30 <i>thirty-minute operating reserve</i> and are not providing support to the exports that may be flowing at the time. The source of the purchases must be the seller's surplus <i>energy</i> . The IESO will issue an advisory notice. | MR Ch.5 s.2.3.3A | Y | | | |
| The IESO is now no longer able to operate to respect the 30 <i>thirty-minute operating reserve</i> requirement. The preceding control actions are insufficient to meet the full 30 <i>thirty-minute operating reserve</i> requirement. | | | | | | | |
| 25 | Include any 3% or 5% voltage reductions not already included as <i>10-minute operating reserve</i> | This action will help to maintain the 10 <i>ten-minute operating reserve</i> . | MR Ch.5 s.10.3 | Y | | | |
| 26 | Constrain ramp limited units up to maximize <i>10-minute operating reserve</i> | These control actions will be taken if not recognized by the pre-dispatch or real time <i>dispatch algorithms</i> . | | | | | Y |
| 27 | Bring a sufficient amount of 30 <i>thirty-minute operating</i> | This IESO will ask the external <i>control area</i> if they can deliver the scheduled 30 <i>thirty-minute operating reserve imports</i> | | | | | Y |

¹⁷ Reliability declaration is a term used in association with the IESO/Hydro Quebec Capacity Sharing Agreement. For more information, refer to [Market Manual 4.3: Real-Time Scheduling of the Physical Markets](#).

| No. | Action | Description | References | A B C D |
|-----|--|---|---|---------|
| | <i>reserve imports to 10-minute operating reserve status.</i> | in 10 minutes. If the external <i>control area</i> cannot deliver the imports in 10 minutes, the <i>IESO</i> will constrain on the import to allow internal <i>energy</i> to be made available for <i>10-minute operating reserve</i> . | | |
| 28 | Constrain Dispatch of Resources on a reasonable effort economic basis. | <p>These control actions, where available and implemented, are intended to <u>avoid the declaration</u> of an <i>emergency operating state</i>.</p> <p>Constrain <i>GOG-eligible resources</i> already scheduled in pre-dispatch where the <i>start-up notice</i> has not yet been issued.</p> <p>This action could include, if not recognized by the pre-dispatch of real time <i>dispatch</i> sequence algorithms:</p> <ul style="list-style-type: none"> • Issue <i>capacity import call</i> to <i>generator-backed capacity import resources</i> • Constraining imports on, which may include <i>system-backed</i> and <i>generator-backed capacity imports</i> • Constraining down <i>dispatchable loads</i> and <i>dispatchable electricity storage facilities</i> that are withdrawing • Constraining linked wheels off only if it frees up available transfer capability • Constraining exports off¹⁸, except for capacity backed exports (provided the backing generation is covering the MW) <p>Note: <i>Operating reserve</i> may be sold as a recallable export in an <i>emergency</i> situation (e.g., to help prevent a neighboring entity from having to shed load).</p> <ul style="list-style-type: none"> • Activate HDR <i>resources</i> <p>Note: This activation can be issued to any HDR resource that was previously sent a</p> | <p>MM 4.3 s.6.8</p> <p>MR Ch.5</p> <p>ss.1.2.1 and 2.3.2</p> <p>MR Ch.7</p> <p>ss.7.2.1A.1, 7.2.5A.1 and 11.3.3</p> | Y |

| No. | Action | Description | References | A B C D |
|-----|---|---|--|---------|
| | | standby notification. Resources must be activated approximately 2.5 hours in advance of their expected load curtailment time. The use of Daily Energy Limited <i>resources</i> may be used at this time provided adequate <i>resources</i> are available for future hours. | | |
| 29 | Solicit Bids/Offers | The <i>IESO</i> will solicit <i>bids</i> and <i>offers</i> at this time. The <i>IESO</i> will open the offer / bidding window and issue an advisory notice. | | Y |
| 30 | Reconfigure <i>Transmission system</i> | Where an evaluation has deemed it beneficial to do so, the <i>IESO</i> will reconfigure the <i>transmission system</i> to avoid the declaration of an <i>emergency operating state</i> . | | Y |
| 31 | Include incremental import transactions beyond two hours before the dispatch hour. | This action may allow additional import transactions to be scheduled. A system advisory will be issued to notify the market place prior to this action. | | Y |
| 32 | Issue <i>NERC</i> Energy Emergency Alert 2 (EEA2) | The <i>IESO control area</i> has or is about to initiate load management procedures. The <i>IESO</i> will open the <i>bidding / offer</i> window and issue an RCIS message and an advisory notice. | <i>NERC Reliability Standard – EOP-011, Attachment 1</i> | Y |
| 33 | Issue a <i>reliability</i> declaration to call on Hydro Quebec capacity (only during summer periods in which Hydro Quebec has committed capacity to the <i>IESO</i>) | A <i>reliability</i> declaration must be made to ensure <i>offers</i> are submitted by Hydro Quebec to provide firm <i>energy</i> . The <i>IESO</i> will issue an advisory notice. | <i>IESO</i> internal procedures | Y |

| No. | Action | Description | References | A | B | C | D |
|-----|--|---|-------------------------------------|---|---|---|---|
| 34 | Issue an advisory notice for the declaration of an <i>emergency operating state</i> | Issue an advisory notice to indicate the <u>declaration</u> of the <i>emergency operating state</i> . The <i>IESO</i> will issue an RCIS message. | MR Ch.7 s.12.1.3.3 | | | | Y |
| 35 | Give advance warning to the Ministry of the Environment Conservation and Parks (MECP) Spills Action Centre (by phone 1-800-268-6060) and the Ministry of Natural Resources and Forestry (MNR) Provincial Emergency Response Coordinator (1-866-898-7372) of potential for Environmental Variance request from <i>market participants</i> . | This will allow MECP and MNR time to alert their Regional Offices and be prepared to approve Environmental Variance Requests. The <i>IESO</i> will only provide this notification if the situation is expected to progress to the point where environmental variance requests will be required. | <i>IESO</i> internal procedures | | | | Y |
| 36 | Request <i>market participants</i> to seek prior approval of environmental variances | The <i>IESO</i> will request <i>market participants</i> to seek prior approval for environmental variances. The <i>IESO</i> will issue an advisory notice. | <i>IESO</i> internal procedures | | | | Y |
| 37 | Purchase <i>emergency energy</i> and request <i>emergency assistance</i> | The <i>IESO</i> will purchase resources not made available through market mechanisms. These purchases are made to maintain 10 <i>ten-minute operating reserve</i> and are not providing support to the exports that may be flowing at the time. The source of the purchases should be the seller's surplus <i>energy</i> or 30 <i>thirty-minute operating reserve</i> . The <i>IESO</i> will issue an advisory notice. | MR Ch.5 s.2.3.3A | | | | Y |

| No. | Action | Description | References | A | B | C | D |
|---|--|---|---------------------------------|---|---|---|---|
| <p>The <i>IESO</i> is no longer operating to respect the 30-minute or 10-minute non-synchronized <i>operating reserve</i> requirement and has only enough resources available to meet the 10-minute synchronized <i>operating reserve</i> and minimum <i>regulation</i> requirements. The preceding control actions are insufficient to maintain 10-minute non-synchronized <i>operating reserve</i>.</p> | | | | | | | |
| 38 | Give warning to the Ministry of the Environment Conservation and Parks (MECP) Spills Action Centre (by phone 1-800-268-6060) that the <i>IESO</i> is about to request <i>market participants</i> to implement their environmental variances. | This will allow MECP to alert their Regional Offices that the <i>market participants</i> are about to be requested by the <i>IESO</i> to implement their nuclear and gas environmental variances. | <i>IESO</i> internal procedures | | | | Y |
| 39 | Implement MECP thermal environmental variances. | The <i>IESO</i> will request <i>market participants</i> to implement available MECP environmental variances to allow thermal <i>generators</i> (nuclear, gas) to increase their output. The <i>IESO</i> will open the <i>offer / bidding</i> window and issue an advisory notice. | <i>IESO</i> internal procedures | | | | Y |
| 40 | Disregard High-Risk Limits | This action will allow the <i>IESO</i> to make additional bottled <i>energy</i> available at the expense of increased risk to system <i>security</i> . The <i>IESO</i> will open the <i>offer / bidding</i> window and issue an advisory notice. | <i>IESO</i> internal procedures | | | | Y |
| 41 | Purchase <i>emergency energy</i> and request <i>emergency</i> assistance | The <i>IESO</i> will purchase resources not made available through market mechanisms. The source of the purchases should be the seller's surplus <i>energy</i> or 30-minute <i>operating reserve</i> made available by Step 40: Disregard High Risk Limits. The <i>IESO</i> will issue an advisory notice. | MR Ch.5 s.2.3.3A | | | | Y |

| No. | Action | Description | References | A | B | C | D |
|---|--|--|--|---|---|---|---|
| 42 | Curtail withdrawals from <i>self-scheduling electricity storage facility</i> | These control actions, where available and implemented, are intended to <u>avoid the operation to</u> emergency condition limits. | <i>IESO</i> internal procedures | | | | Y |
| <p>The <i>IESO</i> is no longer operating to respect the 10-minute synchronized <i>operating reserve</i> requirement and has only enough <i>resources</i> available to meet the minimum <i>regulation</i> requirements.</p> | | | | | | | |
| 43 | Issue <i>NERC</i> Energy Emergency Alert 3 (EEA-3) | <p>This <i>publishes</i> to all that either:</p> <ul style="list-style-type: none"> Firm load interruption is imminent or in process; or The <i>IESO</i> is short of 10<i>ten</i>-minute <i>operating reserve</i>. <p>These alerts are posted on the <i>NERC</i> public website.</p> <p>The <i>IESO</i> will issue a RCIS message and an advisory notice.</p> | <i>NERC Reliability Standard</i> – EOP-011, Attachment 1 | | | | Y |
| 44 | Implement 3% voltage reductions | <p>The <i>IESO</i> has reduced voltage by 3% at the distribution level. Power quality affected but no “real” load cut.</p> <p>The <i>IESO</i> will issue an advisory notice and RCIS message.</p> | MR Ch.5 s.10.3 | | | | Y |
| 45 | Implement 5% voltage reductions | <p>The <i>IESO</i> has reduced voltage by 5% at the distribution level. Power quality affected but no “real” load cut. Expect significant customer complaints and requests for <i>exemption</i>.</p> <p>The <i>IESO</i> will issue an advisory notice and RCIS message.</p> | MR Ch.5 s.10.3 | | | | Y |
| 46 | Give warning to the Ministry of Natural Resources and Forestry (MNR) (1-866-898-7372) that the <i>IESO</i> is about to request <i>market participants</i> to implement environmental variances | This will allow MNR to alert their Regional Offices that the <i>market participants</i> are about to be requested by the <i>IESO</i> to implement their hydroelectric environmental variances. | <i>IESO</i> internal procedures | | | | Y |

| No. | Action | Description | References | A | B | C | D |
|-----|--|--|---------------------------------|---|---|---|---|
| 47 | Implement all necessary remaining approved environmental variances. | <p>The <i>IESO</i> will request <i>market participants</i> to implement all remaining approved environmental variances.</p> <p>The <i>IESO</i> will open the <i>bidding / offer</i> window and issue an advisory notice.</p> | <i>IESO</i> internal procedures | | | | Y |
| 48 | Operate to Emergency Condition Limits | <p>This action will allow the <i>IESO</i> to make additional bottled <i>energy</i> available at the expense of increased risk to system <i>security</i>.</p> <p>The <i>IESO</i> will open the <i>bidding/offer</i> window, issue a RCIS message and an advisory notice.</p> | <i>IESO</i> internal procedures | | | | Y |
| 49 | Purchase <i>emergency energy</i> and request <i>emergency</i> assistance | <p>The <i>IESO</i> will purchase resources not made available through market mechanisms. The source of the purchases should be the seller's surplus <i>energy</i> or <i>operating reserve</i> including 10<i>ten-minute operating reserve</i> made available by Step 48: Operate to Emergency Condition Limits.</p> <p>The <i>IESO</i> will issue an advisory notice.</p> | MR Ch.5 s.2.3.3A | | | | Y |
| 50 | Curtail <i>non-dispatchable load</i> | <p><i>Curtailment</i> achieved through emergency block or rotational load shedding.</p> <p>The <i>IESO</i> will issue a RCIS message and an advisory notice.</p> | MR Ch.5 s.10.3 | | | | Y |

B.2 Emergency Operating State Actions (IESO and External Control Area Deficiency)

Legend applied to the last four columns of the table, indicating the status of the *IESO-controlled grid* associated with each control action:

- A** ~~30~~*thirty*-minute operating reserve, ~~10~~*ten*-minute operating reserve and *regulation* reserve maintained
- B** ~~10~~*ten*-minute operating reserve and *regulation* reserve maintained
- C** 10-minute synchronized *operating reserve* and *regulation* reserve maintained
- D** *Regulation* reserve maintained

B.2.1 Initial Actions

The *IESO* will:

- utilize all *dispatchable* resources, including Ontario *dispatchable load/generation/storage*, bid at +MMCP to satisfy *demand* and reserve requirements;
- provide notices of expected supply shortfall, reject, revoke, and recall *outages*, cancel commissioning test and take all other acceptable control actions as articulated in the Appendix B.1 to minimize the deficiency; and
- include voltage reduction as sources of *operating reserve*.

At this point all remaining exports would be supplying non-dispatchable load in the deficient jurisdiction and it would be in a state comparable to the Ontario *emergency operating state*. The following actions will be taken as long as the deficient area remains in a comparable or more severe state:

Table B-2: Emergency Operating State Actions (IESO and External Control Area Deficiency)

| No. | Action | Description | References | A | B | C | D |
|-----|--|-------------|---|---|---|---|---|
| 1 | Curtail exports ¹⁸ to jurisdictions not purchasing <i>emergency energy</i> or taking equivalent action. | | MR Ch.5 s.2.3 <i>IESO</i> internal procedures | | | | Y |

¹⁸ With the exception of capacity exports, unless the backing *resource* that has committed its capacity has not been scheduled or is not outputting to the full amount of the capacity export, at which point the capacity export may be curtailed to the lower of the *resource's* schedule or output.

| No. | Action | Description | References | A | B | C | D |
|-----|---|--|---|---|---|---|---|
| 2 | Purchase <i>emergency energy</i> and request <i>emergency assistance</i> . | Purchase resources not made available through market mechanisms. The <i>IESO</i> will issue an advisory notice. | MR Ch.5 s.2.3.3A | | | | Y |
| 3 | Curtail exports ¹⁹ exports to jurisdictions not implementing 3% voltage reduction or taking equivalent action. | | MR Ch.5 s.2.3 <i>IESO</i> internal procedures | | | | Y |
| 4 | Implement 3% voltage reductions in Ontario. | The <i>IESO</i> has reduced voltage by 3% at the distribution level. Power quality affected but no “real” load cut. The <i>IESO</i> will issue an RCIS message and an advisory notice. | MR Ch.5 s.10.3 | | | | Y |
| 5 | Curtail exports ¹⁹ to jurisdictions not implementing 5% voltage reduction or taking equivalent action. | | MR Ch.5 s.2.3 <i>IESO</i> internal procedures | | | | Y |
| 6 | Implement 5% voltage reductions in Ontario. | The <i>IESO</i> has reduced voltage by 5% at the distribution level. Power quality affected but no “real” load cut. Expect significant customer complaints and requests for <i>exemption</i> . The <i>IESO</i> will adjust the real time demand globally and will issue an RCIS message and an advisory notice. | MR Ch.5 s.10.3 | | | | Y |

¹⁹ If a *generation resource* has committed its capacity externally, Ontario cannot include that capacity towards Ontario *adequacy* in a planning time frame, nor for real-time operations under certain real-time circumstances. The *IESO* will not curtail a capacity export for global/local *adequacy* unless the backing *generator* is not scheduled or is not generating to the full amount of the capacity export, at which point the *IESO* can curtail a capacity export to the lower of the schedule or output amount of the *resource* that has committed its capacity externally.

| No. | Action | Description | References | A | B | C | D |
|-----|---|--|---|---|---|---|---|
| 7 | Curtail exports ¹⁹ to jurisdictions not operating to emergency condition limits (or disregarding high-risk limits). | | MR Ch.5 s.2.3 <i>IESO</i> internal procedures | | | | Y |
| 8 | Operate to <i>emergency</i> condition limits (or disregard high risk) in Ontario. | This action will allow the <i>IESO</i> to make additional bottled <i>energy</i> available at the expense of increased risk to system <i>security</i> . The <i>IESO</i> will open the bidding/ <i>offer</i> window, issue a RCIS message and an advisory notice. | <i>IESO</i> internal procedures | | | | Y |
| 9 | Curtail remaining exports ¹⁹ . | | MR Ch.5 s.2.3 <i>IESO</i> internal procedures | | | | Y |
| 10 | If Hydro Quebec TransÈnergie has issued a reliability declaration to the <i>IESO</i> , curtail Ontario <i>non-dispatchable loads</i> to support firm <i>energy</i> export to Hydro Quebec (pro-rata with Hydro Quebec to equalize <i>load</i> shedding in both <i>control area</i> , up to the <i>IESO</i> capacity obligation) | To be applied only when <i>IESO</i> has committed capacity to Hydro Quebec (refer to MM 4.3 s.6.4). | <i>IESO</i> internal procedures | | | | Y |
| 11 | Curtail Ontario <i>non-dispatchable loads</i> . | <i>Curtailment</i> achieved through <i>emergency</i> block or rotational <i>load</i> shedding. The <i>IESO</i> will issue an RCIS message and an advisory notice. | MR Ch.5 s.10.3 | | | | Y |

– End of Appendix –

List of Acronyms

| Acronym | Term |
|-------------|--|
| ABNO | available but not operating |
| <i>AVR</i> | <i>automatic voltage regulation</i> |
| BES | bulk electric system |
| BPS | bulk power system |
| DAM | <i>day-ahead market</i> |
| DESN | dual element spot network |
| EMS | Energy Management System |
| EOSCA | <i>emergency operating state control actions</i> |
| <i>GOG</i> | <i>generator offer guarantee</i> |
| HE | hour ending |
| Hz | hertz |
| ICG | <i>IESO-controlled grid</i> |
| IROL | interconnection reliability operating limit |
| <i>MMCP</i> | <i>maximum market clearing price</i> |
| MNR | Ministry of Natural Resources |
| MOE | Ministry of Energy |
| MR | <i>market rules</i> |
| MVA | megavolt-amp |
| MVAR | megavolt-amp reactive |
| MW | megawatt |
| <i>NERC</i> | <i>North American Electric Reliability Corporation</i> |
| NPCC | Northeast Power Coordinating Council, Inc. |
| RAS | <i>remedial action scheme</i> |
| RCIS | Reliability Coordinators Information System |
| <u>SBG</u> | <u>Surplus Baseload Generation</u> |

| Acronym | Term |
|----------------|-------------------------------|
| SCS | Shift Control Specialist |
| SOL | system operating limit |
| TS | transformer station |
| UFLS | under-frequency load shedding |
| ULTC | under-load tap changer |

– End of Section –

Defined Terms

The following table contains definitions for terms specific to this *market manual* and are not defined under Chapter 11 of the *market rules*.

| Term | Meaning |
|---------------------|--|
| auxiliary equipment | auxiliary equipment includes: <ul style="list-style-type: none"> • All protection systems (including line, transformer, overvoltage, overcurrent, and high resistance open phase) • All communications <i>facilities</i> associated with protections • All dynamic control systems: <i>AVRs</i>, power system stabilizers, other excitation system components • All RASs • All UFLS relays • All automatic reclosure schemes • All automatic tap changer controls on 500 kV/230 kV and 230 kV/115 kV autotransformers • All voltage reduction <i>facilities</i> that are used for <i>demand</i> control • Ferroresonance protection schemes • All voice communications <i>facilities</i> that are required by the <i>market rules</i> • <i>Regulation facilities</i> • SCADA <i>facilities</i> |

– End of Section –

References

| Document ID & Link | Document Title |
|-------------------------------|--|
| MDP_RUL_0002 | Market Rules for the Ontario Electricity Market |
| MDP_PRO_0048 | Market Manual 1.4: Connection Assessment and Approval |
| MDP_PRO_0022 | Market Manual 2.6: Treatment of Compliance Issues |
| MDP_PRO_0023 | Market Manual 2.7: Treatment of Market Surveillance Issues |
| IMP_PRO_0035 | Market Manual 7.3: Outage Management |
| IMO_PLAN_0001 | Market Manual 7.8: Ontario Power System Restoration Plan (OPSRP) |
| IMO_PLAN_0002 | Market Manual 7.10: Ontario Electricity Emergency Plan |

– End of Document –